



2021 Cooperative Summer Internship Program

USGS Project Scientist	Nicholas S. Johnson
Project start date	5/3/2021
Duration	20 weeks
Location	Millersburg, Michigan
Type of Intern	ESA
Title of Project	Deploy and evaluate supplemental sea lamprey control tools
Background	<p>Sea lamprey invaded the upper Great Lakes during the first half of the 20th century and were a primary driver of catastrophic ecological and economical damage to the Great Lakes fishery. Since the 1960s, sea lamprey populations have been controlled in the Great Lakes using dams and physical barriers to block adult sea lamprey from reaching spawning habitat and by killing larval sea lamprey with pesticides (lampricide) in tributaries where adults have successfully reproduced. However, use of sea lamprey control tools that supplement lampricide and barriers has been a program goal since 1979. Lampricides effectively target larvae in most, but not all, streams and sole reliance on lampricides increases the risk of sea lampreys developing resistance to active chemicals. Barriers can block 100% of spawning adults, but also block non-target fishes and many barriers are in need of replacement. Several control tools meant to reduce sea lamprey reproduction have been tested since 1979. Pulsed-DC electricity can block and guide sea lamprey to traps, but nearly all electrical barriers have been decommissioned because they did not eliminate the need for lampricide treatment and disrupted migration of valued non-target fishes. Sterile-male release was tested in Lake Superior and the St. Marys River, but was discontinued when benefits to control could not be quantified. Pheromones have been identified, synthesized, and registered, but they did not increase trapping efficiency enough to convince managers they could suppress recruitment. Chemosensory-based repellents are still in development. History provides key lessons concerning the use of tools that reduce reproduction: (1) they may only be useful when integrated with other control methods and (2) assessing their impact is not trivial, and therefore, requires experimental planning prior to deployment and sustained effort for multiple years. We conceive that integration of multiple control tools to reduce reproduction can reduce recruitment of age-1 larvae and that effects of reducing recruitment can be quantified and compared to lampricide when assessment methods are deployed in years before, during, and after application. Our overall goals are to (1) develop, implement, and evaluate an integrated array of sea lamprey control tools focused on reducing reproduction that supplement on-going lampricide and barrier programs and (2) define stream characteristics where supplemental controls provide the greatest benefit.</p>

Objectives	Determine how effects of supplementing lampricide treatments with control tools that reduce reproduction vary among streams and why.
Intern Tasks	The intern would be engaged in the planning and implementation of all aspects of the project. In May and June, the intern would help conduct sea lamprey trapping, release of sterilized male sea lamprey, application of sea lamprey pheromones, and monitoring of an electrical sea lamprey blocking device. In July, August, and September, the intern will work with field crews from U.S. Fish and Wildlife Service and Fisheries and Oceans Canada to conduct electrofishing for larval sea lamprey and stream habitat analysis. The intern will learn to manage data sets. Based on the intern's level of experience and interest, the USGS Scientist and intern will craft a independent study/experiment related to the overall project. This independent study is most likely to occur in June and July and would include data analysis and manuscript preparation.
Expected Results and Benefits to the Intern	The intern would gain practical field experience working with USGS, U.S. Fish and Wildlife Service, and Fisheries and Oceans Canada. Skills learned would include lamprey trapping, lamprey tagging, biotelemetry, electrofishing, habitat analysis, data entry, study design, and scientific writing. The USGS P.I. collaborates with 10+ University Professors and will link up the intern with work being done at Universities.
Skills and Interests of Candidates	An intern that is comfortable working in remote stream conditions is most likely to succeed. Interest in fisheries, aqua-culture, stream ecology, and animal population dynamics is a plus.
Project Type	Field Work;Lab Work;Office Work;
Project Discipline	Ecology;Field Mapping;Surface Water;