Ohio Invasive Plant Assessment Protocol

Botanical Name: *Typha x glauca*
Common Name: Hybrid cattail
Family Name: Typhaceae
Posted Date: 7/20/16
Initial assessment conducted: Allison Mastalerz, Theresa Culley

Step I Outcome: **Invasive**
Step II Score: **73**
Step II Outcome: **Invasive**

		Score	Notes	References
Step I				
Directions: Place an "X" in the Score column next to the selected answer to each of the four questions.				
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	Species occurs in all regions of Ohio, but information concerning individual populations is lacking.	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	PA, WV (considered 'occasionally invasive')	1,2,3,4,5,6
	No			
	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.				
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.				
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		7
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	17: 1986 map shows hybrid in at least Region 2 (lower regions not examined)	7,17
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,MI,WI,WV (considered 'occasionally invasive'); 13: is a hybrid from non-native *T. angustifolia* and native *T. latifolia*.	2,4,5,11,12,24
Step II: Biological Characters				
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.**)			13: Grows through extensive network of underground rhizomes. 17:	

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- 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.**) - Information unknown (**U**)	5	pernnate by rhizomes. 18: Ability to outperform native *Typha latifolia* is primarily driven by production of larger and more numerous ramets and not via increased investment in those ramets. 25: Hybrid spreads primarily through vegetative propagation.	7,9,13,17,18,25
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**)	3	9: Hybrid cattail reproduces by seed, but factors such as stand age impact the importance of sexual reproduction. 14: Both *T. angustifolia* and *T. x glauca* can be identified from *T. latifolia* and other similar wetland species by their pollen grain characteristics. 15: Around the Great Lake region, *T. latifolia* is most common across habitat types but the hybrid is not limited by any reproductive barriers in the F1 hybrids. 17: flowers are wind-pollinated, unisexual with pistillate spike positioned below the staminate spike (with a gap between the two - there is no such gap in *T. latifolia*); cattails are self-fertile. 19: The hybrid is formed throughout eastern North America and is fertile - backcrosses were detected via genetic markers. 21: A few hybrid backcrosses were detected genetically in a large survey of *Typha* species. 32: Hybrids form between parental taxa and are capable of backcrossing back to both parents in natural stands. 35: F1 and backcrosses with parental taxa is possible.	9,14,15,17,19,21,25, 32,35
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**)	5	7,25: Individuals can produce 250,000 seeds [for species and hybrid generally]. 17: Typha in general produces single-seeded fruits with estimates for a single inflorescence ranging from 20,000-700,000.	7,17,25
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**)	0	10: Approximately 4 weeks. 23: *T. angustifolia* bloomed from May 24 to less than 20 days and *T. latifolia* bloomed from June 3 to July 27 in Columbus, OH [hybrid not mentioned but likely to be in the middle?].	10,23
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	7: Wind and water dispersed. 17: Wind-dispersed, but when wet, may fall close to the maternal plant.	7,17
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	25: A single seedling of a Typha spp. can produce 6-7 new ramets and grow to cover a square meter of the course of a growing season under favorable conditions (Miao et al. 2000).	11,25
10. Establishment - unable to invade natural areas (**0 pts.**) - can only colonize certain habitat stages (e.g. early successional habitats) (**1 pt.**)		13: In a common garden experiment, both T. angustifolia and T. xglauca exhibited fastest overall growth rates and strongest effects of initial	

