Great Lakes Governance and the Risk of Grass Carp

Dr. John Dettmers

Fishery Management Program Director

Great Lakes Fishery Commission

for

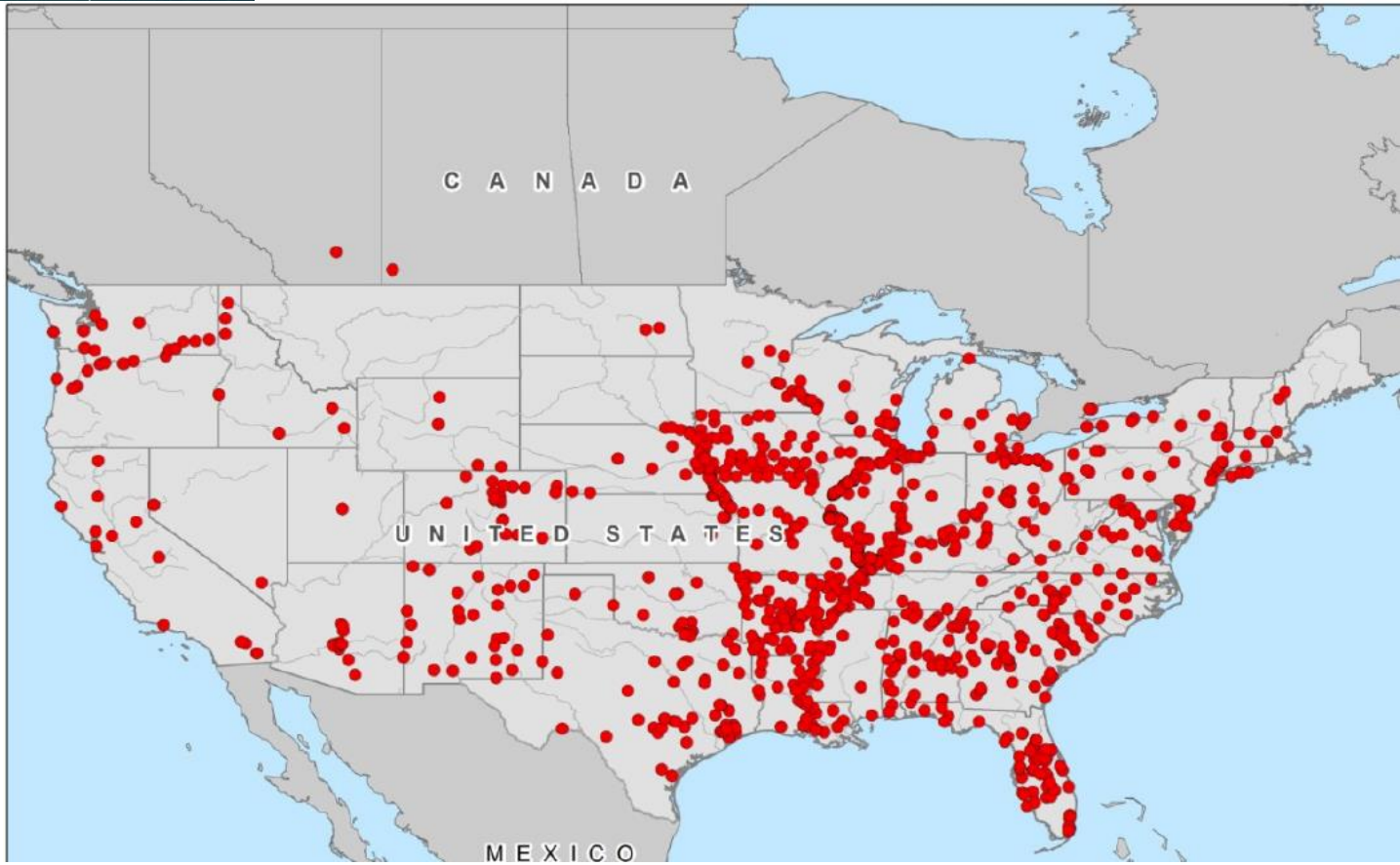
Northeast-Midwest Institute Congressional Briefing

February 6, 2018

Not what we will be talking about today

- Prevent arrival into the Great Lakes
- Widespread effects on fishes possible
- ACRCC, MRWG, GLRI roles pivotal
- Successful prevention necessary!

- Prevention for bighead carp, silver carp
- Grass carp imported to U.S. in 1963
  - Used to control aquatic vegetation still important
- Sterile (triploid) fish available through
- Immediate focus on Lake Erie USFWS inspection beginning in 1985
- Existing fishery management structures in place.
- Grass carp first reported from Lake Erie in 1985



Key Findings

- Sterile (triploid) Grass Carp are not expected to be a major problem.
- Substantial reductions in peak submerged aquatic vegetation (SAV) predicted (*if no additional management actions are taken*).
- Adults are herbivorous; direct competition with Great Lakes fishes unlikely;
- Consumption of SAV could affect the biotic community:

  FISH:

  - 66 of 136 GL fishes may experience high or moderate negative consequences (e.g., Largemouth Bass, Northern Pike, Bowfin, Walleye)

  BIRDS:

  - 37 of 47 Canadian GL bird species may experience high or moderate negative consequences (e.g., Sora, Least Bittern, Mallard, Black Tern).

