
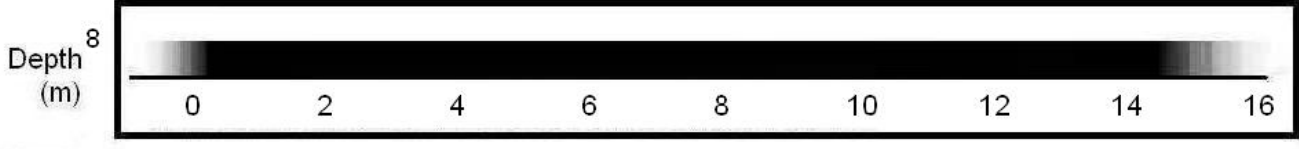


Aquatic Plant		Anchored water hyacinth; Rooted water hyacinth
I. Current Status and Distribution		<i>Eichhornia azurea</i>
a. Range	Global/Continental	Wisconsin
Native Range South America, Central America, and Mexico ^{1,2,3}	 <p>Figure 1: U.S and Canada Distribution Map⁴ Several populations also reported from Southern Indiana⁵</p>	Not recorded in Wisconsin ⁶
Abundance/Range Widespread: Locally Abundant: Sparse:	Undocumented Undocumented Puerto Rico, Southern Indiana ^{3,4,5} ; India, Iran ² ; Florida ^{3,7} ; Japan ³	Not applicable Not applicable Not applicable
Range Expansion Date Introduced: Rate of Spread:	1980s ⁽³⁾ Undocumented	Not applicable Not applicable
Density Risk of Monoculture: Facilitated By:	Can produce biomass up to 900 g/m ² ⁽³⁾ Nutrient enriched waters ³	Undocumented Undocumented
b. Habitat	Rivers, lakes, ponds, marshes, canals, reservoirs ^{2,8}	
Tolerance	Chart of tolerances: Increasingly dark color indicates increasingly optimal range	
		
Preferences	Sandy, acidic, clay or alkaline soils ⁹ ; larger leaves produced in lotic and high nutrient environments ^{3,10} ; larger plants produced in deep-water habitats ¹¹	
c. Regulation		
Noxious/Regulated ⁴ :	Federal Noxious Weed List; AL, AZ, CA, FL, MA, NC, OR, SC, TZ, VT	
Minnesota Regulations:	<i>Not regulated</i>	
Michigan Regulations:	<i>Not regulated</i>	
Washington Regulations:	<i>Not regulated</i>	

II. Establishment Potential and Life History Traits

a. Life History	Perennial aquatic plant with submerged and emerged leaves ² ; usually rooted in mud but occasionally free-floating ⁸
Fecundity	High
Reproduction Importance of Seeds: Vegetative:	Can reproduce by seed ^{2,3,8} Can reproduce by whole plants and stem fragments ^{2,3,8}
Hybridization	Undocumented
Overwintering Winter Tolerance: Phenology:	Undocumented Flowers from June to October ^{3,7,8}

b. Establishment

Climate Weather: Wisconsin-Adapted: Climate Change:	Tropics ² Uncertain Undocumented
Taxonomic Similarity Wisconsin Natives: Other US Exotics:	Medium; family Pontederiaceae ⁶ High; <i>E. crassipes</i> ⁴
Competition Natural Predators: Natural Pathogens: Competitive Strategy: Known Interactions:	<i>Cornops aquaticum</i> (grasshopper) ^{12,13,14} ; <i>Blastocerus dichotomus</i> (marsh deer) ³ ; <i>Hydrochoerus hydrochaeris</i> (capybara) ³ ; <i>Goeldichironomus petiolicola</i> ¹⁵ ; <i>Thrypticus</i> sp. ¹⁶ ; <i>Drosophila aguape</i> ¹⁷ Galls induced by cecidomyiid flies ¹⁸ Capable of adapting to different environmental changes ^{3,9,11} Co-occurs with other free-floating macrophytes (<i>Salvinia</i> spp., <i>E. crassipes</i>) ^{11,19} ; colonized by <i>Callibaetis willineri</i> (nymph) ²⁰
Reproduction Rate of Spread: Adaptive Strategies:	Fast growing ³ Has high reproductive potential ³
Timeframe	Undocumented

c. Dispersal

Intentional: Unintentional: Propagule Pressure:	Aquatic ornamental ^{2,3} Wind/water currents ^{3,8} ; mud ⁸ ; birds ^{3,8} , boats/vehicles ⁸ ; potential contaminant with other aquarium plants ^{1,3} Medium; fragments easily introduced, but source populations not near Wisconsin
---	---



Figure 2: Kurt Stueber, Max-Planck-Institute for Plant Breeding Research, Cologne, Bugwood.org²¹

