

Taxon: <i>Oenothera stricta</i> subsp. <i>stricta</i>	Family: Onagraceae
Common Name(s): common evening primrose fragrant evening primrose sweet sundrop	Synonym(s): <i>Oenothera striata</i> Link

Assessor: Assessor	Status: Assessor Approved	End Date: 10 Oct 2014
WRA Score: 10.0	Designation: H(HPWRA)	Rating: High Risk

Keywords: Naturalized, Disturbance Weed, Annual, Self-Compatible, Insect-Pollinated

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	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	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	y
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
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	y=1, n=0	n
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	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n

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	y
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	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	y
703	Propagules likely to disperse as a produce contaminant		
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	y
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)		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	n

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.	[No evidence of domestication] "Native to Chile and Argentina, South America, now naturalized on all continents except Antarctica"

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2014. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2014. 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, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 9 Oct 2014]	"Native: SOUTHERN AMERICA Southern South America: Argentina - Buenos Aires, Chaco, Chubut, Cordoba, Neuquen, Rio Negro, San Luis; Chile"
	Mihulka, S., & Pyšek, P. 2001. Invasion history of <i>Oenothera</i> congeners in Europe: a comparative study of spreading rates in the last 200 years. <i>Journal of Biogeography</i> , 28(5): 597-609	"This species seems to be tolerant to a relatively wide gradient of ecological conditions within Mediterranean environment."

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 9 Oct 2014]	

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

Qsn #	Question	Answer
	Mihulka, S., & Pyšek, P. 2001. Invasion history of <i>Oenothera</i> congeners in Europe: a comparative study of spreading rates in the last 200 years. <i>Journal of Biogeography</i> , 28(5): 597-609	"The invasion of <i>O. stricta</i> , a species characteristic of warmer regions with Mediterranean climate, was faster in Portugal than in the UK." ... "This species seems to be tolerant to a relatively wide gradient of ecological conditions within Mediterranean environment. RostanÄ ski (1982) mentions <i>O. stricta</i> as a species of maritime sands and various waste places in UK. Frean et al. (1997) emphasize the capability of <i>O. stricta</i> to invade grasslands, coastal vegetation, fynbos, as well as semidesert areas in South Africa."
	Dave's Garden. 2014. PlantFiles: Evening Primrose - <i>Oenothera stricta</i> . http://davesgarden.com/guides/pf/go/56580/ . [Accessed 9 Oct 2014]	[Able to grow in 5+ hardiness zones] "Hardiness: USDA Zone 5b: to -26.1 °C (-15 °F) USDA Zone 6a: to -23.3 °C (-10 °F) USDA Zone 6b: to -20.5 °C (-5 °F) USDA Zone 7a: to -17.7 °C (0 °F) USDA Zone 7b: to -14.9 °C (5 °F) USDA Zone 8a: to -12.2 °C (10 °F) USDA Zone 8b: to -9.4 °C (15 °F) USDA Zone 9a: to -6.6 °C (20 °F) USDA Zone 9b: to -3.8 °C (25 °F)"
	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 1000 m in Hawaiian Islands, demonstrating environmental versatility] "In Hawai'i, naturalized and relatively common in open sites, especially along roadsides, 1,200-2,740 m"