U.S. Fish & Wildlife Service

Fisheries and Oceans Canada | Pêches et Océans Canada

Great Lakes Fishery Commission

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Overall Risk

- Lake Erie is at risk of developing an established Grass Carp population within 10 years.
- If establishment occurs and the Grass Carp population grows, ecological consequences will increase.
- Regulations and enforcement of regulations are two important factors that may affect the likelihood of arrival.
- Immediate actions to reduce the probability of establishment and delay or reduce subsequent ecological consequences in Lake Erie would be most effective.
- Socio-economic risk evaluation coming later in 2018?

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Protecting Our Fishery · Great Lakes Fishery Commission · Science · Sea Lamprey Control · Partnerships

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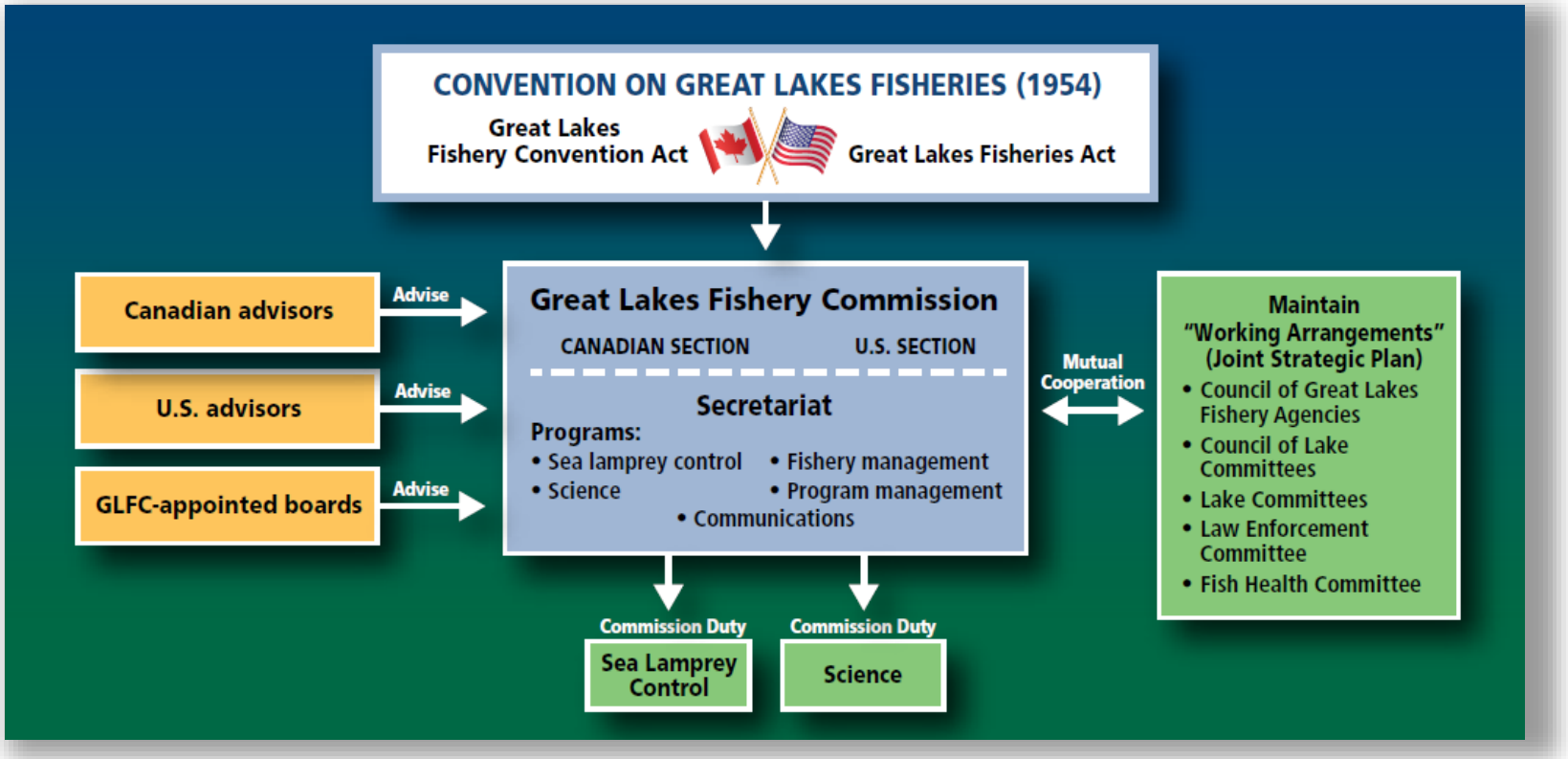

