SELECTED KSAs

1. Please describe your experience with and interest in research on aquatic invertebrates, including research involving invertebrate resting stages and performance of taxonomic identification.

Over the last 10 years I have conducted ecological studies in streams, lakes, and wetlands. This work frequently centered on invertebrates, including benthic macroinvertebrates, mussels, and zooplankton. All of this work required taxonomic identification usually under microscopes, including counting the eggs of rotifers to obtain population egg ratios.

My research into the ecosystem-level effects of zebra mussels on Michigan lakes used mesocosm experimentation and field surveys. I conducted a mesocosm experiment at the Experimental Pond Facility at the Kellogg Biological Station examining food web effects of zebra mussels on larval fish, as mediated through the zooplankton. I collected, identified, and enumerated both microzooplankton (rotifers, nauplii) and macrozooplankton (cladocerans, copepods). I also participated in a series of large 50,000L-mesocosm experiments in Gull Lake, in which I examined rotifer fecundity.

My philosophy of ecology involves understanding ecosystems through a balanced consideration of community ecology, biogeochemical processes, and physical factors. For example, I consider food web structure and the movement of a nitrogen atom through an ecosystem to be different ways of phrasing the same question. This reflects a diversified program of study, including the examination of physical ecosystem processes, organism-habitat relationships, population dynamics, community structure, food webs and biogeochemistry. I offer an unusually diverse experience with biological, physical, and chemical components of multiple aquatic ecosystem types, obtained through the study of basic ecology and issues including biological invasion.

2. Please describe your experience with and interest in research on aquatic invasive species in the Great Lakes.

My dissertation examined the biological invasion of zebra mussels into inland lakes. I've investigated how zebra mussels affect food webs and impair larval fish growth rates and zooplankton reproduction rates, alter phytoplankton communities and increase the potential for harmful algal blooms, and affect nutrient cycling including biodeposition and regeneration. I showed that by impacting the microzooplankton heavily, zebra mussels compete for food with larval bluegill. This required the taxonomic classification of zooplankton found in my experiment. This perturbation to the food web impairs the growth of larval fish during a critical stage of early development. An initial slowing of growth rate can lead to smaller juvenile body size resulting in increased risk of predation and decreased chance of over-winter survival. I studied the impact of zebra mussels on phytoplankton communities using surveys of inland lakes. This required the taxonomic classification and enumeration of diverse phytoplankton communities. I showed that lakes with zebra mussels and low to moderate nutrient levels have greater dominance of

the toxin-producing scum-forming cyanobacteria Microcystis aeruginosa. Such a pattern is contrary to conventional wisdom on eutrophication caused by increased nutrient loads. This perturbation of the algal community could lead to a higher risk of harmful algal blooms in low nutrient lakes, thus impairing zooplankton herbivory, decreasing the efficiency of pelagic food webs, impacting fisheries, and reducing the aesthetic value of lakes. I have also documented a stream Corbicula invasion.

My interest in this subject is two-fold. On the one hand, biological invasion is a fascinating ecological phenomenon. Huge ecological changes can occur, but not always. The scientific questions that follow from this observation intrigue me: what makes an invader invasive? Why do some exotics fail and others proliferate? On the other hand, biological invasion is a huge problem. The invasion of zebra mussels has cost billions of dollars and decimated native mussel populations. Why do invasions keep occurring? Can we stop them? The answer is yes, we can stop them, but that doesn't mean it's an easy job to do. As an ecologist I want to stop new invasions from occurring. I see this position as a true opportunity to use my scientific skills to do good by helping to stop future invasions of the Great Lakes.