U.S. Fish & Wildlife Service

Lower Great Lakes Fish and Wildlife Conservation Office, Aquatic Invasive Species Program

Early Detection Monitoring Implementation Plan, Lake Erie and Lake Ontario 2024

Program Overview

Aquatic invasive species pose a serious threat to the Great Lakes. That threat has prompted natural resource agencies to examine pathways of introduction and risks posed by priority species. Prevention, early detection, and rapid response provide the most effective and potentially successful means to minimize harm to the environment and costs associated with stopping the spread of nonnative species. The U.S. Fish and Wildlife Service (USFWS) developed the *Strategic Framework for the Early Detection of Non-native Fishes and Select Benthic Macroinvertebrates in the Great Lakes* identifying early detection as a priority action. The framework defines how the USFWS will carry out early detection efforts in high priority locations (HPL). HPLs are selected based on their increased likelihood for invasion. Sampling focuses on harbors, rivers, and embayments of the Great Lakes as determined by a risk-based prioritization framework for AIS in the Great Lakes. Results from the risk-based prioritization framework produce a ranking for each taxa that represents invasion risk at a location and is used to select and prioritize survey locations (Table 1).

Table 1: Priority levels of the top ranked locations across the lower Great Lakes.

		Ranking out of 386 Locations		
Basin	Location	Fish	Invertebrate	Priority*
Lake Erie	Buffalo, NY	3	9	High
	Erie, PA	27	27	Moderate
	North Tonawanda, NY	29	52	Moderate
	Grand Island, NY	54	67	Moderate
	Dunkirk, NY	72	74	Moderate
	Irving, NY	94	126	Low
Lake Ontario	Rochester, NY	5	20	High
	Oswego, NY	6	21	High
	Massena, NY	124	189	High
	Sodus Point, NY	57	64	Moderate

* Priority designation was assigned based on rankings from the risk-based prioritization framework (fish and invertebrate), supporting ongoing invasion fronts, and other AIS program objectives.

This report outlines implementation of the field elements of the Framework in Lake Erie and Lake Ontario during 2024. The proposed work will be carried out by the USFWS's Lower Great Lakes Fish and Wildlife Conservation Office (LGLFWCO).

Questions related to the implementation plan can be directed to Zy Biesinger, Aquatic Invasive Species Program Lead, Lower Great Lakes Fish and Wildlife Conservation Office, Phone: 585-948-7046, Email: zy_biesinger@fws.gov

General Objectives

The objective of the framework is early detection; therefore, sampling strategies are designed to detect rare or low abundance species. Generally, sampling for rare species involves collecting the entire suite of species known to inhabit a location using a variety of gear types that sample multiple habitats and depth strata. The objective of this implementation plan is to execute a multi-gear sampling strategy that maximizes the potential for detecting a newly introduced fish or benthic macroinvertebrate species in a complex aquatic system while it is still rare and geographically restricted. This surveillance strategy uses both traditional (active and passive fisheries gear) and genetic (eDNA) methods to identify species presence across the various communities.

During the 2024 early detection monitoring field season, water bodies near the following locations will be surveyed (Figure 1): Buffalo, NY, Rochester, NY, Oswego, NY, Erie, PA, North Tonawanda, NY, Grand Island, NY, Sodus Point, NY, Dunkirk, NY, Massena, NY, and Irving, NY. The total proposed units of effort for juvenile/adult fish, metabarcoding, and benthic invertebrate sampling by each survey location can be found in Table 3. Gear will be used in accordance with the *Recommended Sampling Gear Types and Standard Operating Procedures for the Early Detection of Non-native Fishes and Select Benthic Macroinvertebrates in the Great Lakes* and will also follow safety and operation procedures implemented by the USFWS.