CONVENTION ON GREAT LAKES FISHERIES (1954)
Great Lakes Fishery Convention Act
Great Lakes Fisheries Act
Canadian advisors
U.S. advisors
GLFC-appointed boards
Advise
Advise
Advise
Great Lakes Fishery Commission
CANADIAN SECTION
U.S. SECTION
Secretariat
Programs:
• Sea lamprey control
• Fishery management
• Science
• Program management
• Communications
Mutual Cooperation
Maintain "Working Arrangements" (Joint Strategic Plan)
• Council of Great Lakes Fishery Agencies
• Council of Lake Committees
• Lake Committees
• Law Enforcement Committee
• Fish Health Committee
Commission Duty
Sea Lamprey Control
Commission Duty
Science


0 100 200 miles
0 100 200 kilometers
N
W
E
S
Ontario
Thunder Bay
Minnesota
Lake Superior
Canada
United States
Québec
CORA
(headquarters, MI)
Duluth
Odanah
Sault Ste. Marie (MI/ON)
1854 Treaty Authority
(headquarters)
GLIFWC
(headquarters)
Michigan
Ottawa
Wisconsin
Traverse City
Lake Huron
Toronto
Ontario
Lake Ontario
Michigan
Hamilton
Rochester
Buffalo
New York
Milwaukee
Lake Michigan
Port Huron
Sarnia
Detroit
Windsor
Lake Erie
Chicago
Illinois
Cleveland
Pennsylvania
Indiana
Ohio

Three Pillars of Great Lakes Fishery Management

A Joint Strategic Plan for Management of Great Lakes Fisheries

- Plan signed in 1981; revised in 1997
  - Voluntary, non-binding
- Many jurisdictions on the lakes
  - Provincial, state, tribal, federal, binational
  - Need to work together
- Complex issues
  - Need to understand the resource
  - Need to translate science into management
  - Need to balance competing interests
- Participants work together
  - Under the Joint Strategic Plan
  - Through “lake committee” meetings
- Great Lakes Fishery Commission facilitates
- Highly successful agreement!

Grass Carp Governance

- Role of the ACRCC
  - Important for prevention activities for bighead carp, silver carp, and black carp
  - Important for Grass Carp prevention activities
    - Arrival through the CAWS and other GLMRIS pathways
    - Through interstate trade
- Role of coordinated fishery management through the GLFC
  - Grass Carp (or other invasive fishes) response activities in the Great Lakes, after arrival has occurred
  - Strong state, provincial, federal partnerships
  - States and Province hold primary decision making authority
    - Excellent federal support: research, eDNA development, and technical assistance

Grass Carp Action With the Joint Strategic Plan

- Lake Erie Committee Activities:
  - A prudent, adaptive approach based on the latest information available to reduce the population of Grass Carp
  - Information gathering (MI, OH, ON, NY, PA, USGS, USFWS, DFO)
  - Structured decision making (all affected agencies invited)
  - Action (MI, OH, ON, PA, NY, USFWS, DFO, USGS)
  - Coordination support from the GLFC

- Council of Great Lakes Fishery Agencies Activities:
  - Invasive Fishes Executive Committee to focus on any new invasive fish
  - 5-year Grass Carp strategic framework under development
  - Communication plan under development

How Can Congress Help?

- Amend the Lacey Act to prohibit interstate transport of listed species
- Provide base budget funding to federal agencies
  - Department of State (GLFC) for coordination support of joint activities in response to Grass Carp in Lake Erie and its tributaries.
  - USGS for research to support identified grass carp priorities
  - USFWS for development of a grass carp eDNA marker and other technical assistance
  - Grants to states to enable sufficient effort to be applied to the problem

