

Taxon: Ludwigia repens	Family: Onagraceae
Common Name(s): creeping primrosewillow creeping primrose-willow creeping waterpurslane	Synonym(s): Isnardia repens DC. Isnardia intermedia Small & Ludwigia natans Elliott

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 21 Oct 2015
WRA Score: 22.0	Designation: H(HPWRA)	Rating: High Risk

Keywords: Aquatic Herb, Naturalized, Weedy, Mat-Forming, Water-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)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	n
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed		
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		

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	n
411	Climbing or smothering growth habit	y=1, n=0	y
412	Forms dense thickets		
501	Aquatic	y=5, n=0	y
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	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)	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	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	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m ²)		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
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)		

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Hanelt, P. (ed.). 2001. Mansfeld's Encyclopedia of Agricultural and Horticultural Crops (except Ornamentals), Volume 1. Springer-Verlag, Berlin, Heidelberg, New York	[No evidence of domestication] "Pantropical. In SE Asia cultivated in ponds."
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence of domestication

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 8 Oct 2015]	"Native: NORTHERN AMERICA (Check conservation status in U.S. & Canada in NatureServe Explorer database) North-Central U.S.A.: United States - Kansas [Cowley Co.], Missouri, Oklahoma Southeastern U.S.A.: United States - Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee South-Central U.S.A.: United States - New Mexico, Texas Southwestern U.S.A.: United States - California [s.] Northern Mexico: Mexico - Chihuahua SOUTHERN AMERICA Caribbean: Bahamas; Bermuda; Cuba; Dominican Republic; Jamaica Mesoamerica: Guatemala Western South America: Colombia"

Qsn #	Question	Answer
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 8 Oct 2015]	

203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes
	Dave's Garden, 2015. Floating Water Primrose, Creeping Primrose Willow. <i>Ludwigia repens</i> . http://davesgarden.com/guides/pf/go/1270/ . [Accessed 20 Oct 2015]	"Hardiness: 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) USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 10b: to 1.7 °C (35 °F) USDA Zone 11: above 4.5 °C (40 °F)"
	Useful Tropical Plants Database. 2015. <i>Ludwigia repens</i> . http://tropical.theferns.info/viewtropical.php?id=Ludwigia+repens . [Accessed 20 Oct 2015]	"Mostly submerged in slow-flowing streams at elevations from sea level to about 90 metres" ... "A plant of lowland tropical and subtropical climates."
	Florida Native Plant Society. 2013. <i>Ludwigia repens</i> . http://www.fnps.org/plants/plant/ludwigia-repens . [Accessed 21 Oct 2015]	"Suitable to grow in: 8A,8B,9A,9B,10A,10B"

204	Native or naturalized in regions with tropical or subtropical climates	y
	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 20 Oct 2015]	"Native: NORTHERN AMERICA (Check conservation status in U.S. & Canada in NatureServe Explorer database) North-Central U.S.A.: United States - Kansas [Cowley Co.], Missouri, Oklahoma Southeastern U.S.A.: United States - Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee South-Central U.S.A.: United States - New Mexico, Texas Southwestern U.S.A.: United States - California [s.] Northern Mexico: Mexico - Chihuahua SOUTHERN AMERICA Caribbean: Bahamas; Bermuda; Cuba; Dominican Republic; Jamaica Mesoamerica: Guatemala Western South America: Colombia"

205	Does the species have a history of repeated introductions outside its natural range?	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"...grown for ornamental use in aquaria and ponds. It is cultivated the world over for this purpose and is regularly seen in Hawaii in tropical fish stores."

301	Naturalized beyond native range	y
	Source(s)	Notes
	Kadono, Y. (2004). Alien aquatic plants naturalized in Japan: history and present status. Global Environmental Research, 8(2): 163-169	"Table 1 A list of alien aquatic plants naturalized in Japan*." ... "Species which have increased rapidly in recent years" [Includes <i>Ludwigia repens</i>]
	Johnson, S.B. 2013. Some Weeds Have No Boundaries. What are the next steps we need to take with species that jump the fence? Pp. 61-69 in 17th NSW Weeds Conference, 9-12 September 2013, Corowa, NSW	"Table 1. A selection of recently recorded naturalised plant taxa in New South Wales that have both positive and negative impacts, that is are conflict species. Information is largely drawn from Hosking et al. (2003), (2007), (2011) and Johnson et al. 2013. Only natural ecosystems that could be invaded are listed: no assessment of primary production systems or community/cultural assets has been made." [Ludwigia repens - Ecosystems potentially invaded = Disturbed shallow freshwater areas]

