USFWS Early Detection Surveillance for Non-native Aquatic Species in the Great Lakes

USFWS Fish and Wildlife Conservation Offices:

Alpena - MI

Ashland - WI

Green Bay - WI

Lower Great Lakes - NY

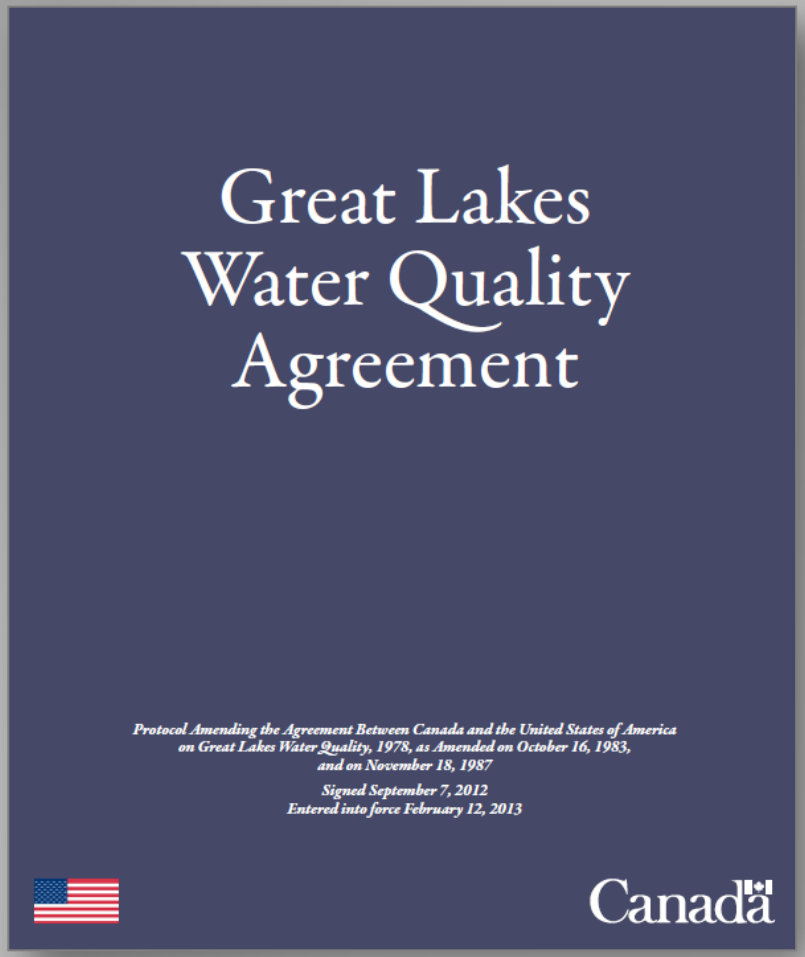
Overview

- Why are we doing this?
- Where to sample?
- How to sample?
- How to identify organisms?
- Results so far

- Long-term Goal 4
  - Comprehensive program for detection and tracking of newly identified AIS in the Great Lakes
    - Provides up-to-date information needed by decision makers
- Principal Actions to Achieve Progress
  - Establish early detection and rapid response capability
    - Initiate surveillance activities to detect new invasive species