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Dietrich, W. 1977. The South American species of <i>Oenothera</i> sect. <i>Oenothera</i> (<i>Raimannia</i> , <i>Renneria</i> ; <i>Onagraceae</i>). <i>Annals of the Missouri Botanical Garden</i> , 64 (3): 425-626	"The following species of subsect. <i>Munzia</i> were adventive or established outside of South America:" ... " <i>O. stricta</i> subsp. <i>stricta</i> : U.S.A., Mexico, Hawaii, Europe, Japan, India, Pakistan, Sri Lanka, Java, Australia, New Zealand, North Africa, South Africa, Ethiopia;"
	Mihulka, S., & Pyšek, P. 2001. Invasion history of <i>Oenothera</i> congeners in Europe: a comparative study of spreading rates in the last 200 years. <i>Journal of Biogeography</i> , 28(5): 597-609	"The South American group is represented by perennial and annual species preferring oceanic climate (e.g. <i>O. rosea</i> , <i>O. stricta</i>), ..." ... "Species of South American origin such as <i>O. stricta</i> or <i>O. rosea</i> , which occur in warmer territories and in scrubland habitats, prefer coastal countries with higher mean annual temperature and higher minimum monthly temperature (Portugal, UK)." ... "One of the groups is represented by species confined to the oceanic regions (e.g. <i>O. rosea</i> , <i>O. stricta</i>), which have been reported as successful invaders from another parts of world with similar type of climate (e.g. South Africa ± Frean et al., 1997)."
	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.	[Tropical to subtropical climate at mid-elevation distribution in Hawaiian Islands] "In Hawai'i, naturalized and relatively common in open sites, especially along roadsides, 1,200-2,740 m"

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.	"...now naturalized on all continents except Antarctica"

301	Naturalized beyond native range	y
	Source(s)	Notes
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	"Auckland to N. Otago and Westland, widely naturalised in lowland areas."
	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 Chile and Argentina, South America, now naturalized on all continents except Antarctica; in Hawaii, naturalized and relatively common in open sites, especially along roadsides, 1,200-2,740 m, on East Maui and Hawaii. First collected on Maui in 1919 (Forbes 1070.M, BISH)."
	Dietrich, W. 1977. The South American species of <i>Oenothera</i> sect. <i>Oenothera</i> (<i>Raimannia</i> , <i>Renneria</i> ; <i>Onagraceae</i>). <i>Annals of the Missouri Botanical Garden</i> , 64 (3): 425-626	"The following species of subsect. <i>Munzia</i> were adventive or established outside of South America:" ... " <i>O. stricta</i> subsp. <i>stricta</i> : U.S.A., Mexico, Hawaii, Europe, Japan, India, Pakistan, Sri Lanka, Java, Australia, New Zealand, North Africa, South Africa, Ethiopia;"
	Mihulka, S., & Pyšek, P. 2001. Invasion history of <i>Oenothera</i> congeners in Europe: a comparative study of spreading rates in the last 200 years. <i>Journal of Biogeography</i> , 28(5): 597-609	"The most abundant invasive <i>Oenothera</i> species in Portugal is <i>O. stricta</i> (Fig. 4), a species native to Mediterranean-like habitats in Southern Chile and Argentina (Table 2)."

302	Garden/amenity/disturbance weed	y
	Source(s)	Notes
	Cordingley, S. and Petherick, C. 2005. Vegetation Management Plan Henley South & West Beach Dune Reserve. City of Charles Sturt, Adelaide	" <i>Oenothera stricta</i> originates from South America. It is widespread throughout Australia and is commonly found in disturbed areas along roadsides and on sandy soils. It is known to be present in sand dunes along the northern Adelaide metropolitan coast." ... "At present, only several small populations exist within the dunes. The species has the capacity, however, to out-compete native species. <i>Oenothera stricta</i> is naturalized within nearby dune systems and consequently should be controlled and contained during the construction phase of the Coast Park shared-use path to ensure it does not become further established."
	Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia	[A disturbance adapted weed with potentially negative environmental effects] "In South Africa, it competes with native vegetation in temperate and subtropical areas (Wells et al. 1986). <i>O. stricta</i> has naturalised in all States and Territories of Australia (Hnatiuk 1990) and is widespread in Victoria and south-western Western Australia (Swarbrick and Skarratt 1994). It inhabits roadsides and other disturbed areas, especially on sandy soils (Auld and Medd 1987)."

