

Taxon: Neptunia oleracea	Family: Fabaceae
Common Name(s): sensitive neptunia water mimosa	Synonym(s): Neptunia natans auct. Neptunia prostrata auct.

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 10 Sep 2015
WRA Score: 17.0	Designation: H(HPWRA)	Rating: High Risk

Keywords: Aquatic Plant, Environmental Weed, Edible, N-Fixing, 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	n=0, y = 2*multiplier (see Appendix 2)	y
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	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)		
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		
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)		
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	n
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	y=1, n=-1	y
801	Prolific seed production (>1000/m ²)		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Paisooksantivatana, Y., 1993. <i>Neptunia oleracea</i> Loureiro [Internet] Record from Proseabase. Siemonsma, J.S. and Piluek, K. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 9 Sep 2015]	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
	Allen, D.J. 2011. <i>Neptunia oleracea</i> . The IUCN Red List of Threatened Species 2011: e.T168883A6545251. http://www.iucnredlist.org/details/168883/0 . [Accessed 8 Sep 2015]	"The species is widespread throughout Africa, Asia (tropical), Mexico and South America (Cook 1996, GRIN 2011). The species native range is uncertain, and it has been widely introduced."
202	Quality of climate match data	High
	Source(s)	Notes
	Allen, D.J. 2011. <i>Neptunia oleracea</i> . The IUCN Red List of Threatened Species 2011: e.T168883A6545251. http://www.iucnredlist.org/details/168883/0 . [Accessed]	
203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes
	Nash, H. 2003. Complete Guide to Water Garden Plants. Sterling Publishing Company, New York, NY	"Hardiness Zones 9-11."
	Paisooksantivatana, Y., 1993. <i>Neptunia oleracea</i> Loureiro [Internet] Record from Proseabase. Siemonsma, J.S. and Piluek, K. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 9 Sep 2015]	[Low elevation tropical climates] "Water mimosa is widely distributed in the tropics of both hemispheres." ... "Water mimosa is a common floating plant in and around fresh water ponds, swamps and canals at low altitudes up to 300 m."

Qsn #	Question	Answer
204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Paisooksantivatana, Y., 1993. <i>Neptunia oleracea</i> Loureiro [Internet] Record from Proseabase. Siemonsma, J.S. and Piluek, K. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 9 Sep 2015]	"Water mimosa is widely distributed in the tropics of both hemispheres. The origin of the species is uncertain. It occurs wild and cultivated as a vegetable throughout South-East Asia, particularly in Thailand and Indo-China."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Imada, C.T., Staples, G.W. & Herbst, D.R. 2005. Annotated Checklist of Cultivated Plants of Hawai'i. http://www2.bishopmuseum.org/HBS/botany/cultivatedplants/ . [Accessed 10 Sep 2015]	"First Collected: 1997 Locations: Waimea Arboretum & Botanical Garden"
	Allen, D.J. 2011. <i>Neptunia oleracea</i> . The IUCN Red List of Threatened Species 2011: e.T168883A6545251. http://www.iucnredlist.org/details/168883/0 . [Accessed 9 Sep 2015]	"The species is widespread throughout Africa, Asia (tropical), Mexico and South America (Cook 1996, GRIN 2011). The species native range is uncertain, and it has been widely introduced."
	Paisooksantivatana, Y., 1993. <i>Neptunia oleracea</i> Loureiro [Internet] Record from Proseabase. Siemonsma, J.S. and Piluek, K. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 9 Sep 2015]	"Water mimosa is widely distributed in the tropics of both hemispheres. The origin of the species is uncertain. It occurs wild and cultivated as a vegetable throughout South-East Asia, particularly in Thailand and Indo-China."