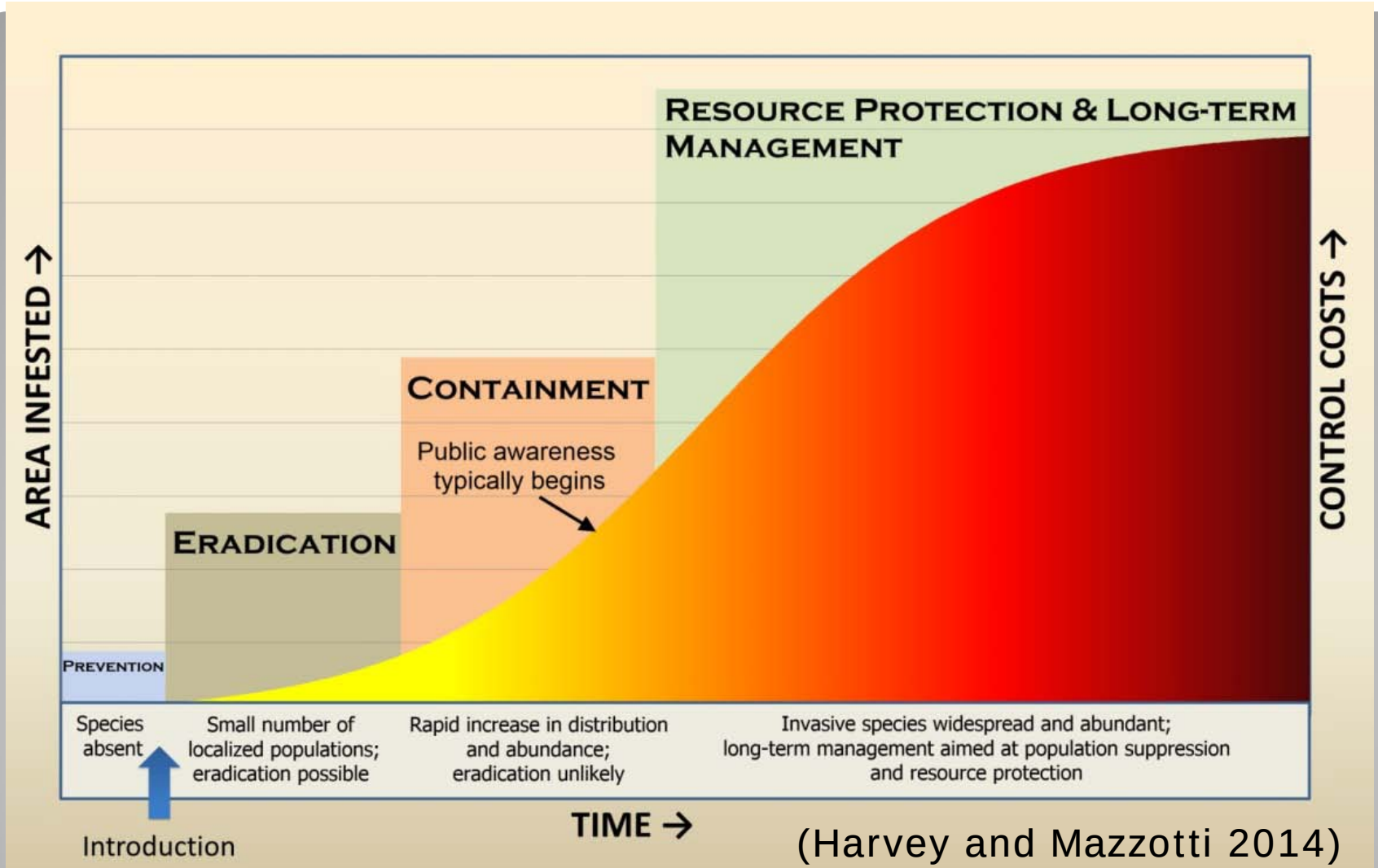
2010 GLRI Action Plan

Great Lakes RESTORATION



- 3. within two years of entry into force of this Agreement, develop and implement an early detection and rapid response initiative that:
  - (a) develops species watch lists;
  - (b) identifies priority locations for surveillance;
  - (c) develops monitoring protocols for surveillance;
  - (d) establishes protocols for sharing information;
  - (e) identifies new AIS; and
  - (f) coordinates effective and timely domestic and, when necessary, binational response actions to prevent the establishment of newly detected AIS.

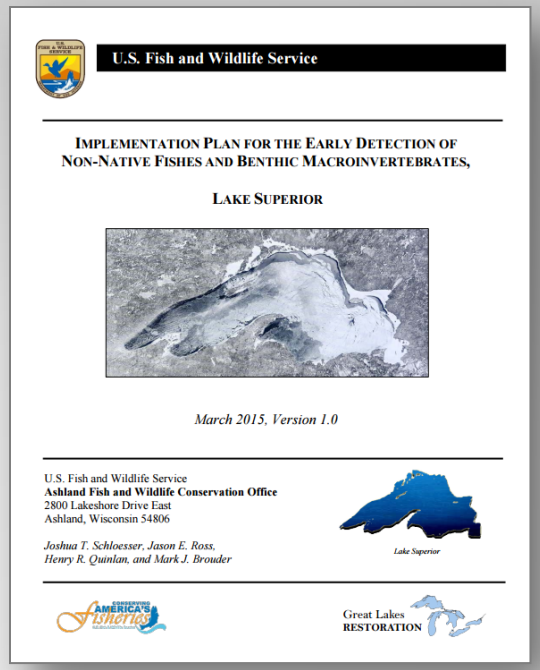
Great Lakes Water Quality Agreement



(Harvey and Mazzotti 2014)

Why are we doing this?

- FWCOs developed implementation plans for all Great Lakes
  - Area covered defined by Great Lakes Fishery Commission



U.S. Fish and Wildlife Service

IMPLEMENTATION PLAN FOR THE EARLY DETECTION OF NON-NATIVE FISHES AND BENTHIC MACROINVERTEBRATES,

LAKE SUPERIOR

March 2015, Version 1.0

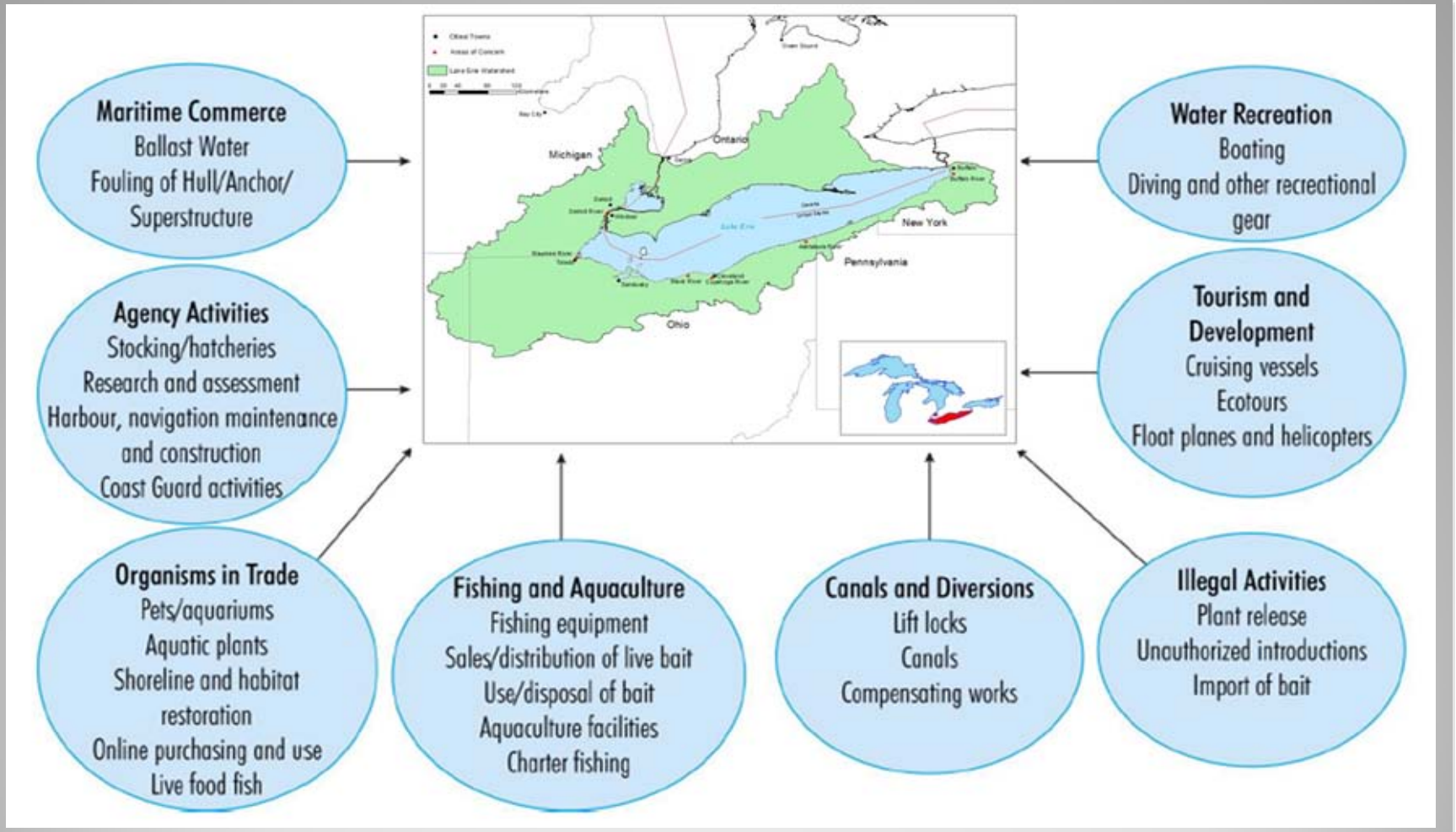
U.S. Fish and Wildlife Service
Ashland Fish and Wildlife Conservation Office
2800 Lakeshore Drive East
Ashland, Wisconsin 54806

Joshua T. Schloesser, Jason E. Ross, Henry R. Quinlan, and Mark J. Brouder

Lake Superior

Great Lakes RESTORATION

Where to sample?

