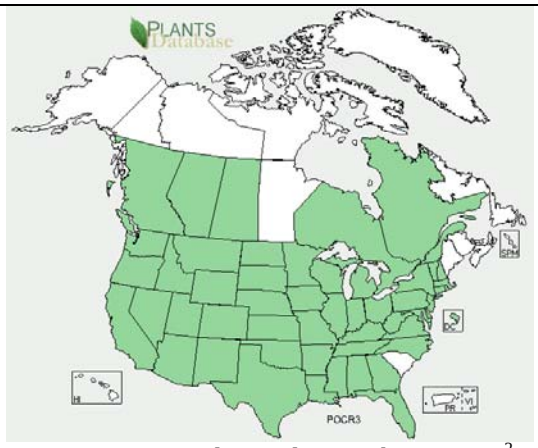
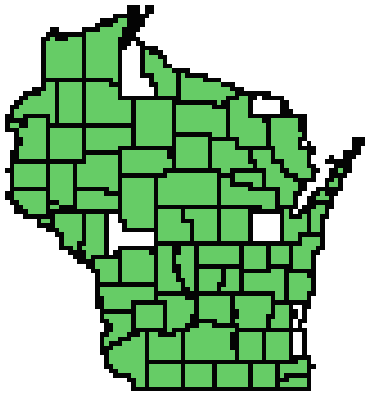
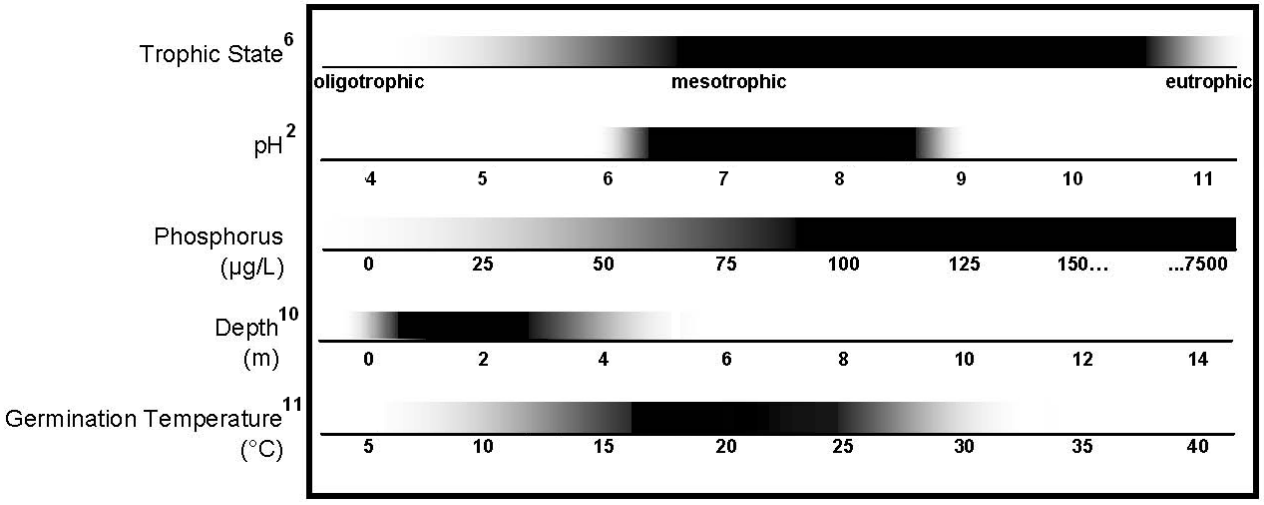
Aquatic Plant		Curly-Leaf Pondweed
I. Current Status and Distribution		***Potamogeton crispus***
a. Range	**Global/Continental**	**Wisconsin**
Native Range Europe, Asia, Northern Africa, Australia[1]	 *Figure 1: U.S and Canada Distribution Map*[2]	 *Figure 2: WI Distribution Map*[3,22]
Abundance/Range Widespread: Locally Abundant: Sparse:	 Northern Midwest[4] Eutrophic, temperate systems Washington[4]	 Found throughout most of Wisconsin[5] Eutrophic, temperate systems North central Wisconsin[5]
Range Expansion Date Introduced: Rate of Spread:	 Wilmington, Delaware, 1859[6] Can be rapid[5,7]; one plant makes hundreds of turions[6]	 First reported in 1905[8] Rapid
Density Risk of Monoculture: Facilitated By:	 High Impacted, eutrophic systems	 High Impacted, eutrophic systems
b. Habitat	Lakes, ponds, reservoirs, estuaries, wetlands, springs, streams, rivers, low to moderate energy systems[9,10]	
Tolerance	Chart of tolerances: Increasingly dark color indicates increasingly optimal range	