303	Agricultural/forestry/horticultural weed	n
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Qsn #	Question	Answer
	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	
	Source(s)	Notes
	Martin, T. G., Campbell, S., & Grounds, S. 2006. Weeds of Australian rangelands. The Rangeland Journal, 28(1): 3-26	"Appendix 1. List of 622 non-native plant species that occur in the rangelands, including 153 species, representing 94 taxa (Table 2), which pose a threat to rangeland biodiversity Species known to have an impact on rangeland biodiversity are noted (Y)." [Oenothera stricta - Not listed as a biodiversity threat]
	Carbutt, C. 2012. The emerging invasive alien plants of the Drakensberg Alpine Centre, southern Africa. Bothalia, 42 (2): 71-85	[Emerging weed] "This study also highlights a further 27 species as possible 'future' emerging alien invasive plants, as the potential for more recently detected species to invade into the DAC should not be underestimated (Table 4)." [Includes Oenothera stricta]
	Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia	[Potentially Yes] "In South Africa, it competes with native vegetation in temperate and subtropical areas (Wells et al. 1986). O. stricta has naturalised in all States and Territories of Australia (Hnatiuk 1990) and is widespread in Victoria and south-western Western Australia (Swarbrick and Skarratt 1994). It inhabits roadsides and other disturbed areas, especially on sandy soils (Auld and Medd 1987)."
	National Park Service. 2014. Invasive Plants of Haleakala National Park. http://www.nps.gov/hale/naturescience/upload/InvasivePlants.pdf . [Accessed 10 Oct 2014]	[Widespread, but not identified as a serious environmental weed, or priority for control] "Manual Control Methods: Pulling is a good way of controlling evening primrose, however it is widespread in the Crater and not a high priority for control."

305	Congeneric weed	y
	Source(s)	Notes

Qsn #	Question	Answer
	Mihulka, S., Pyšek, P., Martínková, J., & Jarošík, V. 2006. Invasiveness of <i>Oenothera</i> congeners alien to Europe: Jack of all trades, master of invasion?. Perspectives in Plant Ecology, Evolution and Systematics 8(2): 83-96	"The genus <i>Oenothera</i> includes a number of species alien to central Europe, which differ in their invasion success. The present study was designed to investigate how fecundity, growth rate of seedlings and competitive ability contribute to the invasion potential within this genus. The relative growth rate and response to interspecific competition from neighbouring vegetation were determined for 15 species. Relations between these characteristics and other species traits identified in previous studies (germination, seed production and seed mass) were examined and used to explain the invasion success of particular species in Europe. Ability to germinate in the light was the only significant predictor of invasion success in six European countries. Fecundity is another trait contributing to invasion success. The most successful invaders within the genus are poor at competing with native vegetation, and an ability to escape from competition seems crucial for invasion success. <i>Oenothera biennis</i> , the most successful invader, is not outstanding in any of the characteristics assessed but is well placed in most of them. We suggest that a 'Jack-of-all-trades' strategy may be beneficial for an invader. The parental chromosomes of the species studied had no effect on the distribution of traits; hence the conclusions drawn at the species level are not biased by the specific banding pattern within the genus (permanent translocation heterozygosity). The present study indicates that comparative studies of closely related species may indicate the determinants of invasion success if they include many characteristics of the complete life cycle."

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.	"Annual or perhaps sometimes biennial herbs; stems erect or rarely decumbent, 3.5-15 dm long, unbranched or with a few side branches, strigillose, especially below, and sparsely to densely villous and glandular pubescent. Basal leaves narrowly elliptic to oblanceolate, 10-15 cm long, 0.8-1.3 cm wide, flat or slightly undulate, margins serrate; cauline leaves very narrowly elliptic to lanceolate, 2-10 cm long, 0.6-1.2 cm wide, flat or slightly undulate, margins serrate."