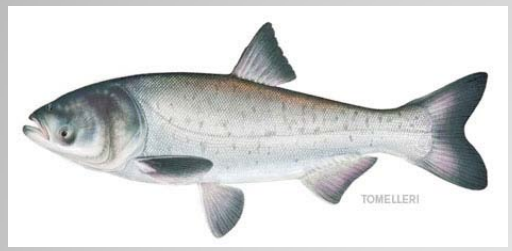


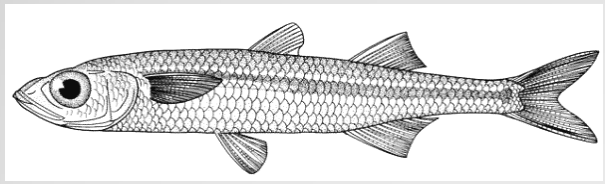
Vector categories

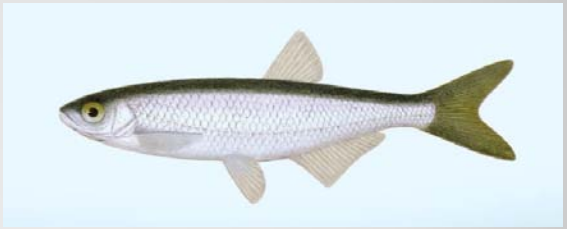
Species of primary concern

- Compilation of list from various risk assessments
- Research to note important characteristics
  - Likely vector(s)
  - Reproduction and larval stage temperature ranges
  - Habitat preference
  - Likely effective sampling gear(s)
- Use to:
  - Weigh vector risk
  - Determine sampling plans

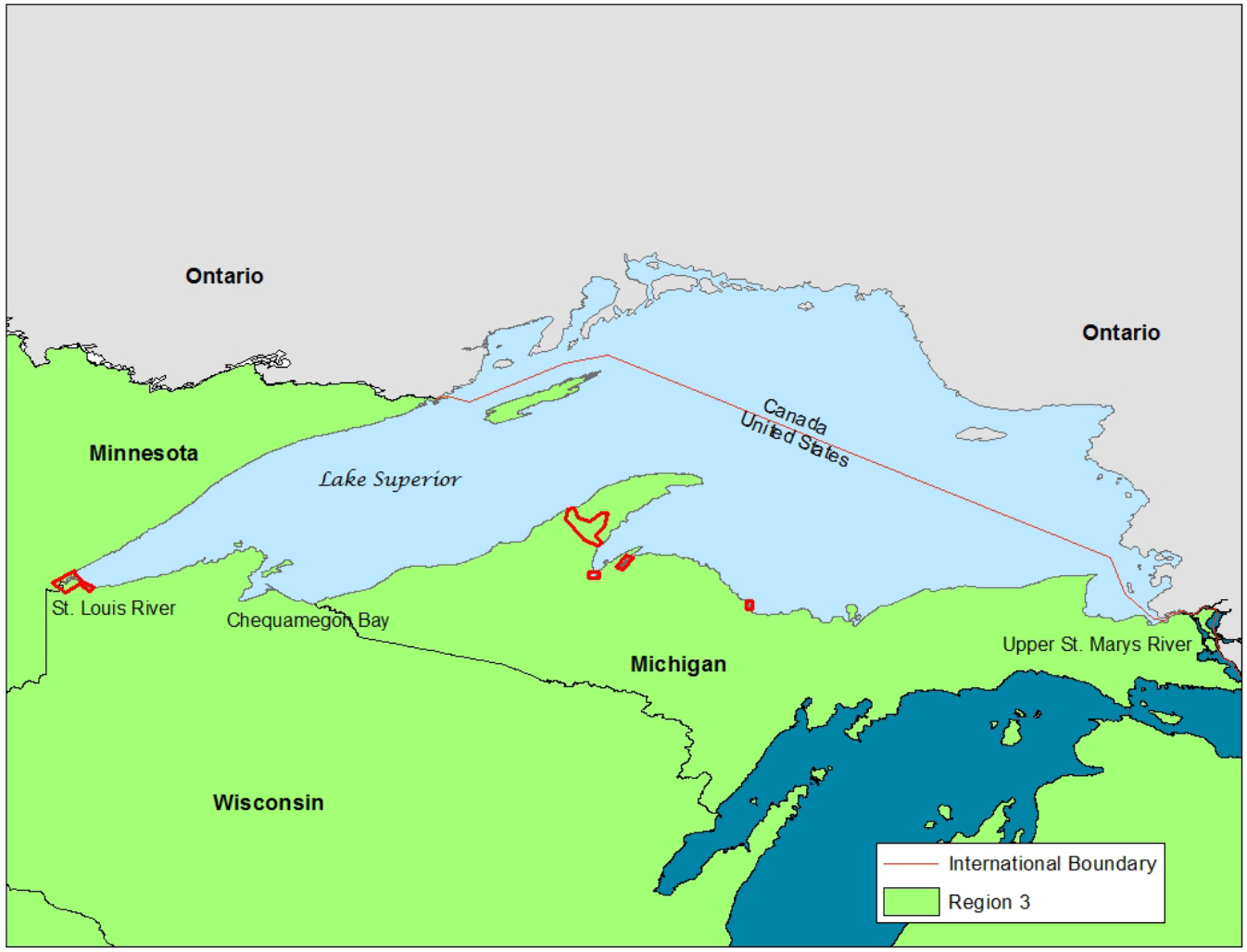
Type	Common name	Scientific name	Vector(s)	Donor region	Reproduction and larval temp. (C)	Habitat	Effective gear
F	Bighead Carp + !	*Hypophthalmichthys nobilis*	C, F, I, O	A	18 - 30[5]		E, G, L, P
F	Black Carp +	*Mylopharyngodon piceus*	C, F	A	26- 30[6]		E, G, L, P
F	Black Sea Silverside	*Atherina boyeri*	F, O	PC	10- 30[25,26]		E, F, L, P, S
F	Bleak	*Alburnus alburnus*	F, O	PC	>15[14]	S,G	L, P







Priority species list example



Lake Superior – Jared Myers

Goal: Monitor for the presence of new non-indigenous and known invasive fishes and benthic macroinvertebrates.
Approach: Rare species detection strategy. Multi-year effort.
Lead Office: Ashland FWCO
Collaboration: Keweenaw Bay Indian Community, Michigan Department of Natural Resources, Ontario Ministry of Natural Resources, Fond Du Lac Natural Resources Department, 1854 Treaty Authority, EPA Mid-Continent Ecology Division.