301	Naturalized beyond native range	y
	Source(s)	Notes
	Peck, J. H., & Serviss, B. E. (2011). <i>Neptunia oleracea</i> (Fabaceae) new to the continental United States, with new and noteworthy records of several angiosperms in Arkansas. <i>Journal of the Botanical Research Institute of Texas</i> , 5(1): 321-326	" <i>Neptunia oleracea</i> is here reported as new to the continental United States."
	Technigro. 2011. Weed Watch. Water mimosa (<i>Neptunia oleracea</i>). Technigro Australia Pty Ltd, Burleigh BC, QLD. http://www.technigro.com.au/documents/WW%20Water%20mimosa.pdf . [Accessed 10 Sep 2015]	"Water mimosa has been used by some south-east Asian communities as a vegetable and is occasionally sold in local markets in the Brisbane area. Two collections of Water mimosa were made from farm dams in south-eastern Queensland in 2006, one from the Logan area and the other from the Boonah district. It has since been recorded at 15 sites in the Logan City area, but all of these known populations have been controlled."
	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 Sep 2015]	"widely naturalized"

Qsn #	Question	Answer
302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	WRA Specialist. 2015. Personal Communication	Environmental weed

303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	WRA Specialist. 2015. Personal Communication	Environmental weed

304	Environmental weed	y
	Source(s)	Notes
	Nash, H. 2003. Complete Guide to Water Garden Plants. Sterling Publishing Company, New York, NY	"Highly invasive in tropical zones."
	Hannan-Jones, M. & Csurhes, S. 2008. Pest Plant Risk Assessment: Water mimosa - <i>Neptunia oleracea</i> . Dead and awake - <i>Neptunia plena</i> . The State of Queensland, Department of Primary Industries and Fisheries, Brisbane, Qld	"Holm et al. (1991) listed <i>N. oleracea</i> as a weed in Cambodia, India and Thailand; however, its significance was not known. <i>N. oleracea</i> is also a problem plant in Madagascar in its putative native range."
	Petroeschovsky, A., & Champion, P. D. (2008). Preventing further introduction and spread of aquatic weeds through the ornamental plant trade. In Sixteenth Australian Weed Conference, Cairns (pp. 200-302)	"Table 1. List of aquatic ornamental plant species recommended for a national ban from sale in Australia." [List includes <i>Neptunia oleracea</i>]
	Missouri Botanical Garden. 2015. <i>Neptunia oleracea</i> . http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=d664 . [Accessed 9 Sep 2015]	"This plant is considered to be an invasive aquatic weed in some tropical waters where large mats may form that choke waterways, resulting in restricted water flow, reduced water quality, reduced fish activity and loss of some underwater and native wetland plants."
	Biosecurity Queensland. 2014. Water mimosa. <i>Neptunia oleracea</i> or <i>Neptunia plena</i> . Fact sheet. Declared Class 1 Pest Plant. Department of Agriculture, Fisheries and Forestry, The State of Queensland	"Water mimosa poses an extreme threat to Queensland's waterways and wetlands. It establishes from small plant pieces in water and from seed. Under favourable conditions, water mimosa grows out from the banks to form floating rafts of dense interwoven stems. These can be dislodged by water movement (especially during floods) and are soon replaced by more water mimosa. These floating rafts can: <ul style="list-style-type: none"> • restrict water flow in creeks, channels and drains • impede recreational water sports and boating access • increase water loss through evapotranspiration • reduce water quality by preventing light penetration and reducing oxygenation of water • create a favourable habitat for mosquitoes • reduce fish activity • cause the death of native, submerged water plants and fish • replace native wetland plants."

305	Congeneric weed	y
	Source(s)	Notes

Qsn #	Question	Answer
	Hannan-Jones, M. & Csurhes, S. 2008. Pest Plant Risk Assessment: Water mimosa - <i>Neptunia oleracea</i> . Dead and awake - <i>Neptunia plena</i> . The State of Queensland, Department of Primary Industries and Fisheries, Brisbane, Qld	"An infestation of <i>N. plena</i> was found in a waterhole on a property at Virginia, Northern Territory south-east of Darwin. It was controlled in October 2004, with follow-up into 2005. By mid-June 2005, there had been no regrowth, but monitoring of the area will continue for 5–10 years to check for regrowth and to carry out follow-up control as necessary (Northern Territory Department of Primary Industry, Fisheries and Mines, 2005)."
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	<i>Neptunia gracilis</i> , <i>Neptunia monosperma</i> , <i>Neptunia natans</i> , <i>Neptunia plena</i> , <i>Neptunia prostrata</i> , <i>Neptunia triquetra</i> cited as weeds

