

Notre Dame's STAIRplants

- A) Determine the specie's climate match to the Great Lakes. Because the Great Lakes states lie within [USDA hardiness zones](http://www.nappfast.org/Plant_hardiness/2012/PHZ30yr2012.pdf) (hyperlink to http://www.nappfast.org/Plant_hardiness/2012/PHZ30yr2012.pdf) 1-7, native or established species in this range are considered to have a good climate match.

To account for climate change, consider predictions for future hardiness zones available [here](http://nappfast.org/Plant_hardiness/2007%20IPCC%20and%20GHCN/2007%20ph_index.htm). (hyperlink to http://nappfast.org/Plant_hardiness/2007%20IPCC%20and%20GHCN/2007%20ph_index.htm)

- B) Characterize as many of the following traits as possible using the scoring guidance. Record the corresponding score and all information sources used in scoring. A species' total score indicates the likelihood that it would be invasive—the higher the score, the higher the likelihood.

Trait	Scoring guidance	Species score	Information sources
Temperature tolerance (1.1)	<p>(0,1,2,3) Score 3 if maintains photosynthetic tissue and summer growth form throughout the winter, 2 if dies back to tuber/bulb/rhizome or similar structure during winter, 1 if adult plants completely die but seeds viable in Great Lakes climate remain, and 0 if species is extirpated by summer or winter temperatures.</p> <p>Default to 1 for annual species.</p>		
Range of habitat (1.2)	<p>(1,2,3) Score 3 if able to grow from water to dry land, 2 if able to grow from water to wetland or from shallow to deep (>5 m) water, and 1 if the habitat range is narrow.</p> <p>Default to 1 if no information is available and 2 for free-floating plants unless more information is available.</p>		
Water/substrate type tolerance (1.3)	<p>(1,2) Score 2 if tolerant of sandy-to-muddy (or peaty) substrate or of oligotrophic-eutrophic waters, and 1 if restricted by either.</p> <p>Default to 1 if no information is available.</p>		
Water clarity tolerance (1.4)	<p>(0,1) Score 1 if unaffected by water clarity (i.e. floating, emergent, or submergent tolerant of very low light levels, such as <i>Myriophyllum spicatum</i> and <i>Hydrilla verticillata</i>) and 0 if affected by water clarity.</p>		
Salinity tolerance (1.5)	<p>(0,1) Score 1 if tolerant of saline conditions and 0 if not. Habitat information can be used to determine a score of 0 if species is only found to occur in freshwater habitats.</p>		
pH tolerance (1.6)	<p>(0,1) Score 1 if tolerant of both acidic and basic pH or no information is available and 0 if restricted to neutral, basic, or acidic pH.</p>		

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Water level fluctuation tolerance - tolerates periodic flooding/drying (1.7)	<p>(0,1,2,3) Score 3 if tolerates periodic flooding/drying for longer than 1 month, 2 if tolerates flooding/drying over days/a couple of weeks, 1 if dies back during periods of flooding/drying, and 0 if cannot tolerate flooding/drying.</p> <p>Do not score if no information is available.</p>		
Habitat type – lentic (i.e., rivers, streams, drains, or other flowing waters, including their margins) (2.1)	<p>(0,1,2,3) Score 3 if major weed (reaches high density and dominates plant community), 2 if minor weed (common but rarely or never dominant), 1 if present but not weedy, and 0 if absent.</p>		
Habitat type - lotic (i.e., ponds, lakes and other standing waters, including their margins) (2.2)	<p>(0,1,2,3) Score 3 if major weed (reaches high density and dominates plant community), 2 if minor weed (common, but rarely or never dominant), 1 if present but not weedy, and 0 if absent.</p>		
Habitat type - swamp, marsh, bog, or other wet areas not covered by 2.1 or 2.2 (2.3)	<p>(0,1,2,3) Score 3 if major weed (reaches high density and dominates plant community), 2 if minor weed, 1 if present but not weedy, and 0 if absent.</p>		
Establishment into existing vegetation (2.4)	<p>(-5,-3,0) Score 0 if able to invade unmodified vegetation, -3 if only able to colonize certain types of vegetation (e.g., turf-forming shoreline vegetation), and -5 if no evidence of ability to move into intact vegetation.</p> <p>Default to 0 if there is evidence of establishment but no specific information on level of invasion into existing vegetation or type of vegetation invaded. Default to -3 if not established outside its native range.</p>		
Establishment into disturbed vegetation (2.5)	<p>(0,1,5) Score 5 if able to aggressively colonize newly constructed waterbodies, after vegetation clearance, or after nutrient enrichment, 1 if grows in disturbed areas but there is no other information, and 0 if no evidence of establishment in disturbed areas. Information from either the native or introduced range may be used to answer this question.</p> <p>Default to 1 if no information is available.</p>		