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- aggressively colonizes and establishes in edge habitats (**3 pts.**) - aggressively colonizes and establishes in intact and healthy natural areas (**6 pts.**) - Information unknown (**U**)	6	biomass in first few weeks of growth; species and hybrid showed evidence of translocation over a greater number of rhizome segments than T. latifolia. 15: The hybrid an displace either parental taxa. 18: The hybrid outperformed native *T. latifolia* in a common garden under different water depths. 21: The hybrid was most common in a southern Canada survey of sites dominated by *Typha* species. 25: Hybrid has greater morphological and physiologic plasticity than its parental species, allowing it to survive at more extreme water depths. 35: Hybrid can displace both parental taxa around the Great Lakes.	8,13,15,18,21,25,35
Step II: Ecological Importance			
Step II **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.**) - causes long-term, substantial alterations in the ecosystem (e.g., changing fire regime of an area, changing hydrology of wetlands) (**6 pts**	6	8:"...sediments in *T. x glauca* stands tend to have unique physical composition, microbial communities and elevated nutrient concentrations." 13: "The hybrid…reduces species richness and increases litter mass, soil organic matter, and nutrient concentrations where it invades (Angeloni et al. 2006; Tuchman et al. 2009; Larkin et al. 2012, Farrer and Goldberg 2014)." [similar to 15]. 15: The hybrid an displace either parental taxa. 22: Over 2-4 years in northern MI along Lake Huran, the hybrid litter decreased light and increased inorganic nitrogen (removal did not reverse these effects). 25: Litter inputs in wetlands through aboveground cattail biomass is greater than cattail litter decay losses. 26: Sites invaded by the hybrid exhibited significantly higher concentration of soil organic matter, nitrate, and ammonium than native sites; may also alter the bacterial community. 27: Litter had a stronger effect on the ecosystem than live biomass, affecting light, temperature and its variability, community and species-level plant biomass, and community composition. 28: The hybrid has greater N uptake and retention, which should lead to increasing appropriation of N away from native species and into *Typha* biomass. 29: cattail density correlated with increased denitrification in the field (but not in mesocosms, due to large variability. 30: But young stands of the hybrid (not old > 30 yrs) were associated with significant biodiversity and habitat improvements with the potential to double plant species richness. 33: Compared to non-*Typha* invaded areas, hybrid-invaded areas differed in plant-community composition with lower species richness, higher litter mass and higher soil organic matter and nutrient concentrations.	7, 8,13,15,22,25,26,27, 28,29,30,33,34
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.**)	3	R. Gradner: Impacts rare species in marsh and mudflats.	
13. Impact on Native Animals - no known negative impact on animals (**0 pts.**) - documented direct or indirect negative effects on animal taxa (**3 pts.**)	3	9: Hybrid cattail expansion and dominance "limits the ecosystem services provided by the wetland to wildlife populations." 16: But occupancy of	9,16,20
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.**)		8:"Because of high rates of primary productivity and slow decomposition, litter accumulates in *Typha* beds, eventually excluding other	

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- impacts native plants to such an extent that community structure is greatly altered (**6 pts.**)	6	litter accumulates in *Typha* beds, eventually excluding other macrophytes." 13: "The hybrid…reduces species richness and increases litter mass, soil organic matter, and nutrient concentrations where it invades (Angeloni et al. 2006; Tuchman et al. 2009; Larkin et al. 2012, Farrer and Goldberg 2014)." 18: The hybrid outperformed native *T. latifolia* in a common garden under different water depths. 24: There was lower plant species richness in sites dominated by *Typha angustifolia* than in *Phragmites*-dominated sites. 25: Sites dominated by invasive *Typha* (both the species and the hybrid combined) exhibited lower native species density; when cattail litter is removed, native species density increases. 26: Sites invaded by the hybrid had the least plant species richness regardless of time since invasion. 28: The hybrid has greater N uptake and retention, which should lead to increasing appropriation of N away from native species and into *Typha* biomass. 29,30: Hybrids negatively impact plant biodiversity in natural sites. 33. Hybrid-invaded areas had lower species richness than non-invaded areas.	7,8,13,18,25,26,28,29,30,33
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.**)	3	9:"hybrid cattails are capable of backcrossing with both of their parental species, as well as crossing among themselves to produce advanced-generation hybrids"	9
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.**)	5	8: Can create dense stands in wetlands, where it has been measured to account for over 6% of wetland areal coverage. Hybrid cattail monocultures have been observed in wetlands. 14: "Some aggressively spreading *T. angustifolia* and *T. x glauca* interfere with wetland communities by forming large monospecific stands, out-competing native species, and altering substrate characteristics." 17: Older sites usually contain "a few large clones in comparison to many small clones in newly established sites" for *Typha* in general. 25: Up to 65% of specimens from the eastern Great Lakes region was the hybrid (Kuehn 1996); In areas around the Great Lakes [including northern OH], the majority of plots examined (53%) contained cover of invasive *Typha* (both *T. angustifolia* and the hybrid combined) of greater than 25% (a mean cover of 37.5% or higher). 32: In the Upper Midwest US, stands of *Typha* consisted of a few large clones of the hybrid accompanied by many smaller clones (but this depended on age); some clones included ramets separated by as much as 60 to 90m, indicating clone fragmentation over time.	8,9,17,25,32
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.**)	4	8: Hybrid cattail is capable of dominating wetlands to the extent that few pockets of native wetland species can exist. Alteration of ecosystem processes can reduce fauna diversity and abundance. 17: Both *T. angustifolia* and the hybrid occur in Canada primarily in early to mid-successional communities; they are frequently found in disturbed wetland sites.	8,17
18. Number of Habitats Invaded ***Forestlands:*** Floodplain forest, hemlock-hardwood forest, mixed mesophytic forest, beech-maple forest, oak-maple forest, oak-			

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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.**)	3	Species is an obligate wetland plant, sometimes found in fens. 21: No evidence was found for niche segregation for *T. angustifolia, T. latifolia*, and the hybrid - all three taxa compete for similar habitat. 31: *Typha angustifolia, T. latifolia,* and the hybrid are all found in the same habitats in Canada, including highly disturbed roadside areas. 34: urban wetlands (conversion of sedge meadows).	1,7,12,13,14,21,31,24

Total Score: **73**
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