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Windler, D.R. (1966). A revision of the Genus <i>Neptunia</i> (Leguminosae). <i>Australian Journal of Botany</i> , 14: 379–420	[No evidence] "Herb, perennial, aquatic, floating or prostrate near water's edge. Tap root thick, becoming woody. Stems to 1.5 m long, rarely branched, becoming detached from the primary root system, forming a spongy-fibrous indument between the nodes and producing fibrous adventitious roots at the nodes when growing in water. Stipules usually not evident on floating stems, persistent, 5.5–15.0 mm long, 3.0–5.0 mm broad, membranous, faintly nerved, lanceolate, with the base obliquely cordate, glabrous, with the margins entire. Leaves bipinnate, with 2–3 9–4) pairs of pinnae; petioles 2.0–6.8 cm long, angled, glabrous, glandless; stipels none; rachis angled, glabrous, glandless, prolonged into a linear leaf-like projection 2.0–5.0 mm long, the projection glabrous; pinna rachis distinctly winged, extended beyond the attachment of the terminal pair of leaflets, glabrous or sparsely ciliate; leaflets 8–20 pairs per pinna, 5.0–18.0 mm long, 1.5–3.5 mm broad, oblong, obtuse to broadly acute, occasionally mucronulate, asymmetrical, glabrous or sparsely ciliate on the margins, the surface appearing minutely punctate, the venation consisting of one main vein with the lateral veins obscure"

402	Allelopathic	n
	Source(s)	Notes
	WRA Specialist. 2015. Personal Communication	Unknown

403	Parasitic	n
	Source(s)	Notes
	Hyde, M.A., Wursten, B.T., Ballings, P. & Coates Palgrave, M. (2015). <i>Flora of Zimbabwe: Species information: Neptunia oleracea</i> . http://www.zimbabweflora.co.zw/speciesdata/species.php?species_id=126310 . [Accessed 9 Sep 2015]	"Aquatic herb. Stems creeping, often swollen and floating, rooting at the nodes." [Fabaceae. No evidence]

404	Unpalatable to grazing animals	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Hannan-Jones, M. & Csurhes, S. 2008. Pest Plant Risk Assessment: Water mimosa - <i>Neptunia oleracea</i> . Dead and awake - <i>Neptunia plena</i> . The State of Queensland, Department of Primary Industries and Fisheries, Brisbane, Qld	[Potential fodder for livestock] " <i>N. oleracea</i> was recommended by Wildin et al. (1996) for evaluation and introduction trials as a potential pasture species to be used in conjunction with introduced grasses <i>Brachiaria mutica</i> , <i>Echinochloa polystachya</i> cv. Amity, and <i>Hymenachne amplexicaulis</i> cv. Olive in ponded pasture systems in Queensland. It has been suggested that <i>Neptunia</i> might be a valuable source of nitrogen for ponded pastures, as well as offering quality grazing to livestock."