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	Environmental weed

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	[Naturalized & environmental weed] "1278-N, 1255-U, 1175-W, 1049-N, 819-N, 809-U, 794-N, 617-CE, 354-N, 287-N, 258-X, 194-Av, 85-X"

304	Environmental weed	
	Source(s)	Notes
	Sydney Weeds Committees. 2008. Sydney-wide Regional Ludwigia Management Plan. http://sydneyweeds.org.au . [Accessed 20 Oct 2015]	[Potentially] " <i>Ludwigia repens</i> has been included in this revised plan as it is a new incursion to the region. It has the potential to spread much further than its current limited distribution and requires close monitoring, further investigation and potential declaration as a Class 5 noxious weed. There is currently a need to understand more about its invasiveness, potential impact, potential distribution, and the feasibility of eradication."

Qsn #	Question	Answer
	Technigro. 2012. Red Ludwigia (<i>Ludwigia repens</i>). Technigro Australia Pty Ltd, Nerang BC, QLD. www.technigro.com.au	[Predicted impacts not yet manifested in Australia] "Red Ludwigia has the capacity to form dense infestations in wetter habitats, and may eventually clog wetlands and slow moving waterways. It replaces native plants in such situations, reducing biodiversity and intercepting most of the incoming light. This can also cause significant ecological impacts such as increased sedimentation, accumulation of organic material and deoxygenation of the water column. It can also reduce the rate of flow in streams affect the usefulness of waterbodies for recreational and navigational purposes."

305	Congeneric weed	y
	Source(s)	Notes
	Okada, M., Grewell, B. J., & Jasieniuk, M. (2009). Clonal spread of invasive <i>Ludwigia hexapetala</i> and <i>L. grandiflora</i> in freshwater wetlands of California. <i>Aquatic Botany</i> , 91 (3): 123-129	" <i>Ludwigia hexapetala</i> and <i>L. grandiflora</i> are recent, aggressive invaders of freshwater wetlands in California (Cal-IPC, 2006; Wagner et al., 2007; B. Grewell, D. Canington, and J. Futrell, unpublished data). The emergent aquatic perennial plants are found in slow-flowing rivers, at lake and reservoir margins, and in the shallow waters of canals and floodplains. Dense stands have degraded natural communities, reduced water quality and floodwater retention, and prevented effective mosquito control. <i>L. hexapetala</i> is currently expanding its range in both northern and southern California whereas, to date, <i>L. grandiflora</i> has only been found in the San Diego River and associated wetlands"

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Correll, D.S. & Correll, H.B. 1975. <i>Aquatic and Wetland Plants of Southwestern United States</i> , Volume 1. Stanford University Press, Stanford, CA	[No evidence] "Glabrous to puberulent herb, creeping and rooting at the nodes, the stems to 5 dm. long; leaves very narrowly elliptic to subrotund, 9-40 mm. long. 2-20 mm. wide. the petiole 3-25 mm. long;"

402	Allelopathic	n
	Source(s)	Notes

Qsn #	Question	Answer
	Doyle, R. D., Francis, M. D., & Smart, R. M. (2003). Interference competition between <i>Ludwigia repens</i> and <i>Hygrophila polysperma</i> : two morphologically similar aquatic plant species. <i>Aquatic Botany</i> , 77(3): 223-234	[<i>L. repens</i> may be impacted by allelopathic effects of competitors, but does not appear to exhibit its own allelopathic properties] "The interference competition between <i>Ludwigia repens</i> and <i>Hygrophila polysperma</i> was investigated in a 12-week tank experiment. In monoculture, sprigs (stem fragments) of both species showed similar growth rate and growth form. However, the two species differed strongly in response to interference competition from the other species." ... "Results of these experiments suggest that both species should effectively colonize unvegetated habitats. However, in an equal mixture of sprigs of the two species colonizing new habitats, <i>H. polysperma</i> will have advantage. Furthermore, established <i>L. repens</i> will be susceptible to invasion by <i>H. polysperma</i> while established <i>H. polysperma</i> is unlikely to be invaded by <i>L. repens</i> . The continued expansion of the exotic <i>H. polysperma</i> in North America is predicted." ... "Other unmeasured factors may also have contributed to the extraordinary dominance of <i>H. polysperma</i> over <i>L. repens</i> in this study. For example, Callaway and Aschehoug (2000) have recently showed that some invasive exotic species proliferate due to negative effects of their root exudates on competing native species (allelopathy)."