Figure 3: California Department of Food and Agriculture Archive, Bugwood.org²²

III. Damage Potential	
a. Ecosystem Impacts	
Composition	Can shade out native vegetation ³
Structure	Can form thick mats over the water surface ³
Function	Disrupts fish production ³
Allelopathic Effects	Undocumented
Keystone Species	Undocumented
Ecosystem Engineer	Yes ³
Sustainability	Undocumented
Biodiversity	Undocumented
Biotic Effects	Undocumented
Abiotic Effects	Can alter water chemistry ³
Benefits	Habitat for fish and aquatic invertebrates ^{3,9,23,24,25,26,27}
b. Socio-Economic Effects	
Benefits	Heavy metal absorption ²⁸
Caveats	Risk of release and population expansion outweigh benefits of use
Impacts of Restriction	Increase in monitoring, education, and research costs
Negatives	Forms floating mats which obstruct navigation and recreation ^{2,3} ; negatively impacts irrigation and hydroelectric production ³ ; agricultural weed ³
Expectations	Undocumented
Cost of Impacts	Decreased recreational and aesthetic value; decline in ecological integrity; increased research expenses
“Eradication” Cost	Undocumented
IV. Control and Prevention	
a. Detection	
Crypsis:	Similar to <i>E. crassipes</i> ^{2,3} ; <i>Monochoria</i> spp. ^{2,8}
Benefits of Early Response:	Undocumented
b. Control	
Management Goal 1	Control
Tool:	Mechanical removal ⁸
Caveat:	Handpulling only feasible for small areas; mechanical harvesters may not be appropriate due to the rooted habitat ⁷
Cost:	Undocumented
Efficacy, Time Frame:	Undocumented
Tool:	Biocontrol (<i>Cornops aquaticum</i>) ^{13,14}
Caveat:	Species has not been studied extensively as a potential biocontrol agent
Cost:	Undocumented
Efficacy, Time Frame:	Undocumented

¹ USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. Retrieved March 4, 2011 from: <http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?316411>

-
- ² Navie, S. Federal Noxious Weed Disseminules of the U.S. *Eichhornia azurea* (Sw.) Kunth. Retrieved March 4, 2011 from: http://keys.lucidcentral.org/keys/v3/FNWE2/key/FNW_Seeds/Media/Html/fact_sheets/Eichhornia_azurea.htm
- ³ Duenas, M.A. 2009. *Eichhornia azurea*. Invasive Species Compendium. Retrieved December 21, 2011 from: <http://www.cabi.org/isc>
- ⁴ United States Department of Agriculture, Natural Resource Conservation Service. 2011. The PLANTS Database. National Plant Data Center, Baton Rouge, LA, USA. Retrieved September 16, 2011 from: <http://plants.usda.gov/java/profile?symbol=EIAZ2>
- ⁵ United States Geological Survey. 2011. *Eichhornia azurea*. United States Geological Survey Nonindigenous Aquatic Species Database, Gainesville, FL. Retrieved March 4, 2011 from: <http://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=2758>
- ⁶ University of Wisconsin – Madison. 2005. *Hydrocotyle americana* L. Wisconsin Botanical Information System, Wisflora. Retrieved September 16, 2011 from: <http://www.botany.wisc.edu/cgi-bin/SearchResults.cgi?Family=Pontederiaceae>
- ⁷ Romero-Gonzalez, G.A., G.C. Fernandez-Concha, R.L. Dressler, L.K. Magrath, G.W. Argus. 2008. Flora of North America: *Eichhornia azurea* (Swartz) Kunth, *Eichhornia*. 4. 1842. Retrieved March 4, 2011 from: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=220004607
- ⁸ Johnson, A. 2011. Weed Alert - Anchored Water Hyacinth, *Eichhornia azurea*. NSW Department of Primary Industries. Retrieved March 4, 2011 from: <http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/anchored-water-hyacinth>
- ⁹ Poi de Neiff, A. 2003. Macroinvertebrates living on *Eichhornia azurea* Kunth in the Paraguay River. *Acta Limnologica Brasiliensia* 15(1):55-63.
- ¹⁰ Pagioro, T.A., S.M. Thomaz. 1999. Decomposition of *Eichhornia azurea* from limnologically different environments of the Upper Paraná floodplain. *Hydrobiologia* 411:45-51.
- ¹¹ Milne, J.M., K.J. Murphy, S.M. Thomaz. 2006. Morphological variation in *Eichhornia azurea* (Kunth) and *Eichhornia crassipes* (Mart.) Solms in relation to aquatic vegetation type and the environment in the floodplain of the Rio Paraná, Brazil. *Hydrobiologia* 570:19-25.
- ¹² Lhano, M.G. J. Adis, M.I. Marques, L.D. Battirola. 2005. *Cornops aquaticum* (Orthoptera, Acrididae, Leptysminae): food plant acceptance in nymphs living on *Eichhornia azurea* in the northern Pantanal, Brazil. *Amazoniana* 18(3-4):397-404.
- ¹³ Da Silva, F.R.J., M.I. Marques, L.D. Battirola, M.G. Lhano. 2010. Phenology of *Cornops aquaticum* (Bruner) (Orthoptera: Acrididae) in *Eichhornia azurea* (Pontederiaceae) in the northern region of Pantanal of Mato Grosso, Brazil. *Neotropical Entomology* 39(4):535-542.
- ¹⁴ Hill, M.P. I.G. Oberholzer. 2000. Host specificity of the grasshopper, *Cornops aquaticum*, a natural enemy of water hyacinth. *Proceedings of the X International Symposium on Biological Control of Weeds*, Bozeman, Montana, USA, 4-14 July 1999. 349-356.
- ¹⁵ Trivinho-Strixino, S., G. Strixino. 2005. Two new species of *Goeldichironomus* Fittkau from Southeast Brazil (Diptera, Chironomidae). *Revista Brasileira de Entomologia* 49(4):441-445.
- ¹⁶ Cordo, H.A., A.J. Sosa, M.C. Hernández. 2000. The petiole mining fly, *Thrypticus* sp. (Diptera: Dolichopodidae), a new agent for the biological control of water hyacinth (*Eichhornia crassipes*). In: *Proceedings of the X International Symposium on Biological Control of Weeds*, Bozeman, Montana, USA, 4-14 July, 1999 [ed. by Spencer, N. R.]. Bozeman, USA: Montana State University, 315-323.
- ¹⁷ Val, F.C.D., M.D. Marques. 1996. Drosophilidae (Diptera) from the Pantanal of Mato Grosso (Brazil), with the description of a new species belonging to the bromeliae group of the genus *Drosophila*. *Papéis Avulsos de Zoologia (São Paulo)* 39(11):223-230.