402	Allelopathic	n
	Source(s)	Notes

Qsn #	Question	Answer
	Takemura, T., Sakuno, E., Kamo, T., Hiradate, S., & Fujii, Y. 2013. Screening of the Growth-Inhibitory Effects of 168 Plant Species against Lettuce Seedlings. American Journal of Plant Sciences, 4(5): 1095-1104	[<i>Oenothera stricta</i> tested and not shown to have significant inhibitory effects] "The methanol extracts of 168 plant species from 68 families were evaluated for their inhibitory activity against lettuce seedling elongation. Among the plant species tested, 12 species had EC50 values for radicle growth inhibition ranging from 0.01 to 5.00 mg fresh weight equivalent mL ⁻¹ . <i>Enterolobium contortisiliquum</i> , a traditionally used herbal medicine, exhibited the strongest inhibitory activity (estimated EC50: 0.28 fresh weight equivalent mL ⁻¹). Among the 12 species, <i>Pachysandra terminalis</i> , <i>Tamarindus indica</i> , and <i>Albizia guachapele</i> required investigation, because only little has been reported about their chemical constituents to date. The data in the present study would be useful in finding new lead compounds for natural herbicides."
	Mihulka, S., Pyšek, P., Martínková, J., & Jarošík, V. 2006. Invasiveness of <i>Oenothera</i> congeners alien to Europe: Jack of all trades, master of invasion?. Perspectives in Plant Ecology, Evolution and Systematics 8(2): 83-96	Unknown. No mention of allelopathy in this publication

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.	"Annual or perhaps sometimes biennial herbs..." [No evidence. Onagraceae]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Moore, G, Sanford, P & Wiley, T. 2006. Perennial pastures for Western Australia. Department of Agriculture and Food Western Australia, Perth	"Evening primrose is readily eaten by sheep and can be grazed to the crown without damaging the plant, however it will not persist under set-stocking and requires some form of rotational grazing. Evening primrose has been successfully grown on deep sands on the south coast along with perennial veldt grass and serradella. It has mainly been grown to help stabilise sandy soils subject to wind erosion."
	Kloot, P. M. 1987. The naturalised flora of South Australia 4. Its manner of introduction. Journal of the Adelaide Botanic Garden, 10: 223-240	[Presumably palatable. Valuable fodder] "Oenothera stricta evening primrose 1889 sown successfully in Mannum area. J. Bur. Agric., 2: 89. 1897 noted as valuable fodder on sandy soils. J. Agric., 1: 43. 1913 recommended for pasture on sandy country at Monteith. J. Agric., 16: 1193."

405	Toxic to animals	n
	Source(s)	Notes
	Moore, G, Sanford, P & Wiley, T. 2006. Perennial pastures for Western Australia. Department of Agriculture and Food Western Australia, Perth	[No evidence] "Evening primrose is readily eaten by sheep and can be grazed to the crown without damaging the plant."
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

Qsn #	Question	Answer
406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Shoot Gardening. 2014. <i>Oenothera stricta</i> 'Sulphurea' (Fragrant evening primrose 'Sulphurea'). http://www.shootgardening.co.uk/plant/oenothera-stricta-sulphurea . [Accessed 10 Oct 2014]	"Pests: Generally pest-free. Specific pests: Slugs Specific diseases: Foot and root rot , Leaf spot , Powdery mildew "

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Mihulka, S., Pyšek, P., Martínková, J., & Jarošík, V. 2006. Invasiveness of <i>Oenothera</i> congeners alien to Europe: Jack of all trades, master of invasion?. <i>Perspectives in Plant Ecology, Evolution and Systematics</i> 8(2): 83-96	No evidence
	Zimmer, H., Cheal, D.& Cross, E. 2012. Post-fire Weeds Triage Manual: Black Saturday Victoria 2009– Natural values fire recovery program. Department of Sustainability and Environment, Heidelberg, Victoria	No evidence

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	Notes
	Shoot Gardening. 2014. <i>Oenothera stricta</i> 'Sulphurea' (Fragrant evening primrose 'Sulphurea'). http://www.shootgardening.co.uk/plant/oenothera-stricta-sulphurea . [Accessed 10 Oct 2014]	"Light: Full Sun"
	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.	[Typically occurs in areas that receive full sun] "naturalized and relatively common in open sites, especially along roadsides"