403	Parasitic	n
	Source(s)	Notes
	Mohlenbrock, R.H. 2010. <i>Aquatic and Standing Water Plants of the Central Midwest. Nelumbonaceae to Vitaceae: Water Lotuses to Grapes</i> . SIU Press, Carbondale, IL	"Perennial herbs: stems floating in water or creeping on mud, rooting at the nodes, usually branched" [Onagraceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Hanelt, P. (ed.). 2001. <i>Mansfeld's Encyclopedia of Agricultural and Horticultural Crops (except Ornamentals)</i> , Volume 1. Springer-Verlag, Berlin, Heidelberg, New York	"The whole plants are fed to pigs, young sprouts are taken for human consumption."

405	Toxic to animals	n
	Source(s)	Notes
	Hanelt, P. (ed.). 2001. <i>Mansfeld's Encyclopedia of Agricultural and Horticultural Crops (except Ornamentals)</i> , Volume 1. Springer-Verlag, Berlin, Heidelberg, New York	[No evidence] "The whole plants are fed to pigs, young sprouts are taken for human consumption."
	Wagstaff, D.J. 2008. <i>International poisonous plants checklist: an evidence-based reference</i> . CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	Notes

Qsn #	Question	Answer
	Center, T.D., Dray Jr., F.A., Jubinsky, G.P., & Grodowitz, M. 1999. Insects and Other Arthropods That Feed on Aquatic and Wetland Plants. Technical Bulletin No. 1870. U.S. Department of Agriculture, Agricultural Research Service	[<i>Ludwigia repens</i> is a host plant] "Water-Primrose Leaf Weevil, <i>Perigaster cretura</i> (Herbst)" ... "The small water-primrose leaf weevils are usually found on the leaves of their host plants during the day. They feed externally, usually on the upper leaf surfaces. When disturbed, the adults jump readily and take flight at the slightest provocation. They also reportedly stridulate (create a creaking sound by rubbing ridged surfaces of their body together) when handled." ... "We know of no studies describing the impacts of this insect on its host plants."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Useful Tropical Plants Database. 2015. <i>Ludwigia repens</i> . http://tropical.theferns.info/viewtropical.php?id=Ludwigia+repens . [Accessed 20 Oct 2015]	"Known Hazards: None known" ... "Edible Uses: Young shoots - used as a vegetable"
	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
	Lytle, S. T. (2003). Adaptation and acclimation of populations of <i>Ludwigia repens</i> to growth in high-and lower-CO2 springs. PhD Dissertation. University of Florida, Gainesville, FL	[No evidence. Aquatic] " <i>Ludwigia repens</i> is an amphibious plant producing both submersed and aerial leaves, and can grow in completely terrestrial conditions (Godfrey & Wooten 1981)."

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	Notes
	Aquaticcommunity.com. 2015. <i>Ludwigia repens</i> . http://www.aquaticcommunity.com/tr/Ludwigiarepens.php . [Accessed 20 Oct 2015]	"Light requirements: medium-very high"
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Full sun or partial shade] " <i>Ludwigia</i> requires a water depth less than 16", soft to moderately hard water above 65° F, strong light (full sun or partial shade outdoors, equivalent artificial light indoors), and a bottom substrate of low to moderate fertility."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	n
	Source(s)	Notes
	Peng, C. I. (1989). The systematics and evolution of <i>Ludwigia</i> sect. <i>Microcarpium</i> (Onagraceae). <i>Annals of the Missouri Botanical Garden</i> , 76(1): 221-302	"All species grow in sandy or occasionally peaty soils."
	Florida Native Plant Society. 2013. <i>Ludwigia repens</i> . http://www.fnps.org/plants/plant/ludwigia-repens . [Accessed 21 Oct 2015]	"Salt Tolerance: Not salt tolerant Soil or other substrate: Sand, organic material (muck) Soil pH Range: Acidic"

