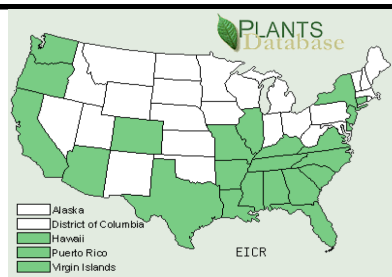
Aquatic Plant | Water Hyacinth

I. Current Status and Distribution
Eichhornia crassipes

a. RANGE	Global/Continental	Wisconsin
Native Range Amazon Basin[28]	 ref: 1	Found in Center Lake, Kenosha County, 2005. Removed same year with no reports of continued presence. Found in Fifield sewage treatment pond in 2003, where it had overwintered for 5 to 6 years[27] Reported in Milwaukee area in 2003[27]
Abundance/range Widespread: Locally Abundant: Sparse:	Crisis level in 75% countries surveyed[24] Enriched, warm water systems Weedy in native range, frost intolerant[5]	Does not overwinter in WI
Range expansion Date introduced: Rate of spread:	Highest of ANY vascular macrophyte[26] Net production = 10-15 t/ha[7]	Limited by cold climate
Density Risk of monoculture: Facilitated by:	High - among world's worst weeds[3] Warm temps; eutrophication; disturbance	Limited by cold climate

b. HABITAT Lakes, reservoirs, temp. ponds, rivers, low energy systems[23]

Tolerance **increasingly dark color indicates increasingly optimal range

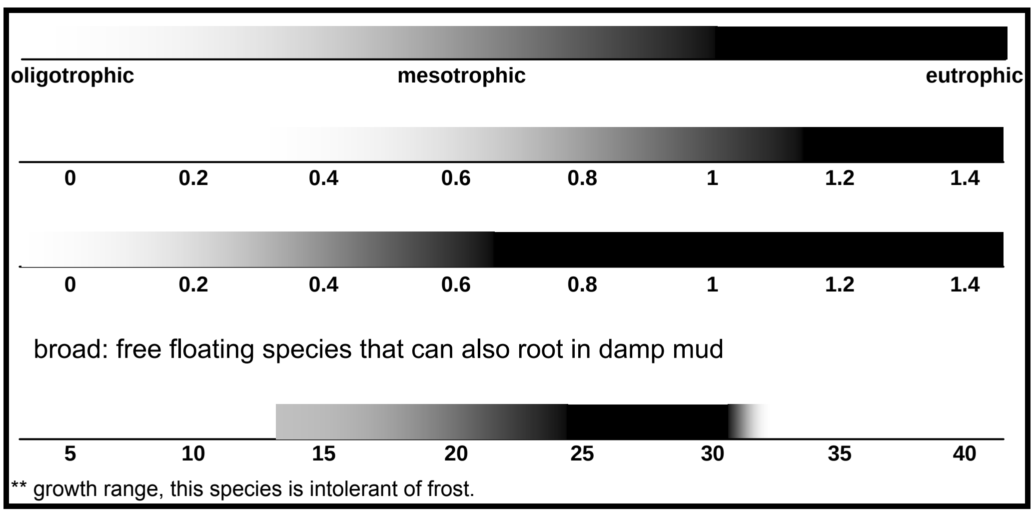
Trophic State

Nitrogen[23] (mg/L)

Phosphates[23] (mg/L)

Depth[6]

Temperature[23] (°C)



Prefers: Eu- (to hypereu-) trophic[11], disturbed[18] systems

c. REGULATION

Noxious/regulated:[1] AL, AZ, CA, CT, FL, SC, TX

Minnesota: *Not regulated (Although Ch84D.06 makes unlawful any nonnative introduction.)*

Michigan: *Not regulated*

Washington: *Watch list: currently not regulated*

II. Establishment Potential and Life History Traits

a. LIFE HISTORY

Fecundity	High, leaf and daughter plant production were more than double at high vs. low [nutrient][13]
Reproduction	Sexual Asexual: stoloniferous rhizomes
Importance of seeds:	Limited: especially when nutrient concentration is high[13]
Vegetative:	Very important Doubling time of 3.2 days for total biomass[14]
Hybridization	None documented
Overwintering	
Winter tolerance:	Low, frost-intolerant[5]
Phenology:	