Juvenile and Adult Fish Sampling

- Locations: St. Louis River, Keweenaw Waterway, L'Anse Bay, Huron Bay, Marquette (provide assistance at Thunder Bay)
- Boat electrofishing (10 minute transects), paired fyke net (overnight sets), bottom trawl (5 minute tow)
- 45-50 samples per location
- August-September

Larval Fish Sampling

- Locations: Keweenaw Waterway
- Larval fish benthic sled (100 m pull), Neuston net (5 minute night tow), tucker trawl (5 minute tow)
- ~25 samples per gear type
- June-July

Benthic Macroinvertebrate Sampling

- Locations: St. Louis River
- Petite ponar (1 grab), Sweep net (5 minutes). Amphipod traps (overnight sets)
- 25 samples per gear type
- June-October
- Marina Monitoring: Hester-Dendy samplers, 2-5 samplers per marina

Lake Superior Sampling

Lake Michigan – Darin Simpkins

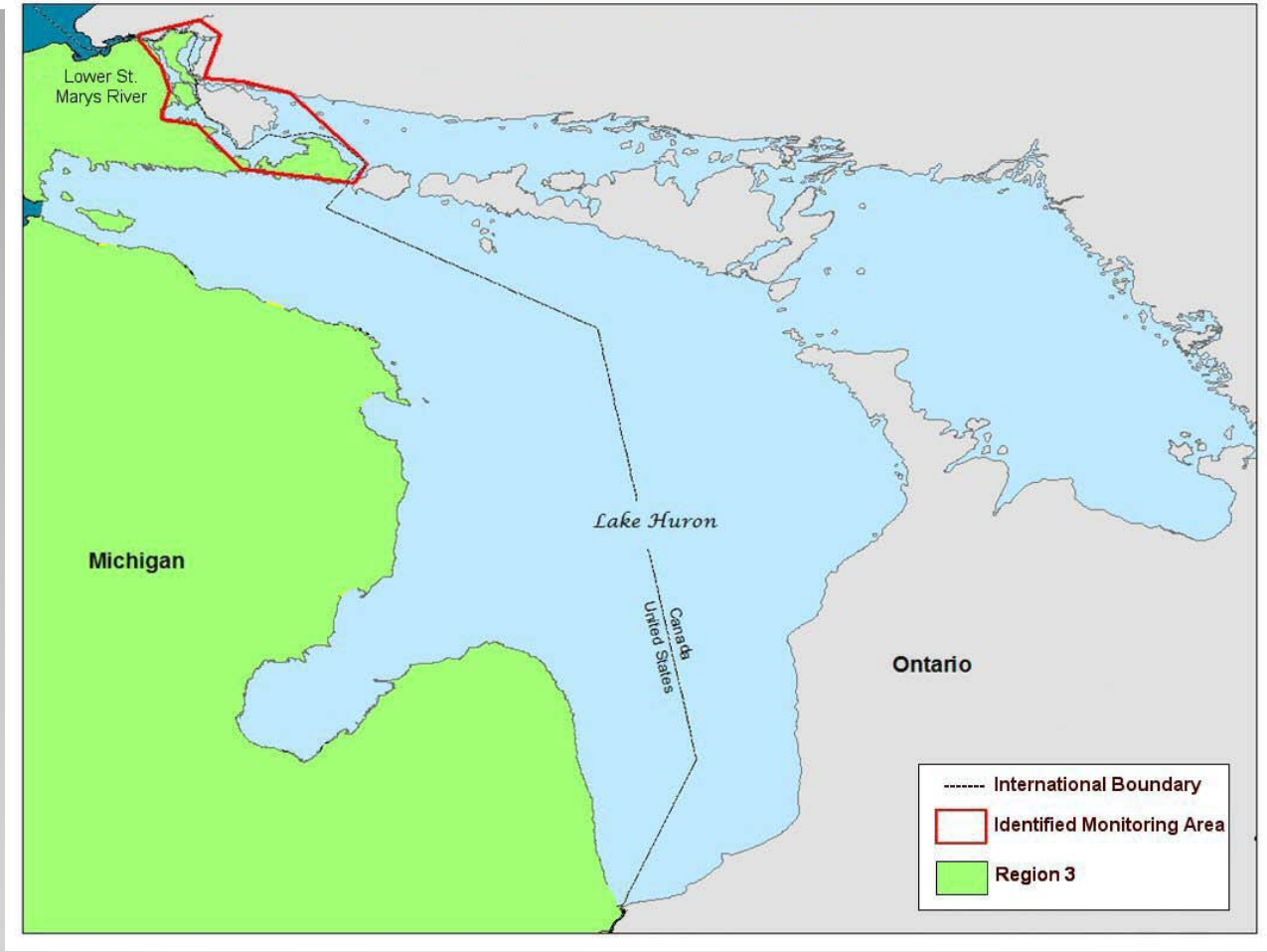
Goal: Monitor for the presence of Asian carp or other new fish and benthos species not currently found in the Great Lakes ecosystem.
Approach: Rare species detection strategy. Multi-year effort.
Lead Office: Green Bay FWCO

A . Juvenile and Adult Fish Sampling
- Five Locations: Burns Harbor, Calumet Harbor, Chicago Harbor, Green Bay, and Milwaukee Harbor
  - Paired fyke net (overnight sets)
  - Boat electrofishing (nighttime - 10 minute transects)
  - Experimental gillnets
  - 70-80 sites per location, conducted July – October, counts by species

B. Ichthyoplankton Sampling
- Locations: Green Bay and Milwaukee Harbor
  - Bongo net - 500 micron (nighttime - 5 minute tows)
  - Light traps (6-8 hr sets)
  - ~25 samples per site, conducted May – August

C. Benthos Sampling – Pilot Program
  - Five Locations: Burns Harbor, Calumet Harbor, Chicago Harbor, Green Bay, and Milwaukee
  - Rock Bags (10-20 bags)
  - Petite Ponar Grabs (20 Grabs)
  - Amphipod traps (10-20 overnight sets)
  - May – October

Lake Michigan Sampling



Lake Huron – Anjanette Bowen and Stephen Hensler

Lake Huron Sampling

Goal: Detect Asian carp or new fish and benthos species not currently found in the Great Lakes ecosystem.