Qsn #	Question	Answer
411	Climbing or smothering growth habit	y
	Source(s)	Notes
	Technigro. 2012. Red Ludwigia (<i>Ludwigia repens</i>). Technigro Australia Pty Ltd, Nerang BC, QLD. www.technigro.com.au	[Smotherers water surfaces] "Red Ludwigia has the capacity to form dense infestations in wetter habitats, and may eventually clog wetlands and slow moving waterways."
412	Forms dense thickets	
	Source(s)	Notes
	Technigro. 2012. Red Ludwigia (<i>Ludwigia repens</i>). Technigro Australia Pty Ltd, Nerang BC, QLD. www.technigro.com.au	[Smotherers water surfaces] "Red Ludwigia has the capacity to form dense infestations in wetter habitats, and may eventually clog wetlands and slow moving waterways."
501	Aquatic	y
	Source(s)	Notes
	Sydney Weeds Committees. 2008. Sydney-wide Regional Ludwigia Management Plan. http://sydneyweeds.org.au . [Accessed]	"It is an emergent aquatic herb with opposite green leaves that are red/purplish underneath broadly lanceolate-elliptic to suborbicular mostly 1–4.5 cm long, 4–27 mm wide, base tapering into a petiole 5–25 mm long."
502	Grass	n
	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 9 Oct 2015]	"Family: Onagraceae subfamily: Ludwigioideae"
503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	Mohlenbrock, R.H. 2010. Aquatic and Standing Water Plants of the Central Midwest. Nelumbonaceae to Vitaceae: Water Lotuses to Grapes. SIU Press, Carbondale, IL	"Perennial herbs: stems floating in water or creeping on mud" [Onagraceae]
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Mohlenbrock, R.H. 2010. Aquatic and Standing Water Plants of the Central Midwest. Nelumbonaceae to Vitaceae: Water Lotuses to Grapes. SIU Press, Carbondale, IL	"Perennial herbs: stems floating in water or creeping on mud. rooting at the nodes. usually branched. glabrous or nearly so, to 50 cm long:" [No bulbs, corms or tubers]
601	Evidence of substantial reproductive failure in native habitat	n

Qsn #	Question	Answer
	Source(s)	Notes
	Godfrey, R.K. & Wooten, J.W. 1981. Aquatic and Wetland Plants of Southeastern United States: Dicotyledons. University of Georgia Press, Athens, GA	[No evidence. Widely distributed] "In flowing or still, clear or "black," water of rivers and small streams, ponds and lakes, pools, swamps, drainage ditches and canals; also in wet, sandy, or sandy-peaty places. Coastal plain, N.C. to s. Fla., westward to Tex. and N.Mex., northward in the interior to Okla., Mo., Tenn.; Calif., southward to cen. Mex.; Berm.; W.I."

602	Produces viable seed	y
	Source(s)	Notes
	Mohlenbrock, R.H. 2010. Aquatic and Standing Water Plants of the Central Midwest. Nelumbonaceae to Vitaceae: Water Lotuses to Grapes. SIU Press, Carbondale, IL	"capsules short-cylindric, often squarish in appearance to turbinate, 4-6 mm long, nearly as wide, without a green stripe on each face; seeds numerous. yellow-brown. 0.5-0.8 mm long."
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Flowering is rare and occurs only on stems that have emerged above the water's surface. Seed may be produced but is slow to germinate."
	Sydney Weeds Committees. 2008. Sydney-wide Regional Ludwigia Management Plan. http://sydneyweeds.org.au . [Accessed 20 Oct 2015]	"Ludwigia propagates by seed as well as vegetatively."

603	Hybridizes naturally	y
	Source(s)	Notes
	Peng, C. I. (1989). The systematics and evolution of Ludwigia sect. Microcarpium (Onagraceae). Annals of the Missouri Botanical Garden, 76(1): 221-302	"Field observations and herbarium study show that hybrid populations of Ludwigia sect. Microcarpium are indeed abundant." ... "In a biosystematic study of Ludwigia sect. Dantia, a close ally of sect. Microcarpium with opposite leaves and prostrate habit, Schmidt (1967) reported two intersectional hybrids, L. repens X L. simpsonii(as L. repens X L. curtissii) and L. palustris x L. glandulosa from North Carolina and Florida, respectively" ... "The other natural hybrid, involving L. repens (n = 24; sect. Dantia) and L. simpsonii (n = 24; sect. Microcarpium), yielded 48 unpaired chromosomes at meiosis, suggesting the dissimilarity in the genomes of plants in the two North American sections." ... "Intersectional hybrids of Ludwigia simpsonii and L. repens (n = 24; sect. Dantia) have been found growing intermixed with both putative parents"
	Plant Finder. 2015. Ludwigia repens. http://www.aquaticplantcentral.com/forumapc/plantfinder/details.php?id=26 . [Accessed 9 Oct 2015]	"In the wild, it is a very polymorphic species in that it readily crosses with other species of its genus."
	Peng, C. I. (1988). The biosystematics of Ludwigia sect. Microcarpium (Onagraceae). Annals of the Missouri Botanical Garden, 75(3): 970-1009	"Ludwigia curtissii (n = 32) and L. simpsonii (n = 24) hybridize with L. repens in nature. Unless chromosome numbers are counted, it is unlikely that one would be able to distinguish between these two hybrid combinations morphologically."

