NAME OF SPECIES: Rainbow Smelt (Osmerus mordax)

A. CURRENT STATUS AND DISTRIBUTION		
1. In Wisconsin?	a. YES ☒ NO ☐	
	b. Abundance: variable	
	c. Geographic Range: Great Lakes, at least 24 inland WI lakes (primarily in nothern WI)	
	d. Type of Waters Invaded (rivers, ponds, lakes, etc): lakes, streams/rivers	
	e. Historical Status and Rate of Spread in Wisconsin: Introduced to Michigan's Crystal Lake as food for stocked Atlantic salmon in 1912, this small ocean fish soon escaped to Lake Michigan. By 1930, the rapidly growing smelt population had expanded into Lake Superior, and is now found in Lakes Huron, Ontario and Erie as well. Smelt have been present in Wisconsin waters of the Great Lakes for over 70 years, first discovered in 1928 in Little Sturgeon Bay in Door County. Through the intentional or accidental efforts of private individuals, smelt began to spread to Wisconsin's inland waters in the 1980's.	
2. Invasive in Similar Climate Zones	YES ☒ NO ☐ Where: Northern MN and MI, Great Lakes	
3. Similar Habitat Invaded Elsewhere	YES ☒ NO ☐ Where: inland lakes and rivers in IL, MN, MI	
4. In Surrounding States	YES ☒ NO ☐ Where: see above	
5. Competitive Ability	High: Introduced populations have been very successful in Great Lakes and inland lakes and rivers in WI, MN, and MI. Many more inland WI lakes (>500 - see Vander Zanden lab web site) are considered candidates for smelt invasion Low:	
B. ESTABLISHMENT POTENTIAL AND LIFE HISTORY TRAITS		
1. Temperature:	Range: 7.2 - 15.6 deg. C	
2. Spawning Temperature:	Range: late winter/early spring	
3. Number of Eggs:	Range: 33,000 - 75,000 eggs pre female per season	
4. Preferred Spawning Substrate:	migrate upstream to rivers/streams to spawn - eggs fall into gravel and become attached	
5. Hybridization Potential:	none found	
6. Salinity Tolerance	Fresh: ☒ Marine: ☒ Brackish: ☒	

7. Oxygen Regime	Range:
8. Water Hardness Tolerance	Range:
9. Easily confused for Native Species?	List: none found

C. DAMAGE POTENTIAL

1. Likelihood of Damage	a. Presence of Natural Enemies: humans, salmon, lake trout
	b. How well introductory and expansion pathways can be described and quantified: Introduced to Michigan's Crystal Lake as food for stocked Atlantic salmon in 1912, this small ocean fish soon escaped to Lake Michigan, then spread to the rest of the Great Lakes. Have spread to inland waters through unintentional bait bucket releases and possibly intentional introductions, as well as natural dispersal to connected waters.
2. Environmental Impacts	a. Alteration of ecosystem composition, structure and function: Larvae and juveniles feed upon zooplankton, particularly microscopic crustaceans. Adult smelt feed on small crustaceans and fish. They have the potential to prey on young sport fish and/or compete directly with them for food (impacting species like yellow perch and walleye).
	c. Damage to ecosystem resilience/sustainability: Negative impacts have been reported on the sportfish populations of Wisconsin's inland lakes. For example, smelt compete directly with juvenile walleye for food, which may be a principal mechanism in limiting walleye recruitment. They compete with other native fish for food as well. Smelt will even eat other fish in their early or larval life stages. These larval fish or fry can include lake trout, whitefish, walleye and cisco, a forage species native to Wisconsin.
	d. Loss of biological diversity:
	e. Abiotic modifications (affects on turbidity, H2O chemistry, etc.):
	f. Biotic effects on other species (loss of cover, nesting sites, forage, changing competitive relationships: There is some evidence that the rate of mercury and PCB accumulation in top level fish consumers accelerates when they switch to a diet of smelt. Rainbow smelt are also rich in thiaminase, an enzyme that destroys thiamin, which is necessary for development of fish embryos; as lake trout and other sport fish consume the smelt, their ability to successfully reproduce diminishes because of thiamin-deficiency.

D. NET SOCIO/ECONOMIC IMPACT

1. Positive aspects of the species to the economy/society:	Effect: Rainbow smelt has come to represent an important component of the recreational and commercial fishery. In 2004, commercial trawlers in Wisconsin harvested 155,000 pounds of rainbow smelt from Lake Michigan and Green Bay; the peak harvest

	in recent years was 1,800,000 pounds (1990). Recreational anglers gather along streams with seines to harvest the fish during their spring spawning runs, cooking them up for the popular 'smelt fry.' They have become an important food source for many large Great Lakes fish
2. Direct and indirect effects of the invasive species:	Effect:
3. Type of damage caused by organism:	Effect: potential to impact sportfish populations
Industries affected by invasive:	Effect: recreational fishing, tourism
4. Loss of aesthetic value affecting recreation and tourism:	Effect:
5. Increased cost to a sector (monitoring, inspection, control, public education, modifying practices, damage repair, lower yield, loss of export markets due to quarantine:	Effect:
6. Cost of prevention or control relative to cost of allowing invasion to occur (cost of prevention is borne by different groups than cost of control):	Effect:
7. Cost at different levels of invasion:	Effect:
E. CONTROL AND PREVENTION POTENTIAL	
1. Costs of Prevention (including Education):	
2. Responsiveness to Prevention Efforts:	Bait bucket release is a primary mechanism of further spread, so education targeting this activity could be effective.
3. Detection Capability:	
4. Control Tactics Effective:	Mechanical: ☐ Biological: ☐ Chemical: ☒
5. Efficacy/Feasibility of Control (effort, # of staff):	
6. Cost of Control:	High: ☐ Medium: ☐ Low: ☐
7. Non-Target Effects of Control:	Current control techniques can't eliminate rainbow smelt from lake communities without harming the rest of the lake population

8. Threshold at which control would be attempted:	
9 Efficacy of Monitoring:	