Trait	Scoring guidance	Species score	Information sources
Competition – between growth form (3.1)	<p>(0,1,2) Score 2 if forms dense stands that displace other growth forms (submerged, floating, emergent), 1 if some suppression, 0 if no displacement.</p> <p>Default to 0 if in the trade globally for >30 years but no information on displacement is available.</p>		
Dispersal outside catchment by natural agents (e.g., birds, wind) (4.1)	<p>(0,1,3,5) Score 5 if species or its parts (e.g., seeds, rhizomes, fragments, etc.) are likely to be frequently dispersed by natural agents, 3 if transport by natural agents is possible but uncommon, 1 if propagule could be spread in bird crop, and 0 if natural agents do not disperse or likelihood is extremely low (e.g., Hydrilla is scored 1 because its turions can survive passage through duck guts, an agent of dispersal, but is believed to happen rarely).</p>		
Dispersal outside catchment by accidental human activity (4.2)	<p>(1,2,3) Score 3 if often spread by human activity or it/its parts (e.g., seeds, rhizomes, fragments, etc.) adapted for easy transportation (e.g., via boat, trailer, fishing gear), 2 if a floating plant or macrophyte with no explicit mention in the literature of human-mediated spread, and 1 if not mentioned and unlikely to be spread by human activity based on growth form and life history.</p> <p>Default to 1 if no information is available.</p>		
Dispersal outside catchment by deliberate introduction (4.3)	<p>(0,1) Score 1 if desirable to humans (e.g., used for food, restoration, medicine, as an ornamental, etc.) and 0 if not used or no information exists.</p>		
Effective spread within waterbody/catchment (4.4)	<p>(0,1) Score 1 for extensive spread within a waterbody or among waterbodies and 0 for no spread. Occurrence along stream or riverbanks or in rivers can be used as evidence, as well as evidence of water dispersal. Do not answer if no information is available.</p>		
Generation time (includes growth rate and time to maturity under ideal conditions) (5.1)	<p>(1,2,3) Score 3 if rapid (reproduction in first year and >1 generation/year), 2 if annual or produces one generation every year including the first year, and 1 if not reproductively mature in the first year.</p> <p>Default to 1 if no information is available.</p>		
Seeding ability - quantity (6.1)	<p>(0,1,2,3) Score 3 if >1000 seeds/plant/year, 2 if 100-1000, 1 if <100 or evidence that seeds are produced in native or introduced range, and 0 if seeds not produced.</p>		

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Seeding ability - viability/persistence (6.2)	(0,1,2) Score 2 if highly viable for >3 years, 1 if low viability or evidence of seed production with no information on viability, and 0 if no viable seeds.		
Vegetative reproduction (7.1)	(0,1,3,5) Score 5 if naturally fragments from rhizomes, stolons, or other vegetative growth into tissue capable of producing new colonies (e.g., <i>Egeria densa</i>), 3 if produces rhizomes/stolons but there is no other information about the formation of new colonies elsewhere, 1 if forms clumps by vegetative spread, and 0 if no vegetative spread.		
Physical – recreational water use (e.g., swimming, fishing, boating) (8.1)	(0,1,2) Score 2 if major nuisance and 1 if minor nuisance. Default to 0 if not established outside its native range or if it has established outside of its native range and there is a reasonable amount of information but none indicating it as a nuisance.		
Physical – non-recreational access (8.2)	(0,1,2) Score 2 if major nuisance and 1 if minor nuisance. Default to 0 if not established outside its native range or if it has established outside of its native range and there is a reasonable amount of information but none indicating it as a nuisance.		
Physical - water flow, power generation (8.3)	(0,1,2) Score 2 if major nuisance and 1 if minor nuisance. Default to 0 if not established outside its native range or if it has established outside of its native range and there is a reasonable amount of information but none indicating it as a nuisance.		
Physical - irrigation, flood control (8.4)	(0,1,2) Score 2 if major nuisance and 1 if minor nuisance. Default to 0 if not established outside its native range or if it has established outside of its native range and there is a reasonable amount of information but none indicating it as a nuisance.		
Aesthetic - visual, olfactory (8.5)	(0,1,2) . Score 2 for both visual and odor problems, 1 for either individually, and 0 for neither or no mention of these impacts. Surface matting of macrophytes scores 1 for visual impact.		
Reduces biodiversity (9.1)	(0,1,3,5) Score 5 for extensive monospecific stands, 3 for species that become dominant, 1 for small monospecific stands, and 0 if does not dominate other species. Default to 0 if not established outside its native range or if traded globally for >30 years and no information is available.		

