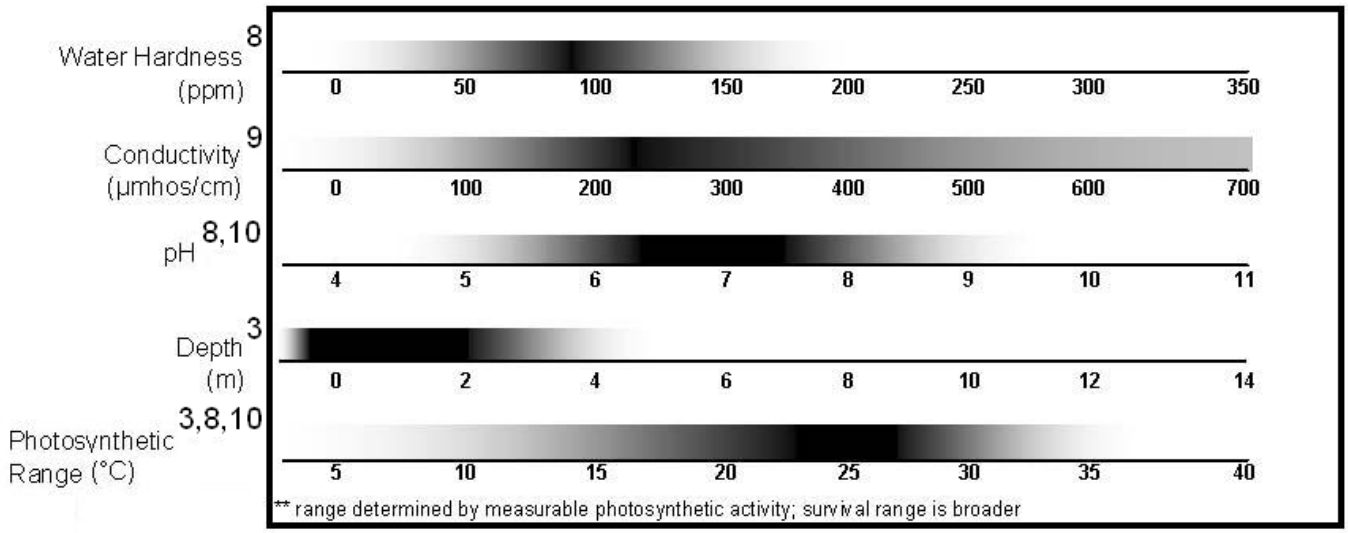
Aquatic Plant	East Indian Hygrophila; Indian Swampweed

I. Current Status and Distribution — *Hygrophila polysperma*

a. Range	Global/Continental	Wisconsin
Native Range Tropical Asia[1]	 *Figure 1: U.S and Canada Distribution Map*[2]	Not recorded in Wisconsin
Abundance/Range Widespread: Locally Abundant: Sparse:	 Florida, south central Texas[3], Recently reported in Europe[21] Current status unknown in Virginia[4,5]	 Not applicable Not applicable Not applicable
Range Expansion Date Introduced: Rate of Spread:	 Brought to US in 1945; first population found in Tampa, Florida, 1965[3] Fast growing and spreading[3]; spread from 0.1 acre to 10 acres in one year (Florida)[6]	 Not applicable Not applicable
Density Risk of Monoculture: Facilitated By:	 High Flowing waters[7]	 Unknown Unknown
b. Habitat	Lakes, ponds, rivers, streams	
Tolerance	Chart of tolerances: Increasingly dark color indicates increasingly optimal range	



Preferences	Warmer climates; deeper moving water or along banks[3]

