Family: ***Pontederiaceae***

Taxon: ***Eichhornia crassipes***

Synonym: *Pontederia crassipes Mart. (basionym)* ***Common Name:*** water hyacinth

Questionaire : current 20090513 **Assessor:** Patti Clifford **Designation:** H(HPWRA)

Status: Assessor Approved **Data Entry Person:** Patti Clifford **WRA Score 26**

101	**Is the species highly domesticated?**	**y=-3, n=0**	**n**
102	**Has the species become naturalized where grown?**	**y=1, n=-1**	
103	**Does the species have weedy races?**	**y=1, n=-1**	
201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**(0-low; 1-intermediate; 2-high) (See Appendix 2)**	**High**
202	**Quality of climate match data**	**(0-low; 1-intermediate; 2-high) (See Appendix 2)**	**High**
203	**Broad climate suitability (environmental versatility)**	**y=1, n=0**	**y**
204	**Native or naturalized in regions with tropical or subtropical climates**	**y=1, n=0**	**y**
205	**Does the species have a history of repeated introductions outside its natural range?**	**y=-2, ?=-1, n=0**	**y**
301	**Naturalized beyond native range**	**y = 1*multiplier (see Appendix 2), n= question 205**	**y**
302	**Garden/amenity/disturbance weed**	**n=0, y = 1*multiplier (see Appendix 2)**	**n**
303	**Agricultural/forestry/horticultural weed**	**n=0, y = 2*multiplier (see Appendix 2)**	**y**
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**	**y=1, n=0**	
403	**Parasitic**	**y=1, n=0**	**n**
404	**Unpalatable to grazing animals**	**y=1, n=-1**	**y**
405	**Toxic to animals**	**y=1, n=0**	**n**
406	**Host for recognized pests and pathogens**	**y=1, n=0**	
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**	**y**
410	**Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)**	**y=1, n=0**	
411	**Climbing or smothering growth habit**	**y=1, n=0**	**y**

412	**Forms dense thickets**	**y=1, n=0**	**n**
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**	
604	**Self-compatible or apomictic**	**y=1, n=-1**	
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**	**n**
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**	**y**
707	**Propagules dispersed by other animals (externally)**	**y=1, n=-1**	**n**
708	**Propagules survive passage through the gut**	**y=1, n=-1**	
801	**Prolific seed production (>1000/m2)**	**y=1, n=-1**	**n**
802	**Evidence that a persistent propagule bank is formed (>1 yr)**	**y=1, n=-1**	**y**
803	**Well controlled by herbicides**	**y=-1, n=1**	**y**
804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y=1, n=-1**	**y**
805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	**y=-1, n=1**	

Designation: H(HPWRA) **WRA Score** **26**

Supporting Data:

101	2011. WRA Specialist. Personal Communication.	No evidence of domestication to reduce invasive characteristics.
102	2011. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network (GRIN) [Online Database Index]. National Germplasm Resources Laboratory, Beltsville, Maryland. http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	N/A
103	2011. WRA Specialist. Personal Communication.	N/A
201	2011. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network (GRIN) [Online Database Index]. National Germplasm Resources Laboratory, Beltsville, Maryland. http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	French Guiana,; Guyana; Suriname; Venezuela; Brazil
202	2011. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network (GRIN) [Online Database Index]. National Germplasm Resources Laboratory, Beltsville, Maryland. http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	French Guiana,; Guyana; Suriname; Venezuela; Brazil
203	2008. Tellez, T.R./Martin de Rodrigo Lopez, E./Granado G.L./Perez, E.A./Lopez, R.M./Guzman, J.M.S.. The water hyacinth, Eichhornia crassipes: an invasive plant in the Guadiana River Basin (Spain). Aquatic Invasions. 3: 42-53.http://www.aquaticinvasions.ru	"he plant's present area of distribution covers a broad range of regimes in terms of physicochemical parameters. The northernmost limit of the area of distribution of E. crassipes is where the mean January temperature is 1°C, the mean annual temperature is 13°C, and the average lowest temperature in the year is -3°C (Ueki et al. 1976). The optimal mean temperature for plant growth is between 25°C and 27°C."
204	2011. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network (GRIN) [Online Database Index]. National Germplasm Resources Laboratory, Beltsville, Maryland. http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	French Guiana; Guyana; Suriname; Venezuela; Brazil
205	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Regarded as one of the world's worst weeds, Eichhornia has been introduced to all tropical and subtropical countries. It was introduced to the United States in 1884.
301	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	Naturalized in Hawaii in standing or slow-moving water such as ponds and sluggish streams at low elevations, at least on Kauai, Oahu, Maui, an Hawaii.
302	2011. WRA Specialist. Personal Communication.	Scored 3.04. [environmental weed]
303	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Eichhornia has resulted in tremendous losses annually in fish and paddy rice production in India.
304	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Eichhornia dominates waterways or aquatic systems degrading habitat for waterfowl and displacing native aquatic species. In the Sudan Eichhornia had infested over 3,000 kilometers of rivers by 1979, resulting in an estimated 10 percent loss in the normal flow of the Nile River and costing more than $3 million per year in control efforts