-
- ¹⁸ Peláez-Rodríguez, M., S. Trivinho-Strixino, M.V. Urso-Guimarães. 2003. Galls in rhizome of an aquatic macrophyte, *Eichhornia azurea* (Swartz) Kunth (Pontederiaceae), in Jataí Ecological Station, Luiz Antônio, SP, Brazil. *Brazilian Journal of Biology* 63(4):723-726.
- ¹⁹ Marques-Silva, G.G., S.M. Thomaz. 2009. Biological interactions in the co-occurrence of *Eichhornia azurea* and free-floating macrophytes. *Maringá* 31(4):355-361.
- ²⁰ De Melo, S.M., A.M. Takeda, A. Monkolski. 2002. Seasonal dynamics of *Callibaetis willineria* (Ephemeroptera, Baetidae) associated with *Eichhornia azurea* (Pontedericeae) In Guaraná Lake of the Upper Paraná River, Brazil. *Hydrobiologia* 470:57-62.
- ²¹ Stueber, K. 2011. Budwood.org
- ²² California Department of Food and Agriculture Archive, Bugwood.org
- ²³ De Souza-Franco, G.M., I. de Andrain, R.M. Franco. 2009. Community of aquatic insects associated on *Eichhornia azurea* (Schwartz) Kunth, in a Varzea Lagoon in the Floodplain of high Parana River River, Mato Grosso do Sul State, MS, Brazil. *Biologico (Sao Paulo)* 71(1):83-91.
- ²⁴ Agostinho, A.A., S.M. Thomaz, L.C. Gomes, S.L.S.M.A. Baltar. 2007. Influence of the macrophyte *Eichhornia azurea* on fish assemblage of the Upper Parana River Floodplain (Brazil). *Aquatic Ecology* 41(4):611-619.
- ²⁵ Fulan, J.A., R. Henry. 2006. The Odonata (Insecta) assemblage on *Eichhornia azurea* (Sw.) Kunth (Pontederiaceae) stands in Camargo Lake, a lateral lake on the Paranapanema River (state of São Paulo, Brazil), after extreme inundation episode. *Acta Limnologica Brasiliensia* 18(4):423-431.
- ²⁶ Padial, A.A., S.M. Thomaz, A.A. Agostingo. 2009. Effects of structural heterogeneity provided by the floating macrophyte *Eichhornia azurea* on the predation efficiency and habitat use of the small neotropical fish *Moenkhausia sanctaefilomenae*. *Hydrobiologia* 624:161-170.
- ²⁷ Monkolski, A., A.M. Takeda, S.M. de Melo. 2005. Fauna structure of water mites associated with *Eichhornia azurea* in two lakes of the upper Paraná floodplain, Mato Grosso do Sul State, Brazil. *Maringá* 27(4):329-337.
- ²⁸ Laybauer L., L.S. Ortiz. 1999. Heavy metals absorption by *Eichhornia azurea* in the Minas do Camaqua, Southern Brazil. *Iheringia Serie Botanica* 52:35-53.