Qsn #	Question	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Mihulka, S., Pyšek, P., Martínková, J., & Jarošík, V. 2006. Invasiveness of <i>Oenothera</i> congeners alien to Europe: Jack of all trades, master of invasion?. <i>Perspectives in Plant Ecology, Evolution and Systematics</i> 8(2): 83-96	"Seeds of the biennial species of <i>Oenothera</i> require light for germination, and their seedlings grow on a wide range of bare soil types (Gross and Werner, 1982; Kachi and Hirose, 1983; Gross, 1985) whereas those of the perennial species also germinate in the dark (Mihulka et al., 2003)."
	Shoot Gardening. 2014. <i>Oenothera stricta</i> 'Sulphurea' (Fragrant evening primrose 'Sulphurea'). http://www.shootgardening.co.uk/plant/oenothera-stricta-sulphurea . [Accessed 10 Oct 2014]	"Soil type: Loamy, Sandy Soil drainage: Well-drained Soil pH: Acid, Alkaline, Neutral"

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Annual or perhaps sometimes biennial herbs; stems erect or rarely decumbent, 3.5-15 dm long, unbranched or with a few side branches, strigillose, especially below, and sparsely to densely villous and glandular pubescent."

412	Forms dense thickets	n
	Source(s)	Notes
	Medeiros, A.C., Loope, L.L. & Chimera, C.G. 1998. <i>Flowering Plants and Gymnosperms of Haleakala National Park</i> . Technical Report 120. Pacific Cooperative Studies Unit, Honolulu, HI	[No evidence in Haleakala National Park] "This species is the common evening primrose with its large, bright yellow flowers, very conspicuous on roadsides of the Crater District. Within the Crater, it is found most often in areas of open cinder and on cliff faces at higher elevations."

501	Aquatic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Terrestrial] "In Hawai'i, naturalized and relatively common in open sites, especially along roadsides, 1,200-2,740 m"

502	Grass	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	Onagraceae

Qsn #	Question	Answer
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.	""Annual or perhaps sometimes biennial herbs" [Onagraceae]

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	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.	"Annual or perhaps sometimes biennial herbs; stems erect or rarely decumbent, 3.5-15 dm long, unbranched or with a few side branches, strigillose, especially below, and sparsely to densely villous and glandular pubescent."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Dietrich, W. 1977. The South American species of <i>Oenothera</i> sect. <i>Oenothera</i> (<i>Raimannia</i> , <i>Renneria</i> ; <i>Onagraceae</i>). <i>Annals of the Missouri Botanical Garden</i> , 64 (3): 425-626	[No evidence] "The following species of subsect. <i>Munzia</i> were adventive or established outside of South America:" ... " <i>O. stricta</i> subsp. <i>stricta</i> : U.S.A., Mexico, Hawaii, Europe, Japan, India, Pakistan, Sri Lanka, Java, Australia, New Zealand, North Africa, South Africa, Ethiopia;" ... "Distribution (Fig. 230): In Chile from the province of Coquimbo to Isla Chiloe, and on the east side of the Andes only at Lago Nahuel Huapi in the province of Rio Negro, Argentina. The localities in Ecuador (Quito) and Peru (Lima) represent escapes from cultivation, as do those on other continents."

602	Produces viable seed	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.	"Capsules conspicuously enlarged at apex, 3-4 cm long. Seeds in 2 rows per cell, ellipsoid, 1.3-1.8 mm long, with a short beak."

603	Hybridizes naturally	
	Source(s)	Notes
	Online Atlas of the British and Irish flora. 2014. <i>Oenothera stricta</i> (Fragrant Evening-primrose). http://www.brc.ac.uk/plantatlas/index.php?q=plant/oenothera-stricta . [Accessed 10 Oct 2014]	"This species was first cultivated in Britain in 1790, and was found in the wild in the Channel Islands in 1847 and in Britain in 1852. It does not hybridise with the other <i>Oenothera</i> species, and remains scarce."
	Dietrich, W. 1977. The South American species of <i>Oenothera</i> sect. <i>Oenothera</i> (<i>Raimannia</i> , <i>Renneria</i> ; <i>Onagraceae</i>). <i>Annals of the Missouri Botanical Garden</i> , 64 (3): 425-626	[Possibly Yes] "Since, as has been pointed out several times, Chile has no native chromosomally homozygous species of the subsection (except for <i>O. coquimbensis</i>), and since the main area of <i>O. villaricae</i> seems rather clearly to be Chilean, it probably originated following hybridization between <i>O. magellanica</i> and <i>O. stricta</i> ."

