

# U.S. Fish & Wildlife Service

## Lower Great Lakes Fish and Wildlife Conservation Office

### *Aquatic Invasive Species Program*

## Early Detection Monitoring Metabarcoding Surveillance

### Program Objective

Aquatic invasive species (AIS) pose a serious threat to the Great Lakes. 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 in the Great Lakes identifying early detection as a priority action. The objective of the Early Detection and Monitoring (EDM) program is to detect novel invasive species and document AIS range expansions while populations are low and geographically isolated - providing management actions a better opportunity of success.

### Metabarcoding Implementation

Along with traditional fisheries surveys (electrofishing and netting), molecular surveillance using environmental DNA (eDNA) has proven to be a valuable tool in AIS monitoring. Metabarcoding, a multi-taxa eDNA method, now allows for fish community level surveillance across a broad range of species, both native, non-native, and AIS watchlist. The USFWS will be implementing an annual metabarcoding AIS surveillance program that will monitor both broad-spectrum AIS watchlist species and targeted species-specific AIS of interest. Objectives for both surveillance purposes are defined as follows:

- **Broad-Spectrum:** Monitoring will focus on AIS watchlist species across high priority locations (HPLs) comprised of harbors, rivers and embayments of the lower Great Lakes as determined by a risk-based prioritization framework for Aquatic Invasive Species (AIS) in the Great Lakes basin (Figure 1). Highest priority HPLs will get the largest sample efforts, with sample allocations trickling down across the other lower ranked priority sites (Table 1).
- **Species-Specific:** Monitoring will also focus on particular AIS species while still employing a multi-taxa approach (Figure 2; Table 2).
  - **Tench** (*Tinca tinca*), an Eurasian cyprinid, will have continued eDNA monitoring along the invasion front in the Massena, NY region of St. Lawrence River. Massena, NY maintains a High priority status due to the range expansion of Tench and binational partner interest in monitoring that invasion front.
  - **Grass Carp** (*Ctenopharyngodon idella*), an Asian cyprinid, will have continued and expanded effort across areas within Lake Ontario and Eastern Lake Erie. Sampling areas were selected based off high priority designation and locations that had habitat conditions preferred by grass carp.

## **Recapping 2024 Metabarcoding Efforts**

In 2024, metabarcoding was implemented on a small scale in high and lower priority locations in Lake Ontario and Eastern Lake Erie. High priority locations were areas where traditional sampling was occurring and data from traditional gear could be compared to metabarcoding results. Lower priority HPLs were areas where no traditional surveillance has been done and therefore metabarcoding was going to be used as a surveillance method for novel AIS. Work was supported through partnerships with the New York Department of Environmental Conservation (NYSDEC) and the USFWS New York Field Office (NYFO). NYSDEC collected samples in Cattaraugus Creek and Dunkirk Harbor, while NYFO collected samples for targeted tench effort on the St. Lawrence River near Massena, NY.

In addition to sampling across the Lower Great Lakes landscape, a contamination study was conducted to gain an understanding for the contamination risk when conducting eDNA sampling. 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 study used eDNA field blanks collected from non-sterile boats to determine the amount of contamination risk associated with sampling from “dirty” vessels. Results from this study will help inform our utilization of this tool in conjunction with traditional gears.

## **2025 Partnership Involvement**

In 2025 the Lower Great Lakes Fish and Wildlife Conservation Office (LGLFWCO) is looking for partners to assist in metabarcoding sample collection. Locations requiring assistance along with number of samples to be collected by partners can be found in Tables 1 and 2. Partners should review the tables and determine if they have capacity to assist and if any of the locations selected are of interest to their office for AIS or other species purposes. Data from samples collected by partners will be shared when data is available.

If partners have interest in other water bodies in the Great Lakes basin for AIS those areas could potentially be sampled if they align with the LGLFWCOs EDM programmatic goals. If there are additional partner requests the LGLFWCO will review those requests, determine if the areas requested align with programmatic objectives, and readjust sample allocations as needed. Extra areas requested that are not selected for sampling this year can be re-evaluated for future years sampling.