405	Toxic to animals	n
	Source(s)	Notes
	Hannan-Jones, M. & Csurhes, S. 2008. Pest Plant Risk Assessment: Water mimosa - <i>Neptunia oleracea</i> . Dead and awake - <i>Neptunia plena</i> . The State of Queensland, Department of Primary Industries and Fisheries, Brisbane, Qld	[No evidence] "Plant-eating fish, turtles, ducks and geese feed on water mimosa"
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	n
	Source(s)	Notes
	Hannan-Jones, M. & Csurhes, S. 2008. Pest Plant Risk Assessment: Water mimosa - <i>Neptunia oleracea</i> . Dead and awake - <i>Neptunia plena</i> . The State of Queensland, Department of Primary Industries and Fisheries, Brisbane, Qld	"In South-East Asia, no diseases have been recorded and very few pests attack water mimosa. The larvae of the leaf roller <i>Synclita</i> sp. may attack the spongy tissue and stem."
	Missouri Botanical Garden. 2015. <i>Neptunia oleracea</i> . http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=d664 . [Accessed 9 Sep 2015]	"No serious insect or disease problems."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Pisooksantivatana, Y., 1993. <i>Neptunia oleracea</i> Loureiro [Internet] Record from Proseabase. Siemonsma, J.S. and Piluek, K. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 8 Sep 2015]	[Edible and medicinal uses. No evidence of toxicity] "Uses Water mimosa is mainly gathered and cultivated for its young shoots, which are consumed as a vegetable, raw, cooked, or fried. It is a common ingredient of Thai cuisine. The people of Kelantan (Malaysia) use the root as an external remedy for necrosis of the bones of the nose and hard palate. The juice of the stem is squeezed into the ear to cure earache and the root is used in the advanced stage of syphilis in Malaysia."
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

Qsn #	Question	Answer
408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Paisooksantivatana, Y., 1993. <i>Neptunia oleracea</i> Loureiro [Internet] Record from Proseabase. Siemonsma, J.S. and Piluek, K. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 9 Sep 2015]	[No evidence] "Water mimosa is a common floating plant in and around fresh water ponds, swamps and canals at low altitudes up to 300 m."

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	Notes
	Paisooksantivatana, Y., 1993. <i>Neptunia oleracea</i> Loureiro [Internet] Record from Proseabase. Siemonsma, J.S. and Piluek, K. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 9 Sep 2015]	"Shade, brackish water and saline soil adversely affect plant growth."
	Missouri Botanical Garden. 2015. <i>Neptunia oleracea</i> . http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=d664 . [Accessed 9 Sep 2015]	"Sun: Full sun to part shade"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	
	Source(s)	Notes
	Useful Tropical Plants Database. 2015. <i>Neptunia oleracea</i> . http://tropical.theferns.info/viewtropical.php?id=Neptunia+oleracea . [Accessed 10 Sep 2015]	"Prefers a pH in the range 5 - 6.5, tolerating 4.5 - 7"
	Paisooksantivatana, Y., 1993. <i>Neptunia oleracea</i> Loureiro [Internet] Record from Proseabase. Siemonsma, J.S. and Piluek, K. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 10 Sep 2015]	"Shade, brackish water and saline soil adversely affect plant growth."

411	Climbing or smothering growth habit	y
	Source(s)	Notes
	Missouri Botanical Garden. 2015. <i>Neptunia oleracea</i> . http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=d664 . [Accessed 9 Sep 2015]	[May smother water surfaces] "Floating plant stems often form thick foliage mats." ... "This plant is considered to be an invasive aquatic weed in some tropical waters where large mats may form that choke waterways, resulting in restricted water flow, reduced water quality, reduced fish activity and loss of some underwater and native wetland plants."

412	Forms dense thickets	
	Source(s)	Notes

Qsn #	Question	Answer
	Technigro. 2011. Weed Watch. Water mimosa (<i>Neptunia oleracea</i>). Technigro Australia Pty Ltd, Burleigh BC, QLD. http://www.technigro.com.au/documents/WW%20Water%20mimosa.pdf . [Accessed 10 Sep 2015]	[Smothers water surfaces] "Because Water mimosa can form rafts of dense interwoven stems on the water surface, it can replace native water plants and cause the death of submerged plants and fish. It also has the potential to restrict water flow in creeks and channels, reduce water quality, and increase water loss through evapotranspiration."

501	Aquatic	y
	Source(s)	Notes
	Paisooksantivatana, Y., 1993. <i>Neptunia oleracea</i> Loureiro [Internet] Record from Proseabase. Siemonsma, J.S. and Piluek, K. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 8 Sep 2015]	"Ecology Water mimosa is a common floating plant in and around fresh water ponds, swamps and canals at low altitudes up to 300 m. When the water level falls, the plants perish. The rooted land form has smaller leaves and flowers, and has no spongy floating tissue."