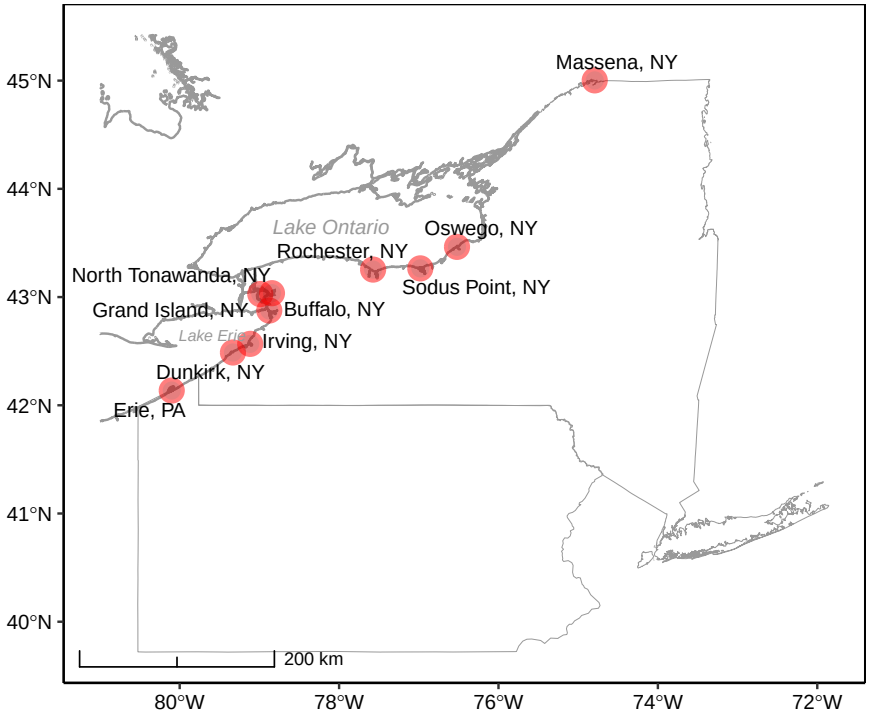

Figure 1: Locations for fish and invertebrate AIS surveys for the 2024 field season.

Traditional Surviellance Efforts

Starting in 2023, the USFWS Great Lakes Early Detection Monitoring program has undergone a review process that resulted in a standardized protocol for conducting broad-spectrum AIS surveillance at HPLs. This process has phases which focus on maintaining consistency in decision-making and gear allocation which will be analyzed to optimize adaptive sampling regimes for each location. Phase 1 describes a consistent 3-year sampling regime for new HPLs that have not previously been surveyed traditionally. None of the HPLs outlined in this plan fall into the phase 1 category, however, to build a baseline in which ongoing HPL surveillance can be analyzed under the protocol, a consistent 3-year sampling regime will be implemented from 2024-2026. During this 3-year sampling regime, a modified random site selection process that has 15% of sites in historically species rich habitats, as determined by historical data, will be implemented across all locations. Gear allocation for fish surveillance will be distributed roughly 80/20 between littoral and benthic habitats with gear allocation ratios being maintained during the 3-year sampling regime. Invertebrate surveillance gear allocation will be split 50/50 between the two gear types (rock bags and sweep net) and also held constant during the 3-year sampling regime. Following the 3-year sampling regime, comparative analyses will be used to compare past sampling strategies. Metrics of success, which are still be developed through the review process, will also be applied to the 3-year sampling regime. Results from these analyses will be used to manipulate the site selection and gear allocation strategy to better optimize broad-spectrum AIS surveillance for each HPL.

Alongside the standard routine surveillance efforts of our early detection monitoring program, there are a few projects that will be undertaken that are worth mentioning:

1. Surveillance efforts along the St. Lawrence River near Massena, NY will be ongoing as Tench (*Tinca tinca*) continue to undergo a range expansion into the upper St. Lawrence River. This effort is targeted towards littoral habitats that have been suggested to be preferred by Tench and therefore will not be subscribed to the 3-year sampling regime. Massena, NY maintains a High priority status due to the range expansion of Tench and binational partner interest in monitoring that invasion front.