305	2011. Center for Invasive Species and Ecosystem Health. Eichhornia azurea (Swartz) Kunth - anchored waterhyacinth. http://www.invasive.org/browse/subinfo.cfm?sub=4677	Eichhornia azurea is considered a noxious weed in the United States. Arizona, Arkansas, California, Massachusetts, North Carolina, Oregon, South Carolina, and Texas all regulated this species as a noxious weed.
401	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	No spines, thorns, burrs.
402	2011. WRA Specialist. Personal Communication.	Unknown.
403	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	Not parasitic. [Pontederiaceae]
404	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Grazing: Most animals, except rabbits, do not readily eat the plant, possibly because its leaves are 95 percent water and have a high tannin content.
405	2011. National Center for Biotechnology Information. PubMed. U.S. National Library of Medicine, Bethesda, Maryland http://www.ncbi.nlm.nih.gov/	No evidence of toxicity to animals.
406	2011. WRA Specialist. Personal Communication.	Unknown.
407	2011. National Center for Biotechnology Information. PubMed. U.S. National Library of Medicine, Bethesda, Maryland http://www.ncbi.nlm.nih.gov/	No evidence of toxicity or allergenic affects to humans.
408	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	Aquatic.
409	1990. Methy, M,/Alpert, P./Roy, J.. Effects of light quality and quantitiy on growth of the clonal plant Eichhornia crassipes. Oecologia. 84: 265-271.	In this study on shade effects on Eichhornia crassipes, the plants tolerated canopy shade and shifted resources from the younger ramets to the oldest, first generation ramet in the clonal group.
410	2008. Tellez, T.R./Martin de Rodrigo Lopez, E./Granado G.L./Perez, E.A./Lopez, R.M./Guzman, J.M.S.. The water hyacinth, Eichhornia crassipes: an invasive plant in the Guadiana River Basin (Spain). Aquatic Invasions. 3: 42-53.http://www.aquaticinvasions.ru	"Another determining factor for the growth of E. crassipes is pH. This has to be between 6 and 8. When the values move outside this interval, the plant can regulate pH of the medium within this range with its growth frequently resulting In the alkalinization of the water. Maximum growth (number of plants and dry weight) is at pH 7, with pH 3.2–4.2 being very toxic for the plant, 4.2–4.3 inhibitory, and 4.3–4.5 possibly inhibitory."
411	2003. Weber, E.. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	Eichhornia crassipes froms solid mats on the water surface that may completely cover the water body. These mats crowd out native species and their shade kills submerged plants and affect water temperatures.
412	2003. Weber, E.. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	Eichhornia crassipes froms solid mats on the water surface that may completely cover the water body. These mats crowd out native species and their shade kills submerged plants and affect water temperatures.
501	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	Aquatic free-floating or sometimes rooting at the nodes in mud.
502	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	Pontederiaceae.