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 8 Sep 2015]	"Family: Fabaceae (alt. Leguminosae) subfamily: Mimosoideae tribe: Mimoseae. Also placed in: Mimosaceae"

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	Hyde, M.A., Wursten, B.T., Ballings, P. & Coates Palgrave, M. (2015). Flora of Zimbabwe: Species information: <i>Neptunia oleracea</i> . http://www.zimbabweflora.co.zw/speciesdata/species.php?species_id=126310 . [Accessed]	[N-Fixing, but not woody] "Aquatic herb. Stems creeping, often swollen and floating, rooting at the nodes. Leaves sensitive, bipinnate with 2-4 pairs. Leaflets in 7-22 pairs, oblong 5-20 mm long, mostly hairless."

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Hannan-Jones, M. & Csurhes, S. 2008. Pest Plant Risk Assessment: Water mimosa - <i>Neptunia oleracea</i> . Dead and awake - <i>Neptunia plena</i> . The State of Queensland, Department of Primary Industries and Fisheries, Brisbane, Qld	[No bulbs, corms, or tubers] "Herb, perennial, aquatic, floating or prostrate near water's edge. Tap root thick, becoming woody."

Qsn #	Question	Answer
601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Allen, D.J. 2011. <i>Neptunia oleracea</i> . The IUCN Red List of Threatened Species 2011: e.T168883A6545251. http://www.iucnredlist.org/details/168883/0 . [Accessed 8 Sep 2015]	"The species is widespread and abundant throughout its known range, populations are enhanced by cultivation and it may be established as an invasive in some areas, it is therefore assessed as Least Concern. "

602	Produces viable seed	y
	Source(s)	Notes
	Biosecurity Queensland. 2014. Water mimosa. <i>Neptunia oleracea</i> or <i>Neptunia plena</i> . Fact sheet. Declared Class 1 Pest Plant. Department of Agriculture, Fisheries and Forestry, The State of Queensland	"It establishes from small plant pieces in water and from seed."
	Hannan-Jones, M. & Csurhes, S. 2008. Pest Plant Risk Assessment: Water mimosa - <i>Neptunia oleracea</i> . Dead and awake - <i>Neptunia plena</i> . The State of Queensland, Department of Primary Industries and Fisheries, Brisbane, Qld	"N. oleracea can be propagated from seeds, but the conventional horticultural method is by stem cuttings"

603	Hybridizes naturally	
	Source(s)	Notes
	WRA Specialist. 2015. Personal Communication	Unknown

604	Self-compatible or apomictic	
	Source(s)	Notes
	Windler, D.R. (1966). A revision of the Genus <i>Neptunia</i> (Leguminosae). Australian Journal of Botany, 14: 379–420	[Possibly Yes. Four <i>Neptunia</i> species are self-compatible] "During the study four species were grown to fruit: <i>N. pubescens</i> , <i>N. plena</i> , <i>N. major</i> , <i>N. monosperma</i> . The species grown were all shown to be self-fertile, as evidenced by the fact that each flowered and set fruit before any other spikes of the same species were in flower. Self-pollination is facilitated in several species by the nodding position of the flowering spike, which places the anthers just above the stigma in the same flower."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Abdullahi, G., Sule, H., Chimoya, I. A., & Isah, M. D. (2011). Diversity and relative distribution of honeybees foraging plants in some selected reserves in Mubi Region, Sudan Savannah ecological zone of Nigeria. <i>Advances in Applied Science Research</i> , 2: 388-395	"Surveys were conducted from August 2009 to June 2011 in some selected grazing and forest reserves of Mubi to study the diversity and distribution of honeybees foraging plant species." ... "The result indicated that 103 species of plants were promising as potential forages for honeybees." ... "Table 1: Bee foraging plants species of Mubi Region and their relative distribution across the sampled locations" [<i>Neptunia oleracea</i> visited by honeybees]