For partners willing to assist with sampling efforts in 2025, the LGLFWCO will provide materials for collection, including: filters, a smith-root sampling unit, and a step by step field SOP. Training opportunities can also be provided if requested. A Field Map and Survey123 form have already been set up for this program and will be utilized for sample collection. A copy of the SOP for the current data workflow can be found here: [eDNA Projects Survey123 Form User Instructional Manual](#)

## Broad-Spectrum AIS Surveillance

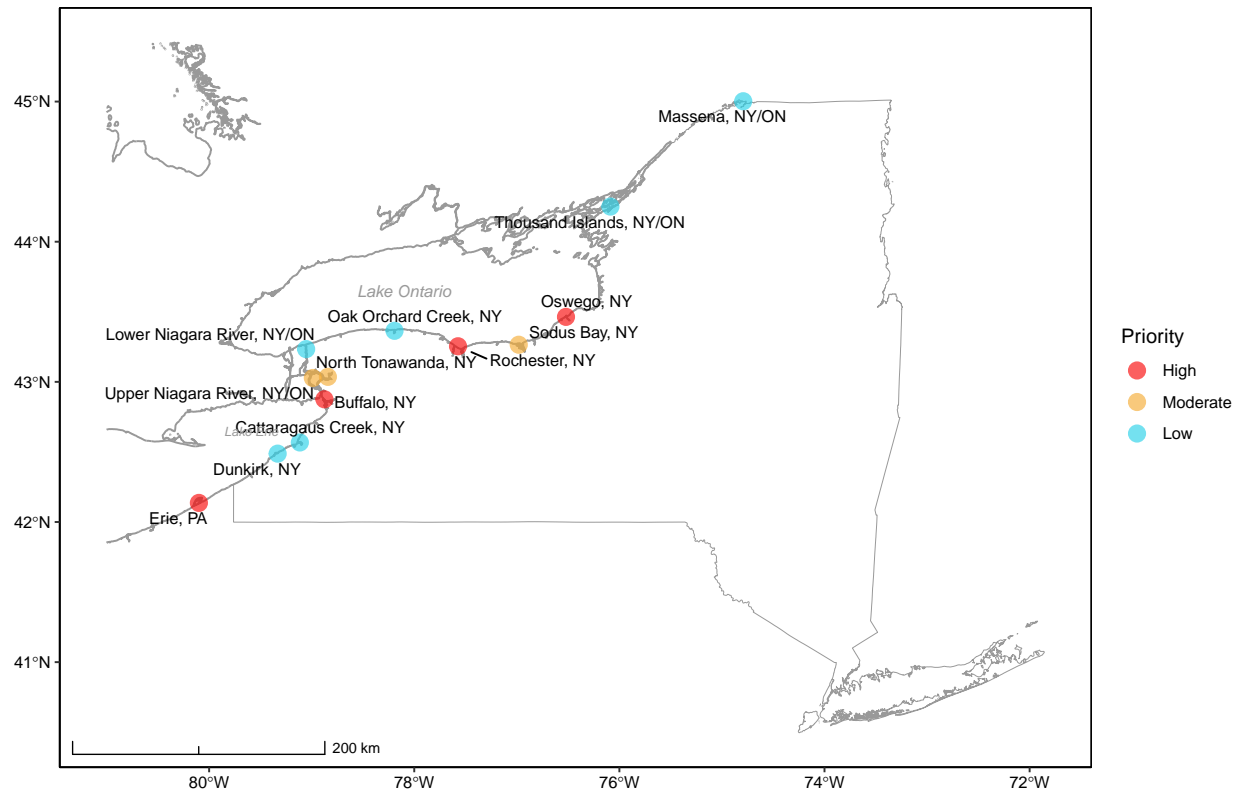


Figure 1: Map of broad-spectrum AIS monitoring locations across the lower Great Lakes with their corresponding priority level (Red: High, Orange: Moderate, Blue: Low).

Table 1: Priority broad-spectrum AIS monitoring locations across the lower Great Lakes.

Location	Ranking out of 388 Locations		eDNA Sample Capacity Scenarios	
	Fish Rank	Priority*	FWS Only	FWS & Partners
<b>Lake Erie</b>				
Buffalo, NY	3	High	20	50
Erie, PA	27	High	20	30
North Tonawanda, NY	29	Moderate	10	20
Upper Niagara River, NY/ON	54	Moderate	10	20
Dunkirk, NY	76	Low		15
Cattaraugus Creek, NY	94	Low		15
<b>Lake Ontario</b>				
Rochester, NY	5	High	20	50
Oswego, NY	6	High	20	50
Sodus Bay, NY	57	Moderate		20
Thousand Islands, NY/ON	71	Low		
Lower Niagara River, NY/ON	81	Low		
Oak Orchard Creek, NY	84	Low		
Massena, NY/ON	124	Low		
Total	-	-	100	270

\* Priority designation was assigned based on rankings from the risk-based prioritization framework.