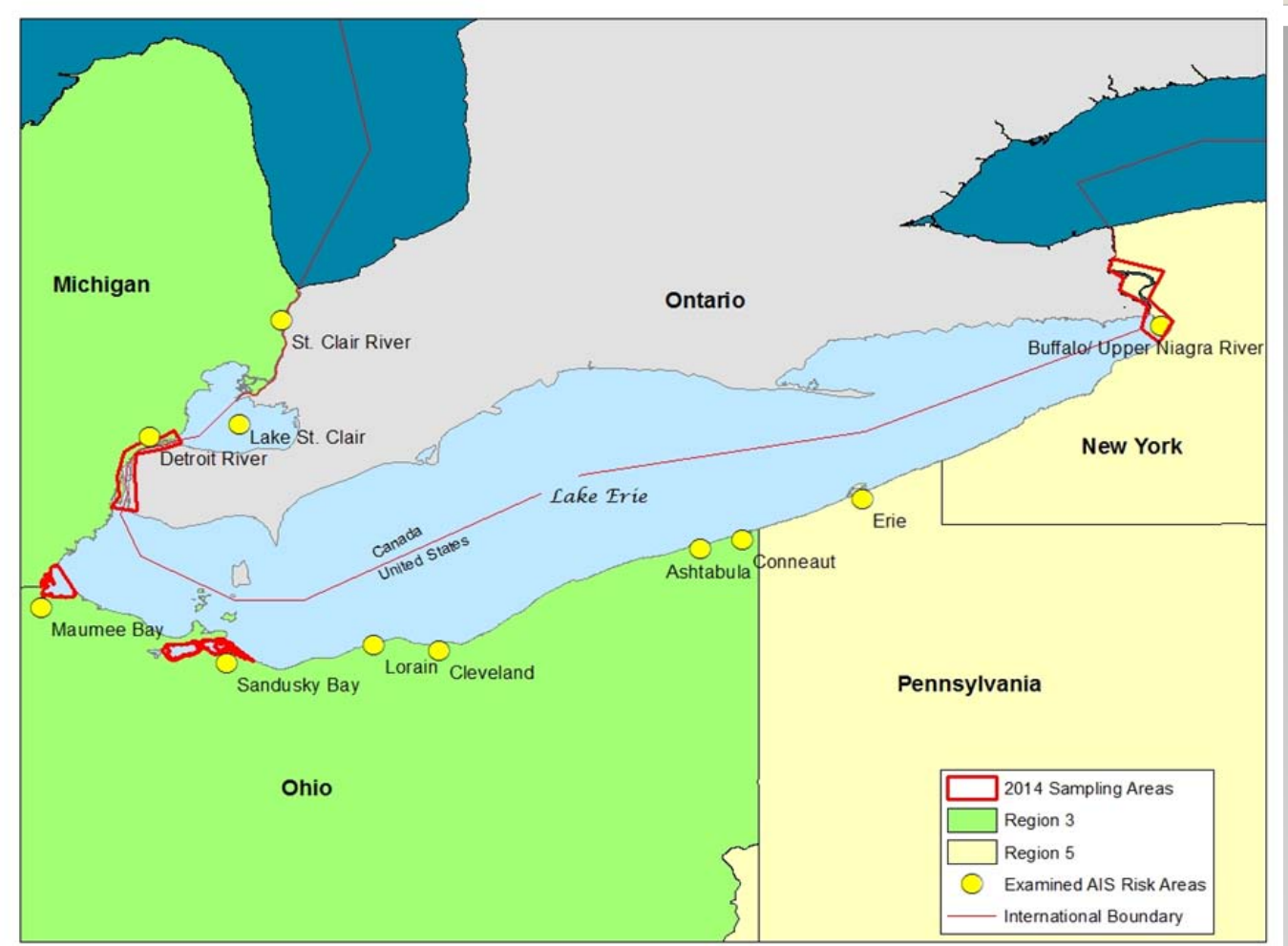
Approach: Rare species detection strategy. Multi-year effort.

Lead Office: Alpena FWCO
Collaboration: Ontario Ministry of Natural Resources and Forestry

Juvenile and Adult Fish Sampling

- Location: Lower St. Marys River
- Boat electrofishing (10 minute transects), paired fyke net (overnight sets), bottom trawl (5 minute tows)
- 45 samples
- August-October

In an analysis of vectors for invasive species introduction and examining high risk species that may become introduced, we identified and ranked sampling priority for all U.S. waters of Lake Huron. One high priority location is targeted in 2016 due to risk, available time, and staffing



Lake Erie – Anjanette Bowen and Stephen Hensler

Goal: Detect Asian carp or new fish and benthos species not currently found in the Great Lakes ecosystem.
Approach: Rare species detection strategy. Multi-year effort.
Lead Offices: Alpena FWCO and Lower Great Lakes FWCO

Juvenile and Adult Fish Sampling

- Locations: Detroit River, Maumee Bay, Sandusky Bay, and Buffalo/Upper Niagara River
- Boat electrofishing (10 minute transects), paired fyke net (overnight sets), bottom trawl (5 minute tows)
- 45 samples per location
- August-October