Qsn #	Question	Answer
	Windler, D.R. (1966). A revision of the Genus <i>Neptunia</i> (Leguminosae). Australian Journal of Botany, 14: 379–420	[No evidence from floral morphology] "Inflorescence a spike, erect or slightly nodding, pedunculate, borne solitary in the axils of the leaves. Spikes obovoid in bud. Peduncles 5.0-20.0 (-30.0) cm long, glabrous, usually with 2 bracts subtending the spike, 3.0-11.0mm long. Flowers 30-50 per spike, sessile, each subtended by a single bract 2.0 -3.1 mm long. Upper flowers perfect, sessile; calyx campanulate, green, 2.0-3.0 mm long, 5-lobed, with the lobes 0-4-0.7 mm long, broadly acute, the margins entire; petals 5, regular, free or slightly coalescent at the margins, green, 3.0-4.3 mm long; stamens 10, free, 6.0-8.9 mm long, with the filaments slender, flattened, white, 5.1-8.2 mm long, anthers exerted, bilocular, yellow, 0.7-0.9 mm long, lacking a terminal stalked gland; pistil 7 -0-8 -9 mm long, usually exerted beyond the stamens; ovary 1.2-2.0 mm long, glabrous, stipitate; style slender, elongate; stigma truncate, concave. Lower flowers sterile, sessile; calyx campanulate, 5-lobed, 0.9-1.5 mm long, with the lobes 0.3-0.5 mm long, broadly acute; petals 5, regular, free, green, 2.2-3.5 mm long; stamens 10, sterile, petal-like, yellow, 7.0-16.0 mm long, 0.5-1.0 inm broad; gynoeceium absent."

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Weeds Australia. 2015. Weed Identification - <i>Neptunia oleracea</i> . http://www.weeds.org.au/cgi-bin/weedident.cgi?tpl=plant.tpl&state=&s=&ibra=all&card=W30 . [Accessed 9 Sep 2015]	"Dispersal: Spread by seed or water movement of stems"
	Biosecurity Queensland. 2014. Water mimosa. <i>Neptunia oleracea</i> or <i>Neptunia plena</i> . Fact sheet. Declared Class 1 Pest Plant. Department of Agriculture, Fisheries and Forestry, The State of Queensland	"It establishes from small plant pieces in water and from seed. Under favourable conditions, water mimosa grows out from the banks to form floating rafts of dense interwoven stems. These can be dislodged by water movement (especially during floods) and are soon replaced by more water mimosa."
	Nash, H. 2003. Complete Guide to Water Garden Plants. Sterling Publishing Company, New York, NY	"Propagate by stem cuttings."

607	Minimum generative time (years)	
	Source(s)	Notes
	Missouri Botanical Garden. 2015. <i>Neptunia oleracea</i> . http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=d664 . [Accessed 10 Sep 2015]	"Can be grown as an annual."
	Useful Tropical Plants Database. 2015. <i>Neptunia oleracea</i> . http://tropical.theferns.info/viewtropical.php?id=Neptunia+oleracea . [Accessed 10 Sep 2015]	"Growth Rate Fast"