Qsn #	Question	Answer
604	Self-compatible or apomictic	y
	Source(s)	Notes
	Peng, C. I. (1989). The systematics and evolution of <i>Ludwigia</i> sect. <i>Microcarpium</i> (Onagraceae). <i>Annals of the Missouri Botanical Garden</i> , 76(1): 221-302	"All 14 species in <i>Ludwigia</i> sect. <i>Microcarpium</i> are genetically self-compatible perennials that reproduce sexually and vegetatively."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Peng, C. I. (1989). The systematics and evolution of <i>Ludwigia</i> sect. <i>Microcarpium</i> (Onagraceae). <i>Annals of the Missouri Botanical Garden</i> , 76(1): 221-302	[Insect-pollinated] "Paper wasps of the genus <i>Polistes</i> have been observed to visit flowers of species of <i>Ludwigia</i> sect. <i>Microcarpium</i> grown in the netted experimental greenhouse at the Missouri Botanical Garden. In the field, more insects (usually bumblebees, honeybees, and wasps) were attracted to <i>L. pilosa</i> and, less so, to <i>L. sphaerocarpa</i> . Moths and ants have also been observed visiting <i>L. pilosa</i> . Relatively few field observations of insect pollinations on other species have been made in my trips to the southeastern United States. Circumstantial evidence from the presence of abundant natural hybrid populations suggests that insect pollination must be more common than I have observed."

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Peng, C. I. (1989). The systematics and evolution of <i>Ludwigia</i> sect. <i>Microcarpium</i> (Onagraceae). <i>Annals of the Missouri Botanical Garden</i> , 76(1): 221-302	"All 14 species in <i>Ludwigia</i> sect. <i>Microcarpium</i> are genetically self-compatible perennials that reproduce sexually and vegetatively." ... "In addition to sexual reproduction, nearly all species of <i>Ludwigia</i> sect. <i>Microcarpium</i> produce sprawling stolons at the base of the erect, flowering stems late in their flowering season. This vegetative reproduction enables the plants to overwinter, when the erect stems die back; in spring, they can then produce a large colony before other species can invade."
	Sydney Weeds Committees. 2008. Sydney-wide Regional <i>Ludwigia</i> Management Plan. http://sydneyweeds.org.au . [Accessed 20 Oct 2015]	"Dislodged branches and stem pieces can take root after dispersal by flood or machinery during removal, and develop into new plants."

607	Minimum generative time (years)	1
	Source(s)	Notes
	Plant Finder. 2015. <i>Ludwigia repens</i> . http://www.aquaticplantcentral.com/forumapc/plantfinder/details.php?id=26 . [Accessed 9 Oct 2015]	"Growth Rate: Fast"
	Florida Native Plant Society. 2013. <i>Ludwigia repens</i> . http://www.fnps.org/plants/plant/ludwigia-repens . [Accessed 21 Oct 2015]	"Life Span: annual"

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Sydney Weeds Committees. 2008. Sydney-wide Regional Ludwigia Management Plan. http://sydneyweeds.org.au . [Accessed 20 Oct 2015]	"The tiny seeds which are produced prolifically, readily adhere to moist surfaces and feathers, and are dispersed by water, wind, birds (especially ducks), machinery, footwear, clothing and mud. Machinery used to clean out drains, four wheel drive vehicles and boats can easily spread the minute seeds."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"...grown for ornamental use in aquaria and ponds. It is cultivated the world over for this purpose and is regularly seen in Hawaii in tropical fish stores."
	Plant Finder. 2015. Ludwigia repens. http://www.aquaticplantcentral.com/forumapc/plantfinder/details.php?id=26 . [Accessed 9 Oct 2015]	"L. repens is now one of the most commonly available aquarium plants around the world."