## Species-Specific Targeted AIS Surveillance

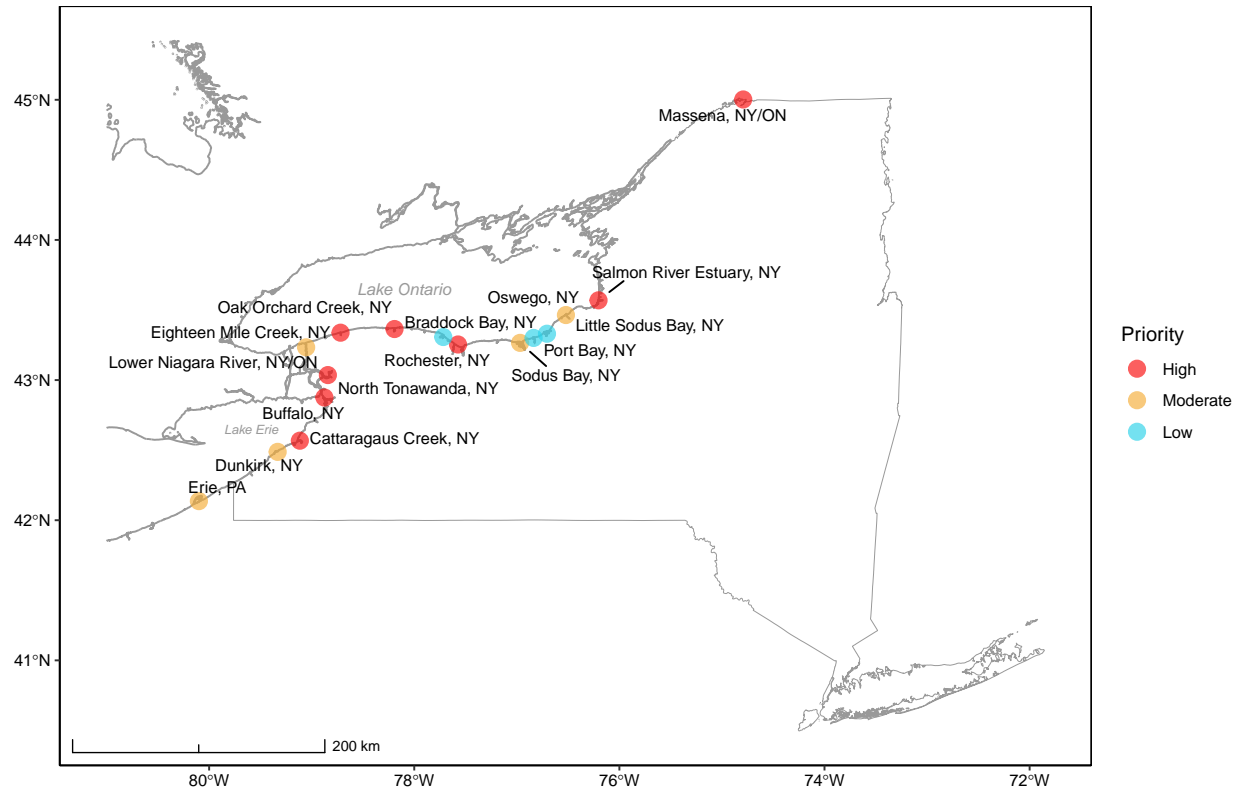


Figure 2: Map of targeted AIS species specific locations across the lower Great Lakes with their corresponding priority level (Red: High, Orange: Moderate, Blue: Low).

Table 2: Priority targeted species-specific AIS monitoring locations across the lower Great Lakes.

Location	Priority*	eDNA Sample Capacity Scenarios		Target Species	Partnerships
		FWS Only	FWS & Partners		
Lake Erie					
Buffalo, NY	High	10	10	Grass Carp	
North Tonawanda, NY	High	10	10		
Cattaraugus Creek, NY	High				
Erie, PA	Moderate				
Dunkirk, NY	Moderate				
Lake Ontario					
Rochester, NY	High	10	10		
Oak Orchard Creek, NY	High	10	15		
Massena, NY/ON	High	110	110	Eurasian Tench	New York Field Office
Eighteen Mile Creek, NY	High	10	10	Grass Carp	
Salmon River Estuary, NY	High	10	20		
Oswego, NY	Moderate	10	20		
Sodus Bay, NY	Moderate		10		
Lower Niagara River, NY/ON	Moderate	10	15		
Braddock Bay, NY	Low				
Port Bay, NY	Low				
Little Sodus Bay, NY	Low				
Total	-	190	230	-	-

\* Priority designation was assigned based on rankings from the risk-based prioritization framework.