503	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	Herbaceous aquatic.
504	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	Not a geophyte.
601	2011. WRA Specialist. Personal Communication.	No evidence.
602	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Water hyacinth can reproduce either sexually or vegetatively.
603	2011. WRA Specialist. Personal Communication.	Unknown.
604	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Thought to be self-pollinated.
605	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Thought to be self-pollinated.
605	2008. Tellez, T.R./Martin de Rodrigo Lopez, E./Granado G.L./Perez, E.A./Lopez, R.M./Guzman, J.M.S.. The water hyacinth, Eichhornia crassipes: an invasive plant in the Guadiana River Basin (Spain). Aquatic Invasions. 3: 42-53.http://www.aquaticinvasions.ru	"Our pollinator censuses (September 2005) showed the agent responsible for crosspollination at these latitudes to be the common honey-bee (Apis mellifera) unlike in the plant's natural habitat where the pollinators are the long-tongued bee Ancyloscelis gigas and the stingless bee Trigona sp."
606	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Water hyacinth can reproduce either sexually or vegetatively.
606	2008. Tellez, T.R./Martin de Rodrigo Lopez, E./Granado G.L./Perez, E.A./Lopez, R.M./Guzman, J.M.S.. The water hyacinth, Eichhornia crassipes: an invasive plant in the Guadiana River Basin (Spain). Aquatic Invasions. 3: 42-53.http://www.aquaticinvasions.ru	"E. crassipes is a plant that reproduces both vegetatively and sexually, the former being the more important for the plant's rapid expansion and colonization throug the formation of stolons."
607	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Vegetative reproduction occurs from late spring through fall. Parts of the stem may break off at the water surface to form independent plants called daughter plants (Penfound and Earle 1948). These daughter plants are capable of producing additional reproductive stem segments within weeks.
607	2008. Tellez, T.R./Martin de Rodrigo Lopez, E./Granado G.L./Perez, E.A./Lopez, R.M./Guzman, J.M.S.. The water hyacinth, Eichhornia crassipes: an invasive plant in the Guadiana River Basin (Spain). Aquatic Invasions. 3: 42-53.http://www.aquaticinvasions.ru	"E. crassipes has an extraordinary growth rate. This has been calculated in other countries to be an increase in biomass of 400–700 tons per ha per day, or an increase in water area coverage by a factor of 1.012–1.077 per day."

701	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	The major means of dispersal, and the most difficult to control, is active transport by people who, ignorant of its impacts, seek to propagate it in other ponds and lakes. In Australia almost every new infestation has come from deliberate planting or the disposal of surplus material from deliberate planting. Humans also contribute to its spread in some areas by using the plant as a packing material and as cushions in boats.
701	2008. Tellez, T.R./Martin de Rodrigo Lopez, E./Granado G.L./Perez, E.A./Lopez, R.M./Guzman, J.M.S.. The water hyacinth, Eichhornia crassipes: an invasive plant in the Guadiana River Basin (Spain). Aquatic Invasions. 3: 42-53.http://www.aquaticinvasions.ru	"Man has clearly been the main agent of the species' spread around the world, since its entry into Africa, Asia, Australia, and North America coincided with the arrival of the vessels of the first explorers or with historically documented human activities."
702	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Regarded as one of the world's worst weeds, Eichhornia has been introduced to all tropical and subtropical countries. It was introduced to the United States in 1884. he major means of dispersal, and the most difficult to control, is active transport by people who, ignorant of its impacts, seek to propagate it in other ponds and lakes. In Australia almost every new infestation has come from deliberate planting or the disposal of surplus material from deliberate planting. Humans also contribute to its spread in some areas by using the plant as a packing material and as cushions in boats.
703	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	Aquatic. [no evidence of produce contaminant]
704	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Water and bird dispersed.
705	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	Aquatic.
706	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Seeds are dispersed by sticking to the bottom of bird's feet.
707	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Water and bird dispersed.
708	2011. WRA Specialist. Personal Communication.	Unknown.
801	1980. Barrett, S.C.H.. Sexual reproduction in Eichhornia crassipes (water hyancinth) 1. fertility of clones from diverse regions. Journal of Applied Ecology. 17: 101-112.	The major form of reproduction for Eichhornia crassipes is vegetative propagation, the results of this study indicate that Eichhronia still retains the potential for sexual reproduction in many regions of the world. The absence or low levels of sexual reproduction in many present day populations is unlikely to be due to strictly genetic factors.
802	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Seeds can remain viable in the sediment for several years.

803	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Water hyacinth can be controlled using glyphosate as a foliar spray (formulated as RodeoÂ®) and copper complexes used only as a foliar spray.
804	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Eichhornia crassipes spreads through the fragmentation of established plants.
805	2000. Godfrey, K.. Eichhornia crassipes In: Invasive plants of California's wildlands. University of California Press, Berkeley http://www.cal-ipc.org/ip/management/ipcw/pages/detailreport.cfm@usernumber=45&surveynumber=182.php?print=y	Insects and fungi: Biological control has been successful in many, but not all, areas. Three insects and a fungus have been extensively studied and subsequently released by the USDA to control water hyacinth. The insects include two weevils, Neochetina eichhorniae Warner, and N. bruchi Hustache (Coleoptera: Curculionidae), and a moth, Sameodes albiguttalis Warren (Lepidoptera: Pyralidae). The fungus is Cercospora rodmanii Conway (Fungi Imperfecti: Moniliales), which was first found in Florida in 1976