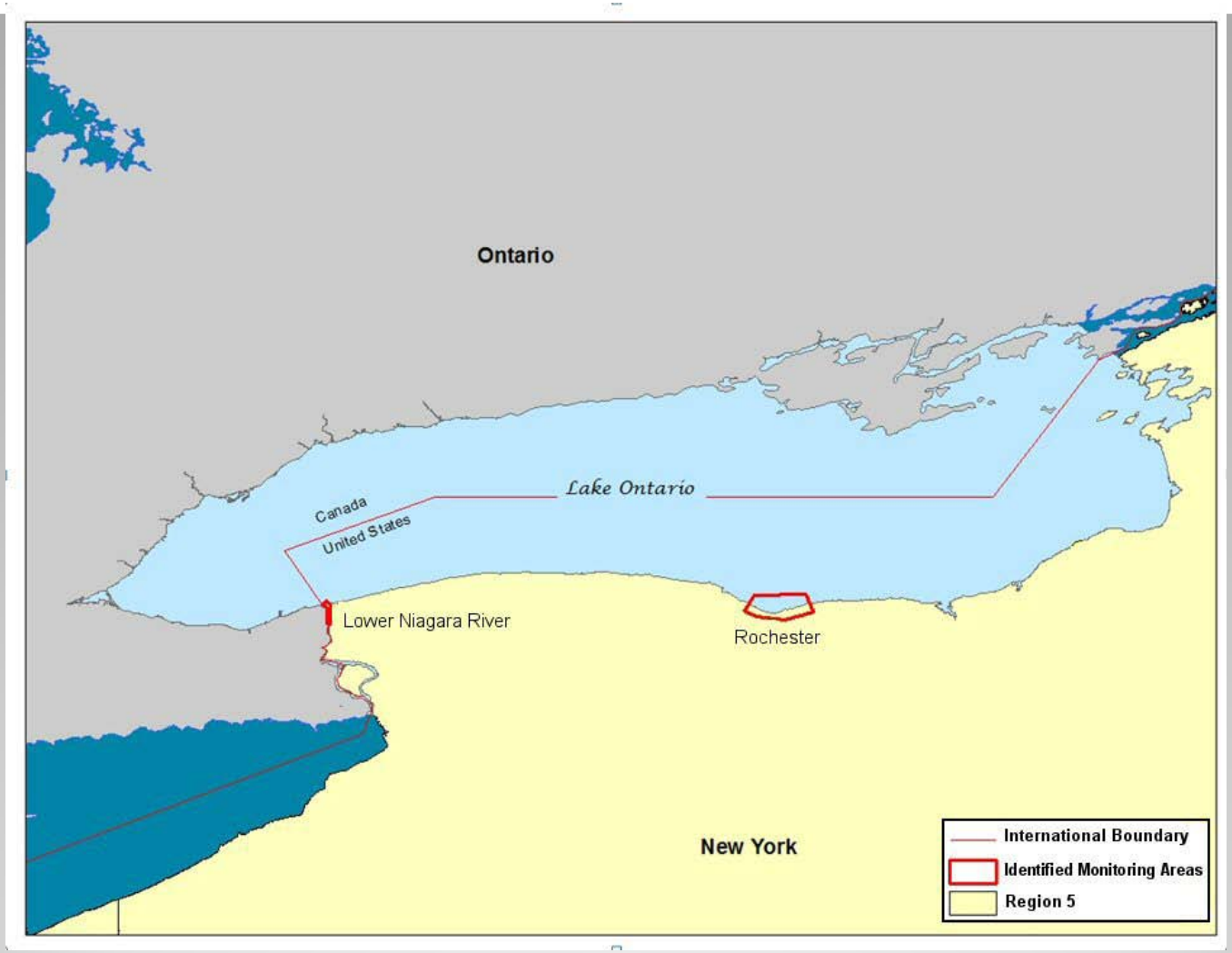
Ichthyoplankton Sampling

- Locations: Maumee Bay, Sandusky Bay, and Buffalo/Upper Niagara River
- Bongo net - 500 micron (5 minute tows), light traps (3-6 hr sets)
- 30 samples per location
- May-July

Benthic Macroinvertebrate Sampling

- Locations: Maumee Bay and Buffalo/Upper Niagara River
- Hester-Dendy samplers (2-6 traps), amphipod traps (overnight sets), benthic sled tows (2 minutes)
- 30 samples per location
- May-October

Lake Erie Sampling



Lake Ontario – Sandra Keppner

Goal: Detect Asian carp or new fish and benthos species not currently found in the Great Lakes ecosystem.
Approach: Rare species detection strategy. Multi-year effort.
Lead Office: Lower Great Lakes FWCO

LOWER NIAGARA RIVER

Sampling effort and gears: Juvenile and adult fish as well as benthos sampling will be conducted in 2016.

Juvenile and adult fish sampling: Effort will be distributed among two gear types: paired fyke net overnight sets (9 sites), daytime and nighttime electrofishing 600s transects (15 sites).

Benthic macroinvertebrate sampling: Six sites will be sampled during June-August using Hester-Dendy colonization plates.

Lower Niagara River Sampling

Goal: Detect Asian carp or new fish and benthos species not currently found in the Great Lakes ecosystem.
Approach: Rare species detection strategy. Multi-year effort.
Lead Office: Lower Great Lakes FWCO

ROCHESTER/IRONDEQUOIT BAY

Sampling effort and gears: Ichthyoplankton, juvenile and adult fish, and benthos sampling will be conducted in 2016.

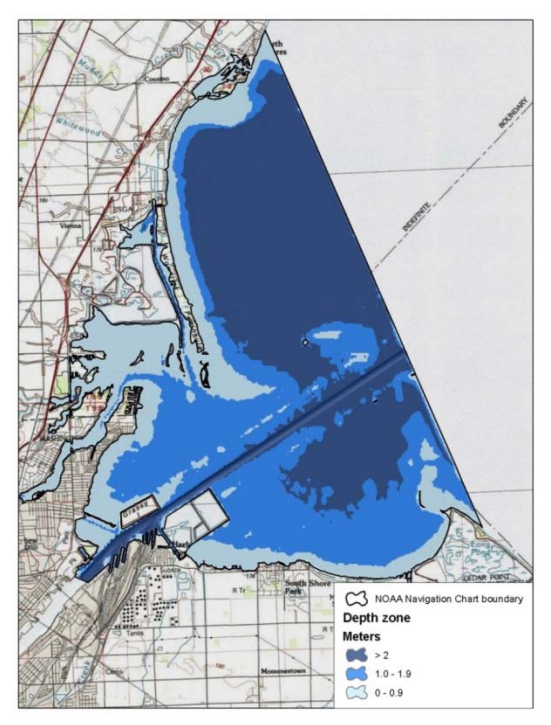
Ichthyoplankton sampling: Effort will be distributed based on depth strata, with 20 sites being sampled by 5-minute, surface bongo net tows and 10 sites being covered using quatrefoil light traps. Light traps will be used at sites less than 1m in depth; surface bongo net tows will be used at sites of greater depth.

