Ohio Invasive Plant Assessment Protocol - 2015

Botanical Name: *Potamogeton crispus*
Common Name: Curly pondweed
Family Name: Potamogentonaceae
Assessment conducted by: Allison Mastalerz, Theresa Culley

Step I Outcome: **Invasive**
Step II Score: **49**
Step II Outcome: **Invasive**

Step I

Directions: Place an "X" in the Score column next to the selected answer to each of the four questions.

		Team Score	Notes	References
1. Is this plant known to occur in the state and listed as "noxious" on any federal or Ohio Department of Agriculture plant list?	Yes. *Place on invasive plant list, no further investigation needed.* ***STOP***			
	No. *Continue on to question 2.*	x		
2. Has this plant demonstrated widespread dispersion and establishment (i.e. high numbers of individuals forming dense stands) in natural areas across two or more regions in Ohio?[a]	Yes. *Place on invasive plant list, no further investigation needed.* ***STOP***	x	Occurs in all 5 regions, but information on individual populations is lacking.	1,7
	No. *Continue on to question 3.*			
3. Does this plant form self-replicating populations outside of cultivation in Ohio and is it documented to alter the composition, structure, or normal processes or functions of a natural ecosystem?	Yes	x		
	No			
	Unknown			
4. Is the plant listed as invasive in an adjoining state or a nearby state east of the Mississippi within the USDA Plant Hardiness zones 5-6?[b,c]	Yes	x		
	No		PA, IN, MI, WV (moderately invasive)	1,2,3,4,5,6
	Unknown			

If the answer was yes for both questions 3 and 4, the plant is placed on the invasive plant list and no further research is needed. Stop here. If the answer is no for both questions 3 and 4, the plant is not considered invasive and no further investigation is warranted. Otherwise, proceed to Step II.

Step II: Invasion Status

Directions: Place the appropriate numerical score (or "U") in the Score column next to the selected answer to each of these 18 questions.

	Team Score	Notes	References
1. Current Invasion in Ohio - plant is not found in natural areas (**0 pts.**) - plant is found in natural areas but only because it persist from previous planting in that location (e.g. old home sites) (**0 pts.**) - plant is only expanding from sites of previous planting (**1 pt.**) - plant occurs in natural areas away from site of planting (**3 pts.**) - Information unknown (**U**)	3		1,7,8,9
2. State Distribution[a] - plant is not naturalized in any region of Ohio (**0 pts.**) - plant is naturalized in only one region in Ohio (**1 pt.**) - plant is naturalized in two regions in Ohio (**2 pts.**) - plant is naturalized in three regions in Ohio (**3 pts.**) - plant is naturalized in four regions in Ohio (**4 pts.**) - plant is naturalized in five regions in Ohio (**5 pts.**) - Information unknown (**U**)	5	In all 5 regions of OH.	1,7
3. Regional/US Distribution - plant is not considered to be a problem in any other state (**0 pts.**) - plant has been reported as a widespread problem in another non-neighboring state within the USDA Plant Hardiness Zones 5-6 (**1 pt.**) - plant has been reported to be a widespread problem in 1-2 adjoining states (**3 pts.**) - plant has been reported to be a widespread problem in 3 or more adjoining states (**5 pts.**) - plant has been reported to be a widespread problem in similar habitat outside the US (**1 pt.**) - Information unknown (**U**)	5	PA, IN, MI, WV (moderately invasive)	1,2,3,4,5

Step II: Biological Characters

	Team Score	Notes	References
4. Vegetative Reproduction - no vegetative reproduction (**0 pts.**) - reproduces readily within the original site (**1 pt.**) - has runners or spreading rhizomes that root easily (**3 pts.**) - fragments easily and fragments can be easily dispersed (**4 pts.**) - has runners or spreading rhizomes that root easily AND fragments easily and fragments can be easily dispersed (**5 pts.**)	5	8: "An interesting sidelight to the vegetative reproductive behavior of P. crispus is that the plant vegetatively exhibits a life cycle very similar to the sexual life cycle of winter annuals." 12: Species reproduces primarily vegetatively	