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	Notes

Qsn #	Question	Answer
	Technigro. 2011. Weed Watch. Water mimosa (<i>Neptunia oleracea</i>). Technigro Australia Pty Ltd, Burleigh BC, QLD. http://www.technigro.com.au/documents/WW%20Water%20mimosa.pdf . [Accessed 10 Sep 2015]	"Seeds may also be dispersed in mud attached to machinery or vehicles."
702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	The Water Garden. 2015. Sensitive Plant <i>Neptunia oleracea</i> . http://www.watergarden.org/Sensitive-Plant . [Accessed 10 Sep 2015]	[Sold by online retail websites]
703	Propagules likely to disperse as a produce contaminant	
	Source(s)	Notes
	Lau, J. 1986. Specimen Details for <i>Neptunia oleracea</i> Lour. ID Number 718804. Bishop Museum, Honolulu, HI. http://nsdb.bishopmuseum.org/A71A68B6-A4D6-4C0F-B4F4-4714A947D00D . [Accessed]	"Locality USA - Hawaii - Oahu - Honolulu International Airport, intercepted by USDA/APHIS" ... "Aquatic plant with Azolla adhering to white masses around stem" [Shipped Intentionally, but might be able to become a contaminant of other aquatic plants]
704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Hannan-Jones, M. & Csurhes, S. 2008. Pest Plant Risk Assessment: Water mimosa - <i>Neptunia oleracea</i> . Dead and awake - <i>Neptunia plena</i> . The State of Queensland, Department of Primary Industries and Fisheries, Brisbane, Qld	[Aquatic plant. No adaptations for wind dispersal] "Legume oblong, flat, membranous-coriaceous, glabrous, marginally dehiscent, 1.5–5.5 cm long, 0.7–1.1 cm broad, rounded to the lateral stripe, the stripe 3.0–9.1 mm long, longer than the persistent calyx. Seeds 8–20 per legume, brown, ovoid, compressed, 4.0–4.1 mm long, 2.2–2.3 mm wide"
705	Propagules water dispersed	y
	Source(s)	Notes
	Weeds Australia. 2015. Weed Identification - <i>Neptunia oleracea</i> . http://www.weeds.org.au/cgi-bin/weedident.cgi?tpl=plant.tpl&state=&s=&ibra=all&card=W30 . [Accessed 8 Sep 2015]	"Dispersal: Spread by seed or water movement of stems"
	Technigro. 2011. Weed Watch. Water mimosa (<i>Neptunia oleracea</i>). Technigro Australia Pty Ltd, Burleigh BC, QLD. http://www.technigro.com.au/documents/WW%20Water%20mimosa.pdf . [Accessed 10 Sep 2015]	"This species grows from seeds, but also reproduces via stem fragments that produce roots at their joints. When grown as a vegetable, it is primarily propagated by stem cuttings. In Queensland, Water mimosa is most commonly introduced to new water bodies through deliberate cultivation. However, seeds and stem fragments may be spread from these areas during floods. Seeds may also be dispersed in mud attached to machinery or vehicles."
706	Propagules bird dispersed	n

Qsn #	Question	Answer
	Source(s)	Notes
	Windler, D.R. (1966). A revision of the Genus <i>Neptunia</i> (Leguminosae). Australian Journal of Botany, 14: 379–420	[Not fleshy fruited & no evidence of consumption by birds] "Legume broadly oblong, flat, membranous-coriaceous, glabrous, marginally dehiscent, 1.9-2.8 cm long, 0.8-1 -0 mm broad, with the body usually at a right angle to the stipe, the stipe 0.4-0.8 cm long, longer than the persistent calyx. Seeds 4-8 per legume, brown, ovoid, compressed, 4.0-5.1 mm long, 2.7-3.5 mm broad."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Windler, D.R. (1966). A revision of the Genus <i>Neptunia</i> (Leguminosae). Australian Journal of Botany, 14: 379–420	[No evidence, and no means of external attachment] "Herb, perennial, aquatic, floating or prostrate near water's edge." ... "Legume broadly oblong, flat, membranous-coriaceous, glabrous, marginally dehiscent, 1.9-2.8 cm long, 0.8-1 -0 mm broad, with the body usually at a right angle to the stipe, the stipe 0.4-0.8 cm long, longer than the persistent calyx. Seeds 4-8 per legume, brown, ovoid, compressed, 4.0-5.1 mm long, 2.7-3.5 mm broad."