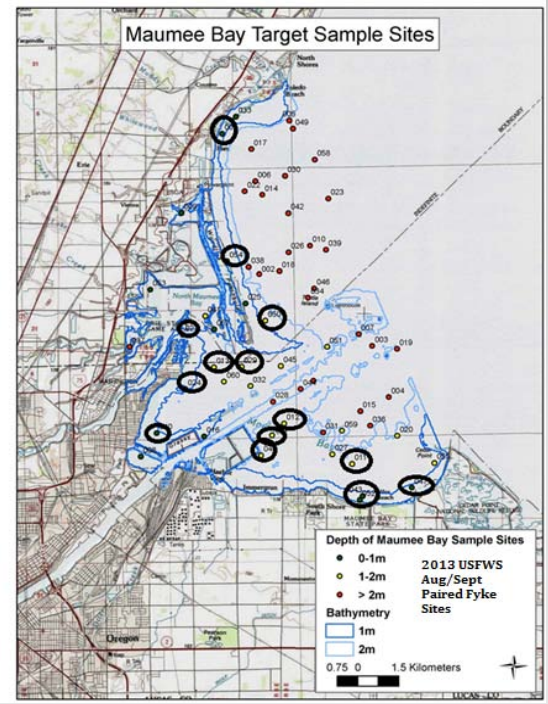
Juvenile and adult fish sampling: Effort will be distributed among four gear types: paired fyke net overnight sets (12 sites), daytime and nighttime electrofishing 600s transects (30 sites), and daytime bottom trawling five-minute tows (13 sites).

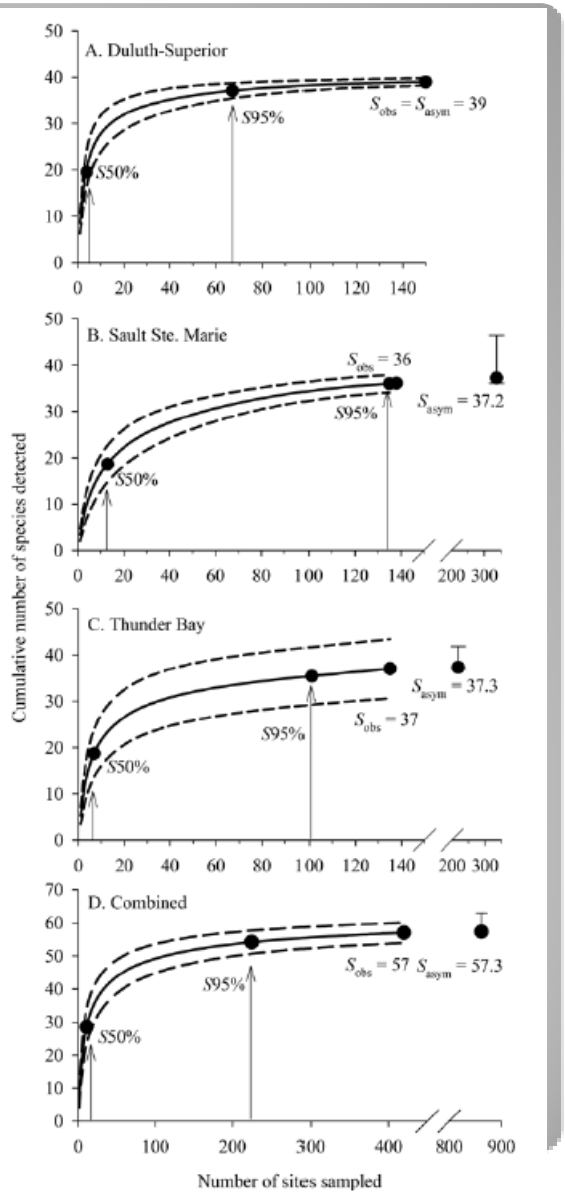
Benthic macroinvertebrate sampling: Effort will be distributed among two gear types: benthic sled two-minute tows (10) and Hester-Dendy colonization plates for 36 day set +/- 5 days (10).

Lake Ontario Sampling

- U.S. EPA framework
  - Hoffman et al. (2016)