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Reduces water quality (9.2)	<p>(0,1,3) Score 3 if causes deoxygenation (e.g., through extensive growth in shallow water) or other water quality loss (e.g., loss of water clarity because of continuously high decomposition rates during growing season), 1 if deoxygenation or other water quality loss is likely based on seasonal growth cycles (e.g., macrophyte that gets to high density and dies off at end of summer), and 0 if otherwise.</p> <p>Default to 0 if traded globally for >30 years and no information is available.</p>		
Negatively affects physical processes (9.3)	<p>(0,2) Score 2 if alters hydrology (e.g., increases the chance of flooding) or substrate stability (e.g., increases amount of sediment erosion or deposition) or other physical processes and 0 if has no history of modifying physical processes.</p> <p>Default to 0 if traded globally for >30 years and no information is available.</p>		
Health impairment (e.g., drowning, poisonous, sharp leaf edges, mosquito breeding habitat) (10.1)	<p>(1,2) Score 1 for one effect and 2 for two or more effects.</p>		
Weed of agriculture (includes crops, livestock, and aquaculture) (10.2)	<p>(0,1) Score 1 if a problematic agricultural weed and 0 if no evidence is available or if evidence suggests it's not problematic.</p>		
Management - ease of management implementation (11.1)	<p>(0,1,2) Score 2 if accessibility to weed is difficult (e.g., dense tall impenetrable growths or growing in habitats that are difficult to access by roads or waterways, such as swamps).</p> <p>Default to 0, 1 or 2 based on habitat or growth form if established outside its native range but no direct evidence is available. Default to 0 if not established outside its native range and has been traded globally for >30 years.</p>		
Management - recognition of management problem (11.2)	<p>(0,1) Score 1 if difficult to assess weediness (e.g., submerged, looks like another species).</p> <p>Default to 0 or 1 based on habitat or growth form if established outside its native range but no direct evidence is available. Default to 0 if not established outside its native range and has been traded globally for >30 years.</p>		

Trait	Scoring guidance	Species score	Information sources
Management - scope of control methods (11.3)	<p>(0,1,2) Score 2 for no control method, 1 for only one control option.</p> <p>Default to 0 if there is direct evidence for 11.1 or 11.2 but no information for this question is available. Default to 0 if traded globally for >30 years but is not established outside its native range and there is no information for this question. Do not answer this question if species has established outside its native range, and there is no direct evidence for either 11.1 or 11.2.</p>		
Management - control method suitability (11.4)	<p>(0,1) Score 1 if control method not always acceptable (e.g., grass carp, unregistered herbicide).</p> <p>Default to 0 if there is direct evidence for 11.1 or 11.2 but no information for this question is available. Default to 0 if traded globally for >30 years but is not established outside its native range and there is no information for this question. Do not answer this question if species has established outside its native range, and there is no direct evidence for either 11.1 or 11.2.</p>		
Management - effectiveness of control (11.5)	<p>(0,1,2) Score 2 if ineffective and 1 if partial control.</p> <p>Default to 0 if there is direct evidence for 11.1 or 11.2 but no information for this question is available. Default to 0 if traded globally for >30 years but is not established outside its native range and there is no information for this question. Do not answer this question if species has established outside its native range, and there is no direct evidence for either 11.1 or 11.2.</p>		
Management - duration of control (11.6)	<p>(0,1,2) Score 2 if no control and 1 if control takes three or more months.</p> <p>Default to 0 if there is direct evidence for 11.1 or 11.2 but no information for this question is available. Default to 0 if traded globally for >30 years but is not established outside its native range and there is no information for this question. Do not answer this question if species has established outside its native range, and there is no direct evidence for either 11.1 or 11.2.</p>		

Trait	Scoring guidance	Species score	Information sources
Problem outside of the Great Lakes states (12.1)	(0,1,3,4,5) Score 5 if reported to be a widespread problem (i.e., a harmful weed outside of the Great Lakes states), 4 if reported to be harmful in 5 or fewer countries or states outside of the Great Lakes, 3 if reported to be a widespread adventive (but not harmful) in many other countries or states outside of the Great Lakes, 1 if reported to be adventive in 5 or fewer countries or states outside of the Great Lakes, and 0 if not adventive elsewhere.		

Total Score: _____