Qsn #	Question	Answer
604	Self-compatible or apomictic	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.	"Self-compatible, usually autogamous, permanent translocation heterozygote"
605	Requires specialist pollinators	n
	Source(s)	Notes
	Mihulka, S., Pyšek, P., Martínková, J., & Jarošík, V. 2006. Invasiveness of <i>Oenothera</i> congeners alien to Europe: Jack of all trades, master of invasion?. <i>Perspectives in Plant Ecology, Evolution and Systematics</i> 8(2): 83-96	" <i>Oenothera</i> flowers are insect-pollinated and facultative self-pollinated."
606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	McIntyre, S., Lavorel, S., & Tremont, R. M. 1995. Plant life-history attributes: their relationship to disturbance response in herbaceous vegetation. <i>Journal of Ecology</i> , 83(1): 31-44	"Appendix 1 Life-form, dispersal unit morphology and vegetative reproduction in 365 herb and shrub taxa from temperate grassy vegetation" [<i>Oenothera stricta</i> - N, vegetative reproduction absent]
	Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia	[No evidence] " <i>Oenothera stricta</i> is an erect, broad-leaf, biennial or perennial herb to c. 1m tall, sometimes becoming woody." ... "The fruit is a capsule 2-3cm long. Reproduction occurs from seeds."
607	Minimum generative time (years)	1
	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.	"Annual or perhaps sometimes biennial herbs;"
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	Notes
	Mihulka, S., & Pyšek, P. 2001. Invasion history of <i>Oenothera</i> congeners in Europe: a comparative study of spreading rates in the last 200 years. <i>Journal of Biogeography</i> , 28(5): 597-609	" <i>Oenothera</i> seeds seem to have a great potential for long-term dispersal in time (Darlington & Steinbauer, 1961), but lack special adaptation for long distance dispersal (Hall et al., 1988). Therefore it can be supposed that their spread is strongly dependent on human activities rather than on natural dispersal agents (Frean et al., 1997). This corresponds to the pattern of occurrence found in the countries studied. Most of <i>Oenothera</i> localities are situated in human-made habitats, on disturbed soils, in industrial sites, along railways and in waste places of various kind, which are occupied by early successional species."
	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.	[Common along roadsides] "naturalized and relatively common in open sites, especially along roadsides, 1,200-2,740 m"

Qsn #	Question	Answer
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	[Distribution suggests inadvertent dispersal along these heavily trafficked corridors] "Behind beaches and in other sandy and stony areas such as river beds, roadsides, railway embankments, and open waste places."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). 2007. Flora of China. Vol. 13 (Clusiaceae through Araliaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"This species, sometimes cultivated for its relatively large, attractive flowers, often becomes naturalized in China and elsewhere."
	Digging Dog Nursery. 2014. <i>Oenothera stricta</i> . http://www.diggingdog.com/pages2/plantpages.php/P-0108 . [Accessed 10 Oct 2014]	[Sold commercially as an ornamental and in seed mixes at this and other horticultural sites] " <i>Oenothera stricta</i> (P-0108) Each \$7.00"

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	Notes
	Rostanski, K. and Karlsson, T. 2008. <i>Oenothera</i> . Flora Nordica. http://www.floranordica.org/Review/-Review_public/accounts/Oenothera.html . [Accessed 10 Oct 2014]	[Possibly introduced as a contaminant in sheep wool] " <i>Oenothera stricta</i> Ledeb. ex Link 1821. N klubbenattlys. S doftnattljus. – Annual or biennial, densely covered with patent hairs and glandular hairs; hypanthium 20–45 mm; flowers opening in the evening; petals 15–35 mm, yellow, often with a red spot at the base; capsule cylindrical, 30–50 × 3–4 mm. – [2n=14] – Lit. (also ill.): Dietrich 1978. D Sjæ København 1972 (ruderal ground), 1990 (weed in botanical garden). N Ak Oslo 1928, Bu Hurum 2002 (with pulpwood). VA Kristiansand 1967 (railway yard). S Sk Lackalänga 1949 (with wool). – Chile and Argentina; naturalized in Britain."