- Information unknown (**U**)		through buds (later called turions). 13: Can reproduce extensively through turions and surviving the winter as grown plants, with expansive spread [so 5 pt. answer here even though species does not have runners]. 16: Reproduction is almost exclusively vegetative through rhizomes and reproductive buds (turions).	8,12,15,16
5. Sexual Reproduction - no sexual reproduction (**0 pts.**) - infrequent sexual reproduction (**1 pt.**) - frequent sexual reproduction, but high variation among years in seed production (**3 pts.**) - frequent sexual reproduction (one or more events per year) (**5 pts.**) - Information unknown (**U**)	1	Species creates seeds via sexual reproduction annually but they have very low seed germination (most reproduction is through vegetative propagation).	8, 10,11,12,15,16
6. Number of Viable Seeds or Propagules per Plant - few (0-10) (**1 pt.**) - moderate (11-1,000) (**3 pts.**) - prolific (>1,000) (**5 pts.**) - Information unknown (**U**)	3	8: Species is not known to create viable seeds in the wild. 12: Individual plants can produce 960 turions [this source incorrectly refers to these as seeds] in one season; in western Lake Erie, there were reported counts of 4,451,000 and 5,644,000 seeds in one season (i.e. fruits) [but unclear if this refers to turions].	8,12
7. Flowering Period - one month or less per year (**0 pts.**) - two months (**1 pt.**) - three to five months (**2 pts.**) - longer than five months (**3 pts.**) - Information unknown (**U**)	1	8,10: May to October [but this likely refers to turions]. 12: Flowering in Ohio is in May to June (inflorescences appear above water).	8,10,12
8. Dispersal Ability - low potential for long-distance seed/propagule dispersal (>1km) (**0 pts.**) - medium potential for long-distance seed/propagule dispersal (**3 pts.**) - high potential for long-distance seed/propagule dispersal (**5 pts.**) - Information unknown (**U**)	5	10-11: Are dispersed by water current and water fowl, but main dispersal mechanism is by boats that have not cleaned off all vegetation and equipment before launching in a new area. As species can increase oxygen in an aquatic habitat, it is sometimes planted to increase oxygen. 12: Dispersed as turions in the water, fruits also consumed by waterfowl. 13: May be associated with fish hatcheries and may have been dispersed with fish stocking operations. 16: Likely associated with fish hatchery activities and perhaps some migratory waterfowl.	10,11,12,13,16
9. Generation Time - long juvenile period (>5 or more years for trees, 3 or more years for other growth forms) (**0 pts.**) - short juvenile period (<5 years for trees, <3 years for other forms) (**3 pts.**) - Information unknown (**U**)	3	12: Can germinate early from turions and flower by May to June.	10,11,12,13
10. Establishment - unable to invade natural areas (**0 pts.**) - can only colonize certain habitat stages (e.g. early successional habitats) (**1 pt.**) - aggressively colonizes and establishes in edge habitats (**3 pts.**) - aggressively colonizes and establishes in intact and healthy natural areas (**6 pts.**) - Information unknown (**U**)	3	10-11: In some instances, curly pondweed can establish, but not create any problems, but in other places, species can become dominant and cause significant problems. 12: In many cases, this depends on the local environment, especially water quality. 13: Species can survive during the winter underwater in a different growth form.	10,11,12,13,15
Step II: Ecological Importance			
11. Impact on Ecosystem Processes - no known effect on ecosystem-level processes (**0 pts.**) - moderate effects on ecosystem-level processes (e.g., changes in nutrient cycling)(**3 pts.**)	6	10: "tends to increase oxygen levels and produce substantial organic material in aquatic environments". 11: mid-summer	