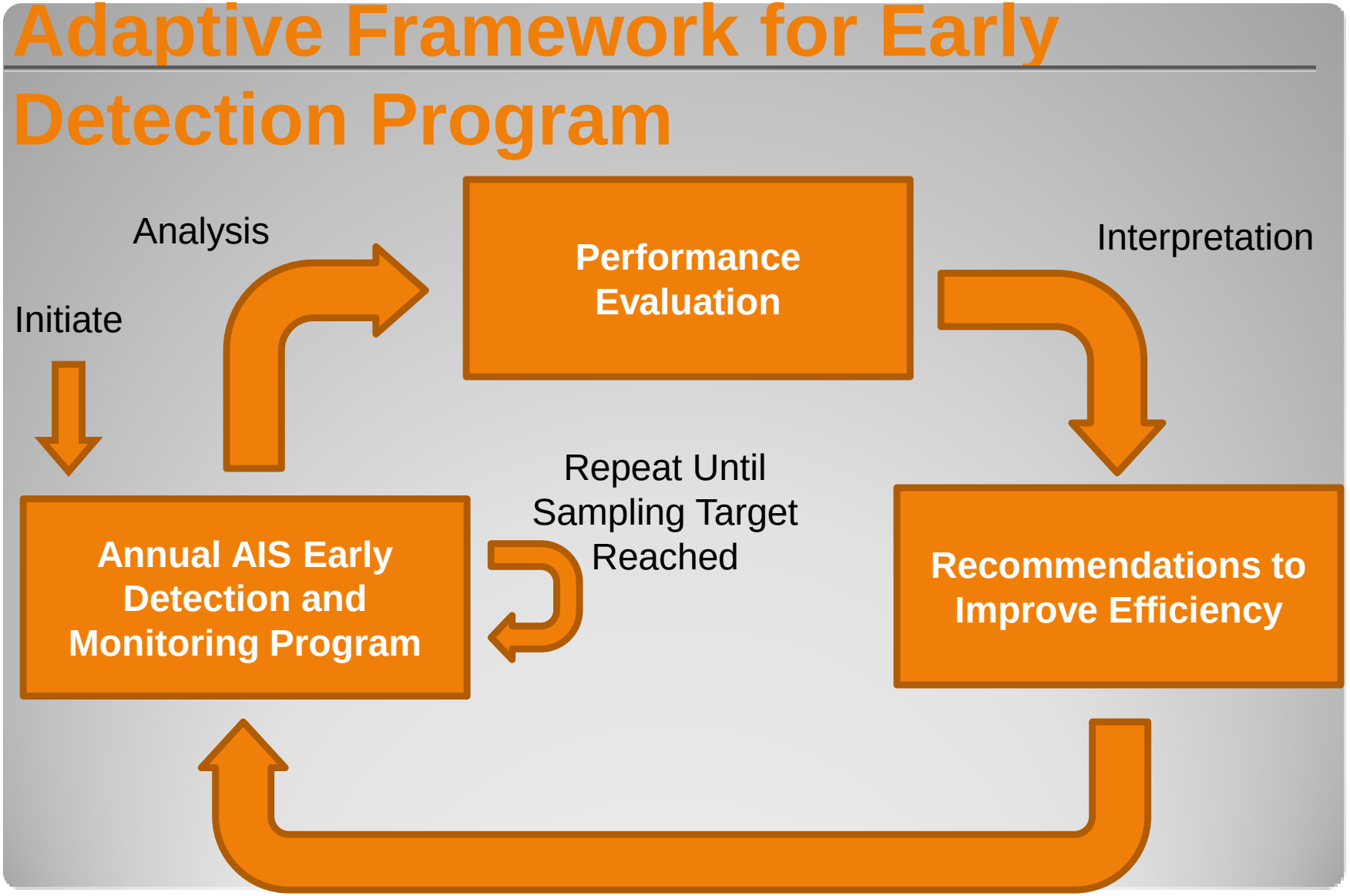






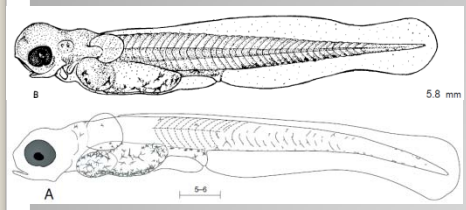
How to sample?

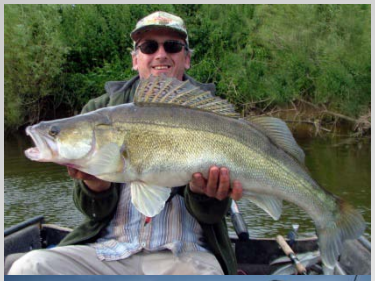
Adaptive Framework for Early Detection Program

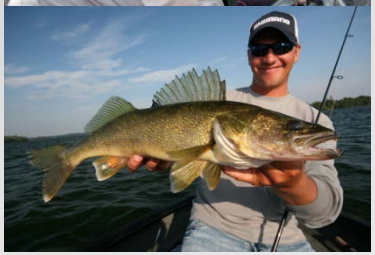


Hoffman et al., 2016

- Genetic techniques
  - Potential “doppelgangers”
  - Need to update/supplement taxonomic keys

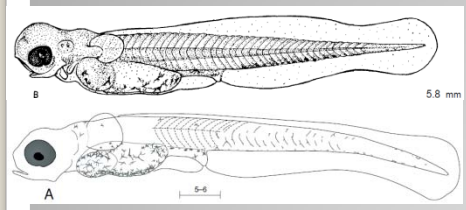


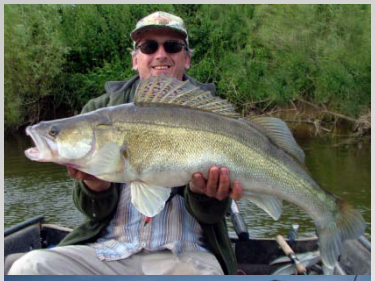


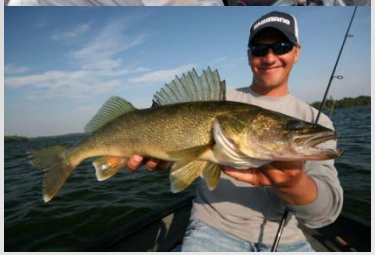


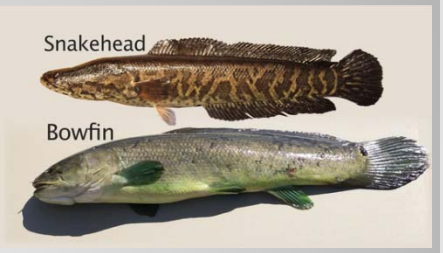
How to identify organisms?

- Genetic techniques
  - Potential “doppelgangers”
  - Need to update/supplement taxonomic keys
- Must search for non-natives to count as “AIS” sampling



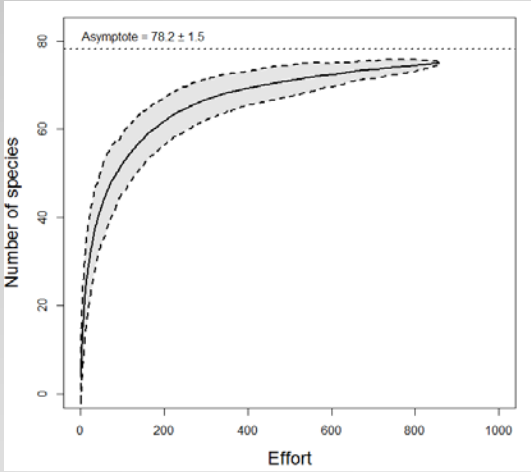


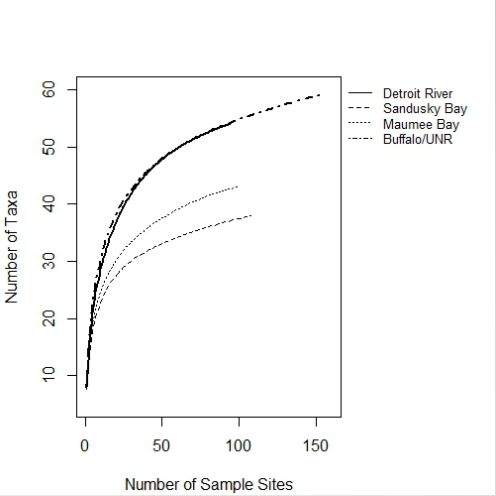




How to identify organisms?

- Goal: detect 95% of species present at each site
- Estimated efficacy at all sites ranged from 81-96%
  - Sampling from 2013-2015





How are we doing?

Lessons learned

- May take several years to achieve 95% detection at many sites based on current level of sampling effort
  - Can be achieved in one year at some sites
- Would like to incorporate collections made by partner agencies in analyses
  - Species identification critical for comparable information
- Citizen science opportunities
- GLRI funds critical for jump-starting program

Questions / Discussion