704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	Western Australian Herbarium. 2014. FloraBase - The Western Australian Flora - <i>Oenothera stricta</i> . https://florabase.dpaw.wa.gov.au/browse/profile/6142 . [Accessed 9 Oct 2014]	"Dispersal. Wind, soil movement."

705	Propagules water dispersed	y
	Source(s)	Notes
	Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds.). 2007. Flora of China. Vol. 13 (Clusiaceae through Araliaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Distribution along streams suggests water dispersal] "Moist, disturbed habitats near streams, roadside ditches, usually escaped from cultivation; 600–2500 m.:"

Qsn #	Question	Answer
	Chalmers, A. C., Erskine, W. D., Keene, A. F., & Bush, R. T. 2012. Relationship between vegetation, hydrology and fluvial landforms on an unregulated sand-bed stream in the Hunter Valley, Australia. <i>Austral Ecology</i> , 37(2): 193-203	[Disturbance provides habitat for germination, but water also likely plays a role in dispersal of seeds] "Consistent with the ruderal annuals described by Menges and Waller (1983), fluvial processes provide short-lived species such as <i>A. subulatus</i> , <i>C. leptophyllum</i> , <i>D. ciliaris</i> , <i>L. hyssopifolia</i> , <i>P. luteoalbum</i> , <i>O. stricta</i> and <i>X. italicum</i> with disturbed, high light environments on the bank toe or top of the bank. We estimate that the toe of the bank at Widden Brook is, on average, flooded every year and inundated for 10.3 days per year, while the top of the bank is inundated for 4.5 days per year. Ruderal annuals of riparian zones grow at elevations that are inundated more frequently, but succeed by completing their life-cycle in the periods between floods (Menges & Waller 1983)."

706	Propagules bird dispersed	n
	Source(s)	Notes
	Gosper, C. R. 1999. Plant food resources of birds in coastal dune communities in New South Wales. <i>Corella</i> , 23(3): 53-62	"The plant food resources of birds, namely nectar, flower parts, leaves, exudates, seeds, elaiosomes and fruits, were recorded in coastal dune communities at several locations along the New South Wales coastline." ... "TABLE 1 Food sources of birds in coastal New South Wales — fruit, seed and elaiosome." ... [<i>Oenothera stricta</i> seed consumed by the European Goldfinch, which is a seed predator]
	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.	[Not fleshy-fruited] "Capsules conspicuously enlarged at apex, 3-4 cm long. Seeds in 2 rows per cell, ellipsoid, 1.3-1.8 mm long, with a short beak"

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Mihulka, S., Pyšek, P., Martínková, J., & Jarošík, V. 2006. Invasiveness of <i>Oenothera</i> congeners alien to Europe: Jack of all trades, master of invasion?. <i>Perspectives in Plant Ecology, Evolution and Systematics</i> 8(2): 83-96	[No evidence, and seeds lack means of external attachment. Small size may allow for adherence to mud, fur or feathers] "The role of fecundity is further stressed by the fact that in the genus <i>Oenothera</i> , there is no special dispersal mechanism; the seeds are released from opening capsules by movement of parental plants caused mostly by wind. Terminal velocity and buoyancy differed little among the species studied (S. Mihulka, unpubl. data) and therefore these variables are unlikely to be related to varying invasiveness."