b. ESTABLISHMENT

Climate	
Weather:	Mild winters facilitate growth
Wisconsin-adapted?:	No
50-yr climate change:	May facilitate growth and distribution
Taxonomic similarity	
WI natives:	None
Other US exotics:	Low
Competition	
Natural predators:	Many
Natural pathogens:	Many
Competitive strategy:	One of the fastest growing plants; rapid biomass expansion dwarfs, shades other species
Known interactions:	*S. herzogii* replaced by *E. crassipes*[14]
Reproduction	
Rate of spread:	High
Adaptive strategies:	Very rapid vegetative spread
Timeframe	Can dominate a system in one year

c. DISPERSAL

Intentional:	Ornamental use, aquarium trade, phytoremediation projects
Unintentional:	Water, animal, human (used as animal feed, spread by boats etc.)
Propagule pressure:	Medium Fragments not easily accidentally introduced, but often sold and planted

Willey Durden
USDA Agricultural Research Service
www.forestryimages.org

Photo: Aquarius Systems
http://www.humanflowerproject.com/index.php/weblog/C29/P20/

III. Damage Potential

a. ECOSYSTEM IMPACTS	
Composition	Prevents growth of emersed and submerged plants[17] Zooplankton abundance significantly lower beneath mats[2] Provides habitat for macroinvertebrates and fish[6] Fish increase after treatment and removal of *E. crassipes* [10]
Structure	Retention of suspended solids in root system[2] Shades out submerged vegetation[25] Fish kills[25]
Function	Deoxygenated and acidified aquatic environment with reduced euphotic zone[9]
Allelopathic effects	Acetone compounds inhibit algae[11]
Keystone species	Unknown
Ecosystem engineer	Yes Dense floating mats alter ecosystem[20]
Sustainability	Impoverishes ecosystem[25]
Biodiversity	Decreases, on multiple trophic levels[25]
Biotic effects	Impacts native species of multiple trophic levels[25]
Abiotic effects	Reduced [DO] and light penetration; changes in water temperature[25]
Benefits	Increases clarity; can improve conditions in severely degraded systems[22]
b. SOCIO-ECONOMIC EFFECTS	
Benefits	Phytoremediation of cyanide[15]; urban sewage treatment[16]; biofuel production[21]; duck food[25]
Caveats	Risk of release and population expansion
Impacts of restriction	Increase in monitoring, education, research costs; impacts green industry and recreation
Negatives	Dense mats can sweep away buildings during floods[25] Completely blocks streams, irrigation and drainage channels, greatly reducing water flow[5] Disrupts electricity generation, irrigation, fishing, fresh water supply[20] Habitat for human parasites and disease vectors[20]
Expectations	More negative impacts can be expected in impacted, eutrophic systems[20]
Cost of impacts	$500 million annual revenue loss in Nigeria[9]; decreased recreational, aesthetic, ecological value
"Eradication" cost	Very expensive, sometimes impossible

IV. Control and Prevention

a. PREVENTION

Types of prevention:	Education, monitoring, research
	Watercraft inspection, distribution (ID) watch
Annual cost:	Watercraft inspection-- $147,000 for all currently targeted species
	Monitoring-- $116,000 covers zebra mussels, EWM, CLP, waterfleas, blue-green algae, rusty crayfish
	CBCW Volunteer program-- $91,000 covers most large propagule-spread species
	Research--contract with UW runs $22,000
	Education-- $106,000 for information, education and outreach efforts
	AIS grants--$816,133 for education, early detection/rapid response and cost-shares

Detection

Crypsis:	Low	*Limnobium spongia, Calla palustris*
Benefits of early response:	High	curbing population at low biomass extremely helpful[24]

b. CONTROL

Management goal	Eradication
Tool:	Integrated herbicidal, mechanical and biological control[8]
Caveat:	Plant can cover large area, chemical impact may be great[24]
	E.g. 70,000 acres needed to be treated in Lake Victoria[24]
Cost:	Billions of dollars (Africa and the Middle East)[24]
Efficacy, time frame:	Often too large to control in one year, thus constant and annual effort needed[24]

Management goal	Nuisance relief
Tool:	Small-scale chemical, mechanical harvest, etc.
Caveat:	Rapid growth rate limits efficacy of small-scale control
Cost:	Expensive
Efficacy, time frame:	Nearly constant
Tool:	Many biological control options[25]
Caveat:	If nutrient influx is not addressed, success is unlikely[19]
Cost:	Depends on agent used
Efficacy, time frame:	Must often stock very high levels of control agents

Minimum effort:	Obligate yearly (one year of no control would return infestation to crisis levels in FL)[25]
Documented cost:	$1,000,000 for 985 ha in CA, over $12m in China[25]

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