c. Regulation	
Noxious/Regulated[2]:	Federal Noxious Weed List; AL, CA, FL, MA, NC, OR, SC, VT
Minnesota Regulations:	*Prohibited*; One may not possess, import, purchase, propagate, or transport
Michigan Regulations:	*Not regulated*
Washington Regulations:	*Not regulated*
II. Establishment Potential and Life History Traits	
a. Life History	Herbaceous, amphibious, perennial, mostly submersed, partly emersed, rarely terrestrial[3]
Fecundity	High
Reproduction Importance of Seeds: Vegetative:	Sexual; Asexual Uncertain[4]; no viable seeds found in U.S.[12] Very important; stem fragments and possibly even free-floating leaves can form new plants[3]
Hybridization	Undocumented
Overwintering Winter Tolerance: Phenology:	 Does not form turions or tubers; minimum survival temperature is 4°C[3] In Florida, grows years round, flowers from October to March[4]
b. Establishment	
Climate Weather: Wisconsin-Adapted: Climate Change:	 Prefers warmer climate[3] Unknown; survived in Virginia for many years until extremely cold winter temperatures occurred[4] Likely to facilitate growth and distribution
Taxonomic Similarity Wisconsin Natives: Other US Exotics:	 Low[3] High; *Hygrophila corymbosa* (Florida)
Competition Natural Predators: Natural Pathogens: Competitive Strategy: Known Interactions:	 Undocumented Virus particles have been found on leaves, but the pathogen has not been isolated or identified[11] Low light saturation and compensation points[12]; low seasonality (occupies niche year-round)[12]; Multiple growth forms possible (submerged, emergent, terrestrial)[13] Outshades and outcompetes both native and even some non-native vegetation (e.g. Hydrilla)[1]
Reproduction Rate of Spread: Adaptive Strategies:	 High[3] Many adventitious roots at stem nodes allows fragments to grow easily[3]
Timeframe	Spread from 0.1 acre to 10 acres in one year (Lake Tohopekaliga, Florida)[6]
c. Dispersal	
Intentional: Unintentional: Propagule Pressure:	Aquarium trade[3] Wind and water currents[3]; boats, gear, wildlife[14] Medium; fragments easily introduced[15]; source population not near Wisconsin

Figure 2: Courtesy of Fred Hrusa; CalPhotos[16]
Figure 3: Courtesy of Ann Murray; University of Florida[17]

III. Damage Potential	
a. Ecosystem Impacts	
Composition	Can outcompete natives due to low CO_2 compensation point that allows early season growth[3]; monocultures don't provide suitable habitat for many invertebrate, fish, and wildlife species[14]; replaces highly invasive Hydrilla in some Florida locations[3]
Structure	Forms dense mats over water surface, decreases light penetration and native submerged aquatic vegetation growth[3]
Function	Decreases light penetration; increases sediment levels[14]
Allelopathic Effects	Undocumented
Keystone Species	Undocumented
Ecosystem Engineer	Yes[3,14]; dense canopy decreases light penetration
Sustainability	Undocumented
Biodiversity	Decreases[14]
Biotic Effects	Impacts native species of multiple trophic levels[14]
Abiotic Effects	Decomposition of large stands can result in anoxic conditions[14]
Benefits	Undocumented
b. Socio-Economic Effects	
Benefits	Seeds are used as a medication in India[18]; plants are used in grafting experiments and in apical dominance studies[10]
Caveats	Transporting seeds or plants could facilitate accidental introduction; dense mats may provide breeding ground for mosquitoes[14]; risk of release and population expansion outweighs benefits of use
Impacts of Restriction	Increase in monitoring, education, and research costs
Negatives	Dense beds of plants create mats over the water surface that inhibit recreation[3]; clogs irrigation, flood-control canals, and water pumping stations[3]; diminishes aesthetic value[14]; decreases water quality and flow[14]; threat to rice field production[19]
Expectations	More negative impacts can be expected in warm flowing streams
Cost of Impacts	Decreased recreational and aesthetic value; decline in ecological integrity[14]; increased research expenses
"Eradication" Cost	Quite expensive

IV. Control and Prevention	
a. Detection	
Crypsis:	High; *Ludwigia repens*, *Alternanthera philoxeroides*, *H. lacustris*
Benefits of Early Response:	Smaller, localized populations have better control success
b. Control	
Management Goal 1	Nuisance relief
Tool:	Mechanical harvesting
Caveat:	Harvesting causes fragmentation which increases distribution and density
Cost:	Expensive
Efficacy, Time Frame:	Not very efficient; may increase distribution
Tool:	Triploid grass carp[20]
Caveat:	Fish have a low preference for *H. polysperma*; non-selective grazers; stocking is illegal due to occasional fertility
Cost:	Expensive
Efficacy, Time Frame:	High stocking rates of large fish necessary; successfully used in canals; long term study needed to access potential impacts
Tool:	Chemical herbicide (endothall, fluridone)
Caveat:	Non-target plant species are negatively impacted
Cost:	Very expensive
Efficacy, Time Frame:	Only marginal control achieved; high concentrations and frequent treatments are needed

[1] Global Invasive Species Database. 2005. *Hygrophila polysperma*. Retrieved December 22, 2010 from: http://www.issg.org/database/species/ecology.asp?fr=1&si=759&sts=

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[18] Bowes, G. 1982. Baseline physiology of the potential problem plants, *Limnophila sessiliflora* and *Hygrophila polysperma.* Department of Botany, University of Florida, Gainesville, 17 pp.

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