703	Propagules likely to disperse as a produce contaminant	y
	Source(s)	Notes
	Barrett, S. C., & Seaman, D. E. (1980). The weed flora of Californian rice fields. Aquatic Botany, 9: 351-376	"Table 1. Species list of Californian rice weeds indicating distribution, rice weed status, habitat in rice agroecosystem and life form" [Includes Ludwigia repens. Seeds would likely become an inadvertent contaminant of aquatic crops such as rice & taro]

704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	Sydney Weeds Committees. 2008. Sydney-wide Regional Ludwigia Management Plan. http://sydneyweeds.org.au . [Accessed 21 Oct 2015]	"The tiny seeds which are produced prolifically, readily adhere to moist surfaces and feathers, and are dispersed by water, wind, birds (especially ducks), machinery, footwear, clothing and mud. "

705	Propagules water dispersed	y
	Source(s)	Notes
	Sydney Weeds Committees. 2008. Sydney-wide Regional Ludwigia Management Plan. http://sydneyweeds.org.au . [Accessed 21 Oct 2015]	"The tiny seeds which are produced prolifically, readily adhere to moist surfaces and feathers, and are dispersed by water, wind, birds (especially ducks), machinery, footwear, clothing and mud." ... "Dislodged branches and stem pieces can take root after dispersal by flood or machinery during removal, and develop into new plants."

706	Propagules bird dispersed	y
	Source(s)	Notes
	Sydney Weeds Committees. 2008. Sydney-wide Regional Ludwigia Management Plan. http://sydneyweeds.org.au . [Accessed 20 Oct 2015]	[Ducks disperse seeds] "The tiny seeds which are produced prolifically, readily adhere to moist surfaces and feathers, and are dispersed by water, wind, birds (especially ducks), machinery, footwear, clothing and mud."

Qsn #	Question	Answer
707	Propagules dispersed by other animals (externally)	y
	Source(s)	Notes
	Sydney Weeds Committees. 2008. Sydney-wide Regional Ludwigia Management Plan. http://sydneyweeds.org.au . [Accessed 20 Oct 2015]	"The tiny seeds which are produced prolifically, readily adhere to moist surfaces and feathers, and are dispersed by water, wind, birds (especially ducks), machinery, footwear, clothing and mud. Machinery used to clean out drains, four wheel drive vehicles and boats can easily spread the minute seeds."

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Brescacin, C. R. 2010. The Role of the Feral Pig (<i>Sus scrofa</i>) as a Disturbance Agent and Seed Disperser in Central Florida's Natural Lands. MSc Thesis. University of Central Florida, Orlando, FL	[Internally dispersed by pigs] "A total of 782 seeds germinated from 108 fecal samples collected from roads/trails (64 samples) and wetlands (44 samples) over an 11-month period, which resulted in the dispersal of 50 different species by feral pigs (Table 4-1 and 4-2)." ... "Approximately 70% of the annual seed contribution was made up by only 5 plant species: <i>Gaylussacia dumosa</i> , <i>Eupatorium compositifolium</i> , <i>Paspalum conjugatum</i> , <i>Ludwigia repens</i> , and <i>Eleocharis</i> sp. (Table 1)."

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Sydney Weeds Committees. 2008. Sydney-wide Regional Ludwigia Management Plan. http://sydneyweeds.org.au . [Accessed 20 Oct 2015]	"The tiny seeds which are produced prolifically, readily adhere to moist surfaces and feathers, and are dispersed by water, wind, birds (especially ducks), machinery, footwear, clothing and mud."
	Naim, P. A. (1987). Wetland seed banks: implications in vegetation management. PhD Dissertation. Iowa State University, Ames, IA	[Prolific seed production, but not at densities in excess of 1000/m2 in this study] "TABLE 1.2. Average number of seeds m-2 in 1 cm deep layers from the surface down to 6 cm depth in the soil profile of Moist Soil Unit 2 South, Spring, 1984" [<i>Ludwigia repens</i> seeds: 131/m2 collected at a soil depth of 0-1 cm] "TABLE 1.3. Average number of seeds (burrs for <i>Xanthium</i>) m-2 in 1 cm deep layers from the surface down to 6 cm depth in the soil profile of Moist Soil Unit 2 South, Spring, 1985" [<i>Ludwigia repens</i> seeds: 175/m2 collected at a soil depth of 1-2 cm; 219/m2 collected at a soil depth of 4-5 cm; 87/m2 collected at a soil depth of 5-6 cm]

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	Source(s)	Notes
	Peng, C. I. (1988). The biosystematics of <i>Ludwigia</i> sect. <i>Microcarpium</i> (Onagraceae). <i>Annals of the Missouri Botanical Garden</i> , 75(3): 970-1009	"Seed dormancy, however, is not characteristic of <i>Ludwigia</i> , at least of sect. <i>Microcarpium</i> . In a few rare cases, hybrid seeds were observed to germinate three or four months after they were sown. These would have been scored as germination failures if the experiments had been terminated after two months, as was generally done."