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	WRA Specialist. 2014. Personal Communication	Unknown. Foliage consumed by animals, but capsules & seeds apparently not adapted for zoochory

801	Prolific seed production (>1000/m2)	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.	[Unknown. Small-seeded, but short-statured plant] "Capsules conspicuously enlarged at apex, 3-4 cm long. Seeds in 2 rows per cell, ellipsoid, 1.3-1.8 mm long, with a short beak"

Qsn #	Question	Answer
802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Hendry, G. A. F., Thompson, K., Moss, C. J., Edwards, E., & Thorpe, P. C. 1994. Seed persistence: a correlation between seed longevity in the soil and ortho-dihydroxyphenol concentration. <i>Functional Ecology</i> ,8(5): 658-664	[Probably Yes. Reported to form a persistent seed bank, but longevity unknown] "Table 1. Mean \pm 1 SD concentration of ortho-dihydroxyphenols, cyanoglycosides and soluble protein in seeds forming persistent (P) or non-persistent (NP) seed banks (sections coincide with the numerical categories shown in Fig. 1)" [<i>Oenothera stricta</i> - Seed bank type = P]

803	Well controlled by herbicides	
	Source(s)	Notes
	Cordingley, S. and Petherick, C. 2005. Vegetation Management Plan Henley South & West Beach Dune Reserve. City of Charles Sturt, Adelaide	[Herbicides effective when plants are young & actively growing] "Use a weed fork to remove plants manually prior to seeding, taking care to remove as much of the deep taproot as possible without causing excessive soil disturbance. The p plants with the following herbicide applications recommended by the Western Australian Department of Agriculture (2002). Note that <i>Oenothera stricta</i> is considered to be relatively tolerant of glyphosate." ... "Young actively growing plants ... 1g triasulfuron plus 100ml spray oil in 10L water or 4L/ha 2,4-DB (400g/L). ... Both herbicides are considered to be fairly selective in bushland situations although 2,4-DB is recommended in areas that contain many seedlings of native species. Re-spray any regrowth."
	Western Australian Herbarium. 2014. FloraBase - The Western Australian Flora - <i>Oenothera stricta</i> . https://florabase.dpaw.wa.gov.au/browse/profile/6142 . [Accessed 9 Oct 2014]	[Seeds susceptible. Older plants resistant] "Suggested method of management and control. Control in seedling stage, as older plants are resistant to herbicide. Relatively tolerant of glyphosate. Hand remove small populations, ensuring removal of entire root system. Spot spray chlorsulfuron 0.4 g/10 L + spray oil."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	National Park Service. 2014. Invasive Plants of Haleakala National Park. http://www.nps.gov/hale/naturescience/upload/InvasivePlants.pdf . [Accessed 10 Oct 2014]	"Manual Control Methods: Pulling is a good way of controlling evening primrose, however it is widespread in the Crater and not a high priority for control."
	HerbiGuide. 2014. Evening Primrose - <i>Oenothera stricta</i> . http://www.herbiguide.com.au/Descriptions/hg_EveningPrimrose.htm . [Accessed 10 Oct 2014]	[Cultivation may provide effective control, but mechanical control may be ineffective if the entire root is not removed] "Increased grazing pressure or cultivation normally controls it." ... "It is difficult to remove by hand because it tends to break off and regrow from the rootstock. If removing manually, use a fork and ensure that all the fleshy rootstock is collected and burnt or buried more than 1 m deep."

Qsn #	Question	Answer
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 of natural enemies] "naturalized and relatively common in open sites, especially along roadsides, 1,200-2,740 m"

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, & able to grow in 5+ hardiness zones, demonstrating environmental versatility
- Naturalized in locations with subtropical climates (possibly only at higher elevations)
- Widely naturalized
- A disturbance-adapted weed with possible negative environmental effects
- Tolerates many soil types
- Self-compatible
- Able to reach maturity in <1 year
- Seeds dispersed intentionally & unintentionally by people, by wind, & water
- May form a persistent seed bank
- Older plants tolerant of glyphosate

Low Risk Traits

- May only threaten higher elevations in tropical & subtropical regions
- Unarmed (no spines, thorns or burrs)
- Provides fodder for livestock
- Ornamental
- Beneficial to pollinators
- Requires full sun
- Not reported to spread vegetatively
- Herbicides may provide effective control of younger plants