Preferences	Impacted systems[12]; alkaline waters[6]

c. Regulation	
Noxious/Regulated[2]:	AL, CT, MA, ME, VT, WA
Minnesota Regulations:	*Prohibited*; One may not possess, import, purchase, propagate, or transport
Michigan Regulations:	*Restricted*; One may not knowingly possess or introduce
Washington Regulations:	*Secondary Species of Concern*; Class C Noxious Weed; State Wetland and Aquatic or Noxious Weed Quarantine List
II. Establishment Potential and Life History Traits	
a. Life History	Submersed, monocotyledonous, perennial forb[2]
Fecundity	High[6]
Reproduction	Sexual; Asexual
Importance of Seeds:	Low[6]
Vegetative:	Rhizomes, turions; single turion can yield thousands of additional turions[6]
Hybridization	Hybridizes with several *Potamogeton* spp.[13, 14,15,16]
Overwintering	
Winter Tolerance:	High[6]; minimum temperature of -33°F[2]
Phenology:	Emerges early relative to natives[6]
b. Establishment	
Climate	
Weather:	Undocumented
Wisconsin-Adapted:	Yes
Climate Change:	Earlier ice off may benefit spring growth; may limit summer growth
Taxonomic Similarity	
Wisconsin Natives:	High; genus *Potamogeton*
Other US Exotics:	Low
Competition	
Natural Predators:	Undocumented
Natural Pathogens:	None known[6]
Competitive Strategy:	Turions; cold tolerant; emerges early and shades natives[6]
Known Interactions:	Undocumented
Reproduction	
Rate of Spread:	High
Adaptive Strategies:	Persistent turions; high rate of vegetative spread[6]
Timeframe	Single turion yielded 23,520 additional turions in one season[6]
c. Dispersal	
Intentional:	Aquarium trade
Unintentional:	Wind, water, animals, humans (boats, trailers), fishery releases, horticultural mailings[6,17]
Propagule Pressure:	High; fragments easily accidentally introduced

Figures 3 and 4: Courtesy of Frank Koshere, Wisconsin DNR

III. Damage Potential	
a. Ecosystem Impacts	
Composition	Can grow in dense beds which outcompete native aquatic plants[10]; summer die-back releases phosphorus and can cause dissolved oxygen crashes[10,18]
Structure	Can form dense monocultures[10]; fish respond to changes in architecture
Function	Increased nutrient release from summer senescence[10]
Allelopathic Effects	Undocumented
Keystone Species	Undocumented
Ecosystem Engineer	Yes; dense canopy decreases light penetration
Sustainability	Undocumented
Biodiversity	Decreases (sometimes no effect)[10]
Biotic Effects	Plant decomposition can stimulate algal blooms
Abiotic Effects	Increased nutrient loading; dissolved oxygen crashes[10,18]
Benefits	Can provide some habitat or food for invertebrates and fish[10,19]
b. Socio-Economic Effects	
Benefits Caveats	Can be used to revegetate degraded systems[20] Risk of release and population expansion outweighs benefits of use
Impacts of Restriction	Increase in monitoring, education, and research costs
Negatives	Impacts recreation, aesthetics, and causes ecological impairment; summer die-back releases phosphorous and can stimulate algal blooms[10]
Expectations	More negative impacts can be expected in eutrophic systems[6]
Cost of Impacts	Decreased recreational and aesthetic value; decline in ecological integrity; increased research expenses
"Eradication" Cost	Expensive
IV. Control and Prevention	
a. Detection	
Crypsis: Benefits of Early Response:	Medium; young/winter form confused with native *Potamogeton* spp. High; decreased turion set

b. Control	
Management Goal 1	Eradication
Tool:	Herbicide (endothall)
Caveat:	Eradication is difficult due to turion persistence
Cost:	Expensive; multiple year treatment scheme that still may only provide nuisance relief[5]
Efficacy, Time Frame:	Spring is the best time for treatment[21]
Management Goal 2	Nuisance relief
Tool:	Small-scale chemical, mechanical harvest
Caveat:	Harvesting causes fragmentation[10]; non-target plant species are negatively impacted
Cost:	Varies
Efficacy, Time Frame:	1-3 times per summer often necessary for control

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