803	Well controlled by herbicides	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Sydney Weeds Committees. 2008. Sydney-wide Regional Ludwigia Management Plan. http://sydneyweeds.org.au . [Accessed 20 Oct 2015]	"Chemical control should ideally be undertaken from just after the hibernation period (over wintering) to the flowering period. Where water bodies and/or native vegetation are within close proximity, initial manual slashing prior to flowering or stem scraping of dense stands can be undertaken, followed by the spraying of regrowth with Glyphosate 360 g/L. This reduces the risk of over spray of herbicide onto native flora and into water bodies. Results can be improved by slashing stands prior to flowering, then spraying the regrowth 2-4 weeks later. Repeat applications may be required for larger plants, and a follow up program will be required to deal with seedlings. If resources are not available for chemical control, branches can be removed during or just after the flowering period."
	Chandrasena, N., Pinto, L. & Sim, R. 2002. Reclaiming Botany Wetlands, Sydney through integrated management of Ludwigia peruviana and other weeds. Pp 8-13 in Thirteenth Australian Weeds Conference. Plant Protection Society of WA, Victoria Park, WA	[Related species effectively controlled with herbicides] "Although both herbicides were effective against <i>L. peruviana</i> , repeat applications were required to control infestations in all ponds. The success of herbicide treatments enabled a progressive vegetation change, in favour of native macrophytes. Some transient herbicide damage to macrophytes was inevitable during treatments, but their recovery was spectacular in most areas."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Sydney Weeds Committees. 2008. Sydney-wide Regional Ludwigia Management Plan. http://sydneyweeds.org.au . [Accessed 20 Oct 2015]	[Fragments will resprout & take root] "Care should also be taken not to inadvertently spread seed attached to clothing. In addition, discarded plant material should never be left in contact with the soil as it may take root."
	Plant Finder. 2015. <i>Ludwigia repens</i> . http://www.aquaticplantcentral.com/forumapc/plantfinder/details.php?id=26 . [Accessed 9 Oct 2015]	[Tolerates intense pruning] "Pruning off the top portions of this plant and leaving the rooted portions in the substrate promotes very bushy growth as the plant should produce a multitude of side shoots. Pruning can also be done by discarding the rooted portions and planting the top portions into the substrate. If allowed to grow on the surface, the plant will also produce many side shoots from each node along the stem." ... "With intense pruning, the plant can even be used as a foreground plant in large aquaria."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	Sydney Weeds Committees. 2008. Sydney-wide Regional Ludwigia Management Plan. http://sydneyweeds.org.au . [Accessed 20 Oct 2015]	[No evidence in Australia] "No known research has been conducted on introduced biological control agents, although there is some evidence of ecological control by shading under dense planting. Because Ludwigia seedlings require high light levels for germination, it can be appropriate in some locations to establish dense, shady cover following clearing, thereby gaining lasting control. In the long term, reducing nutrient levels entering water bodies can also lower the risk of invasion or spread."

Summary of Risk Traits:

High Risk / Undesirable Traits

- Able to grow in tropical & subtropical climates
- Naturalized in New Zealand & Australia
- Potential environmental weed
- Other *Ludwigia* species are invasive
- Able to smother water surfaces
- Reproduces by seeds & vegetatively
- Readily hybridizes with other *Ludwigia* species
- Self-compatible
- Can spread vegetatively by stolons & stem fragments
- Able to reach maturity in 1 growing season
- Seeds dispersed by water, wind, birds (e.g. ducks), machinery, footwear, clothing and mud
- Distributed as an aquarium plant
- Seeds can become a contaminant of rice & possibly other aquatic crops
- Viable seeds passed by feral pigs
- Able to resprout & spread after cutting

Low Risk Traits

- Unarmed (no spines, thorns or burrs)
- Palatable to pigs & humans
- Non-toxic
- Aquarium species
- Seeds may not form a persistent seed bank
- Herbicides may provide effective control