Step II

- causes long-term, substantial alterations in the ecosystem (e.g., changing fire regime of an area, changing hydrology of wetlands) (**6 pts.**)		organic material in aquatic environments . 11: mid-summer dieback can cause increases in phosphorus concentrations, which can lead to an increase in algae. 12,13: Can change water nutrients and interfere with decomposition. 14: "Solubilizes phosphorus and fixes nitrogen from the sediments, which can contribute to algal growth and lead to displacement of native plants and associated animals."	10,11,12,13,14,15,16
12. Impact on Rare Organisms			
- no known negative impact on Ohio State-listed or federal-listed plants or animals (**0 pts.**) - negatively impacts listed species, such as through displacement or interbreeding (**3 pts.**)	0	None known	
13. Impact on Native Animals			
- no known negative impact on animals (**0 pts.**) - documented direct or indirect negative effects on animal taxa (**3 pts.**)	0	13: Fruit used as food by waterfowl.	13
14. Impact on Native Plants			
- no known negative effects on native plants (**0 pts.**) - negatively impacts some native plants (increasing their mortality and/or recruitment of certain taxa) (**3 pts.**) - impacts native plants to such an extent that community structure is greatly altered (**6 pts.**)	3	Species grows aggressively early in the season, often shading out and inhibiting the growth of native species.	8,9,11,12
15. Hybridization			
- no known instances of hybridization with other plant species (**0 pts.**) - can hybridize with native Ohio plants or commercially-available species, but seeds are inviable (**1 pt.**) - can hybridize with native Ohio plants or commercially-available species, producing viable seed (**3 pts.**)	0	12: Can form hybrids with other *Potamogeton* species but no known hybrids seen naturally in Canada.	12
16. Population Density			
- occurs only as small, sporadic populations or individuals (**1 pt.**) - typically forms small, monospecific patches (**3 pts.**) - is a dominant plant in area where population occurs (absolute cover 15-50%) (**4 pts.**) - forms an extensive, monospecific stand (absolute cover >50%) (**5 pts.**)	4	Formation of dense mats can occur (which may interfere with recreation), 16: forms large, monospecific stands.	8,9,10,12,16
17. Role in Succession in Natural Areas			
- successional information is unknown (**0 pts.**) - is an early successional species that temporarily invades a disturbed site but does not persist as the site matures (**0 pts.**) - readily invades disturbed sites and persists, but does not interfere with succession (**1 pt.**) - readily invades disturbed sites, persists and interferes with succession of native plants (**4 pts.**)	1		12
18. Number of Habitats Invaded ***Forestlands:*** Floodplain forest, hemlock-hardwood forest, mixed mesophytic forest, beech-maple forest, oak-maple forest, oak-hickory forest. ***Grasslands:*** Alvar*, beach-dune community*, bur oak savanna*, slough-grass-bluejoint prairie*, sand barren*, big bluestem prairie, little bluestem prairie (xeric limestone prairie*+), post oak opening*+ ***Wetlands:*** Bog*, fen*, twigrush-wiregrass wet prairie*, marsh, buttonbush swamp, mixed shrub swamp, hemlock-hardwood swamp*, maple-ash-oak swamp, white pine-red maple swamp* * Considered a rare plant community in Ohio by ODW's Biodiversity Database Program. + = xeric limestone prairies or cedar glades and post oak openings are unique to the Interior Low Plateau Region of Adams, Highland and Pike counties, and are not included in Schneider and Cochrane (1997). - not found in any natural habitats in Ohio (**0 pts.**) - only found in 1 broad category (**1 pt.**) - found in 2 broad categories or 2 rare habitat types (**3 pts.**) - found in 3 broad categories or 3 rare habitat types (**4 pts.**) - found in 4 or more rare habitat types (**5 pts.**)	1	10: "Commonly found in ponds, lakes, canals, pools and slow moving water of rivers and streams."	8,9,10,12,15
Total Score:	**49**		
Number of Unknowns:	**0**		
Outcome:	**Invasive**		

Total Points	Assessment Decision
4 or more U	Insufficient Data
0-34	Not Known to be Invasive
35-44	Pending Further Review
45-80	Invasive