2. Although there will not be any dedicated crayfish survey effort, further support of the Buffalo Park Schools Red Swamp Crayfish (*Procambarus clarkii*) infestation will result in a few days of effort around the perimeter of the known established population to determine any potential spread.

Genetic Surviellance Efforts

Environmental DNA (eDNA) is a molecular method of species detection that is used for AIS monitoring. The USFWS Great Lakes Early Detection Monitoring program has begun to incorporate multi-species eDNA (metabarcoding) monitoring into routine broad-spectrum surveillance efforts. As this new monitoring program gets implemented, objectives will include addressing research needs and beginning routine monitoring at HPLs. The LGLFWCO's Early Detection Monitoring eDNA objectives for 2024 are detailed below:

Early Detection Monitoring
Begin to implement eDNA metabarcoding as a surveillance method for novel AIS at lower priority

HPLs where traditional surveillance is not currently occurring. This work will be supported through partnerships with the New York Department of Environmental Conservation (NYSDEC) and the USFWS LGLFWCO Grass Carp Strike Team.

St. Lawrence River Tench
Supporting Tench range expansion objectives in the St. Lawrence River using eDNA metabarcoding to detect Tench DNA above the final lock and dam upstream to Lake Ontario. This work will be supported through partnerships with Department of Fisheries and Oceans Canada (DFO) and the USFWS Ecological Services New York Field Office (NYFO).

Metabarcoding Methods Research
Understanding contamination risk when conducting eDNA sampling is an important aspect to implementing defensible collection methods. Ideally, collecting eDNA samples from a vessel that is also concurrently conducting traditional surveys would be an efficient way to combine techniques but contamination in this "dirty" boat environment is a concern. This small scale study will use eDNA field blanks collected from non-sterile boats to determine the amount of contamination risk is associated with sampling from "dirty" vessels.

Detroit River Metabarcoding Reasearch
This effort will be in support of continued research objectives with the Detroit River substation in the Detroit River addressing questions of eDNA in a large connecting channel.

The amount of eDNA sample effort for each of the projects listed above can be found in table 2. Metabarcoding effort associated with routine broad-spectrum surveillance at lower priority HPLs are also outlined in Table 3.

Table 2: Number of eDNA samples that will be allocated to each project.

Project	Agency	Sample #*	Comments
Detroit River Research	LGLFWCO	65	Contribution to FWCO method objectives
EDM	NYSDEC	20	NY Lake Erie sampling
	LGLFWCO	50	Lake Erie and Lake Ontario HPL sampling
	GC Strike Team	30	Lake Erie and Lake Ontario not surveyed HPLs
Methods Research	LGLFWCO	30	Clean vs. Dirty Boat Contamination Study
SLR Tench	DFO	30	June/September Canadian water sampling
	NYFO	65	US water sampling
	LGLFWCO	30	June/September US water sampling
Total	-	320	-

* Samples refer to 5 µm PES filters of which 10% will be designated as field blank controls.

Proposed Priority Location Surviellance Efforts

Table 3: Amount of effort proposed for each high priority location for Juvenile/Adult fish, Metabarcoding, and Benthic Invertebrates.

		Fish Surveys				Invertebrate Surveys	
Basin	Location	Electrofish	Fyke Net	Gill Net	Metabarcoding	Rock Bags	Sweep Net
Lake Erie	Buffalo, NY	20	10	10	20	10	10
	Erie, PA	20	10	10		10	10
	North Tonawanda, NY	10	10	10	20		
	Grand Island, NY	20	20		20		
	Dunkirk, NY				20		
	Irving, NY				10		
Lake Ontario	Rochester, NY	30	15	15	20	10	10
	Oswego, NY	20	5	15		10	10
	Sodus Point, NY				20		
	Massena, NY	60			125		
Total	-	180	70	60	255	40	40