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Rupende, E., Chivinge, O. A., & Mariga, I. K. (1998). Effect of storage time on weed seedling emergence and nutrient release in cattle manure. Experimental Agriculture, 34 (03): 277-285	[Viable seeds passed in cattle manure] "An experiment to determine weed spectrum, weed seedling numbers, temperature and nutrient changes in manure heaped for one to 6 months was undertaken over two seasons. Weed seedling numbers in manure heaped for one to five months decreased significantly by 65±70%. The weed spectrum comprised 17 broadleaf weed species of which <i>Amaranthus hybridus</i> , <i>Leucas martinicensis</i> and <i>Nicandra physalodes</i> were most prevalent. There were six grasses with <i>Eleusine indica</i> and <i>Cynodon dactylon</i> being dominant. Temperature increased from 20 8C in the unheaped manure to averages of 34 and 42 8C in manure heaped for three and five months respectively in the two seasons. In both seasons nitrogen and potassium became more available as the period of manure heaping increased while phosphorus decreased. It was concluded that heaping manure for three months significantly reduces weed seed viability and enhances the availability of some nutrients." ... "A total of 17 broadleaf weed species, of which four were bushy, and six grass species were identified in manure samples" ... "Minor species were <i>Neptunia oleracea</i> , <i>cooper glycine</i> (<i>Glycine wightii</i>) and cat's tail (<i>Sporobolus pyramidalis</i>) (Table 1)."

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Sharma, K. P., Khan, T. I., & Bhardwaj, N. (1984). Temperature regulated seed germination in <i>Neptunia oleracea</i> Lour. and its ecological significance. Aquatic Botany, 20(1): 185-188	[Densities unspecified] "The presence of a hard seed-coat and the requirement for temperature fluctuations are of great ecological significance in the survival of <i>N. oleracea</i> in aquatic environments. At Bharatpur (India), the plant produces large numbers of seeds in October and November."

Qsn #	Question	Answer
802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Royal Botanic Gardens Kew. 2008. Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/ . [Accessed 9 Sep 2015]	"Storage Behaviour: Orthodox"
	Hannan-Jones, M. & Csurhes, S. 2008. Pest Plant Risk Assessment: Water mimosa - <i>Neptunia oleracea</i> . Dead and awake - <i>Neptunia plena</i> . The State of Queensland, Department of Primary Industries and Fisheries, Brisbane, Qld	"This study was unable to find information on seed longevity. However, seeds of a related species, <i>N. lutea</i> germinated after 90 years of storage."

803	Well controlled by herbicides	y
	Source(s)	Notes
	Biosecurity Queensland. 2014. Water mimosa. <i>Neptunia oleracea</i> or <i>Neptunia plena</i> . Fact sheet. Declared Class 1 Pest Plant. Department of Agriculture, Fisheries and Forestry, The State of Queensland	"Water mimosa can be sprayed only between 1st August and 30th April; repeat treatments may be necessary." ... "Table 1 Herbicides permitted for the control of water mimosa" [Includes Metsulfuron-methyl 600 g/kg; Glyphosate 360 g/L; 540 g/L glyphosate present as isopropylamine and mono-ammonium salts; 250 g/L amitrole and 220 g/L ammonium thiocyanate]

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Technigro. 2011. Weed Watch. Water mimosa (<i>Neptunia oleracea</i>). Technigro Australia Pty Ltd, Burleigh BC, QLD. http://www.technigro.com.au/documents/WW%20Water%20mimosa.pdf . [Accessed 10 Sep 2015]	[Able to regrow after mechanical control] "Small infestations can be removed manually, taking care to ensure that no stem and root material remains in the substrate. Once collected, all plant material should be removed from the site and disposed of in a sanitary manner. Prevent further spread of the weed to other areas of the water body by avoiding fragmentation of stem material which usually results from the use of mechanical equipment. This should be repeated on a regular basis until regrowth ceases."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. 2015. Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits

- Thrives in tropical climates
- Naturalized in Australia and elsewhere (origins uncertain)
- Environmental Weed of freshwater aquatic habitats
- Other *Neptunia* species have become invasive
- Chokes and smothers water surfaces
- Reproduces by seeds and spreads by vegetative fragments
- Seeds & fragments dispersed by water & by adhering to mud on vehicles
- Seeds may form a persistent seed bank
- Viable seeds passed through guts of livestock
- Able to regrow after cutting & mechanical control

Low Risk Traits

- Unarmed (no spines, thorns or burrs)
- Provides fodder for livestock
- Non-toxic
- Consumed by humans as a vegetable, & has medicinal uses
- Herbicides may provide effective control