A Joint Strategic Plan for Management of Great Lakes Fisheries

Great Lakes Fishery Commission

Michigan Efforts and Response to Grass Carp

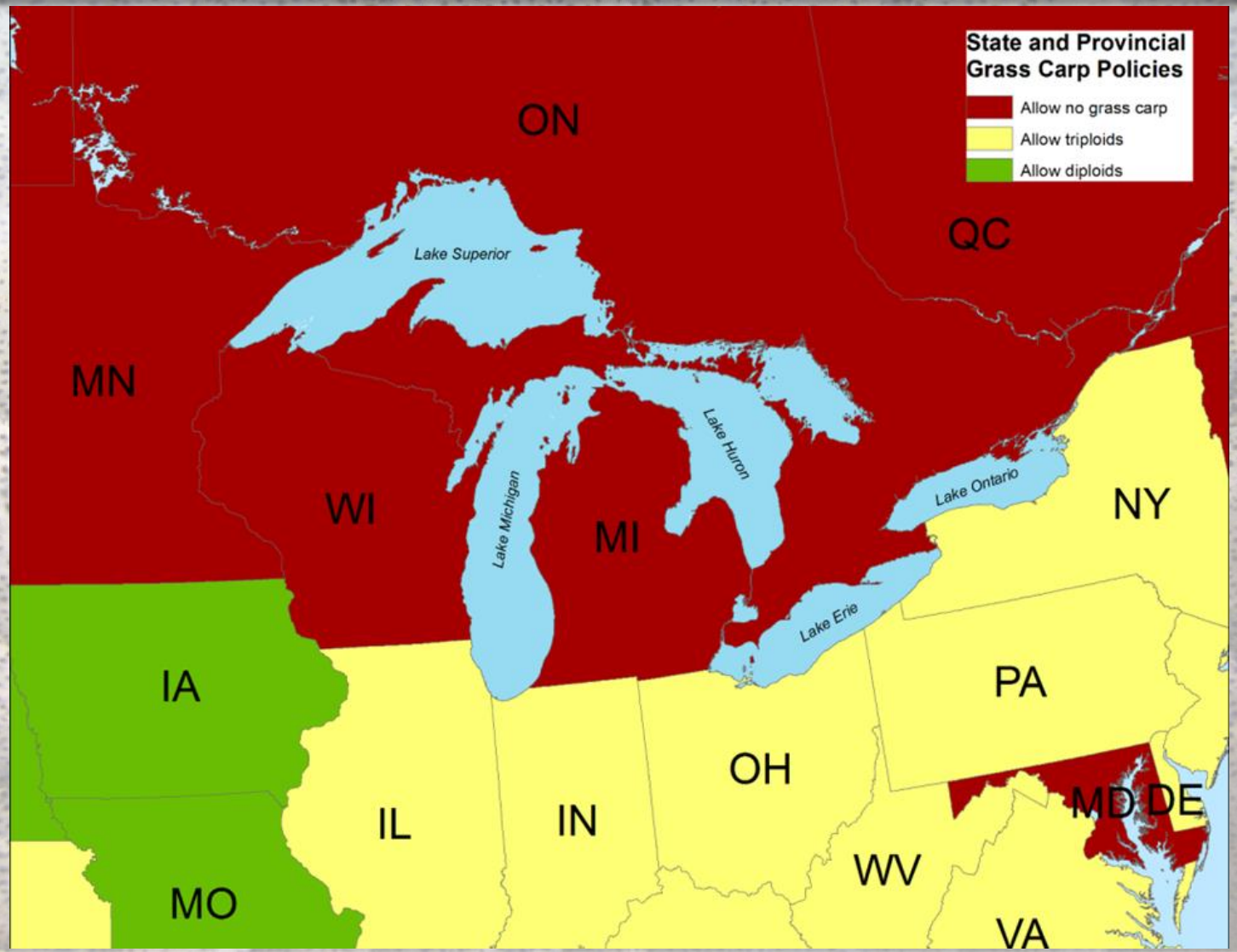
Dr. Seth Herbst

Aquatic Invasive Species Coordinator

Northeast-Midwest Institute Congressional Briefing

February 6, 2018

Michigan has prohibited grass carp since 1969.



MDNR responds aggressively to findings of grass carp.

- Massive eradication event in 1980s
- 2010 Asian Carps Management Plan
- Detection of illegal Grass Carp in live fish hauling truck in 2012 – strong penalties
- 2012 Marrs Lake inland Grass Carp response
- First detection of fertile Grass Carp in Lake Erie in 2012
  - Lake Erie Committee created working group

Grass carp risk evaluated and response determined.

Addressing Risk:

- Active enforcement
- Increased captures reported
- Determined mostly fertile fish
- Eggs found in Sandusky River
- No eggs or larvae in MI rivers

Implementing Initial Response:

- 2014 Lake Erie Response Exercise
- Partnership and bounty program with commercial fishers
- Increasing effectiveness using science and partnerships

2014 Lake Erie Invasive Carp Response Exercise

Collaborating partners:

USGS science for a changing world

U.S. Fish & Wildlife Service

Illinois Department of Natural Resources

Pennsylvania Fish & Boat Commission

Fisheries and Oceans Canada

Minnesota Department of Natural Resources

Ontario

CMU Central Michigan University

Department of Fisheries and Wildlife, Michigan State University

New York State Department of Environmental Conservation

Funding Source

Great Lakes Restoration

Response is complex in Lake Erie and grass carp are difficult to capture.

- Conducted over 3 days in Sept. 2014
- $125,000 for MDNR
- Used multiple removal gears
- 2 grass carp collected and two others observed
- Lake Erie is 10,000 square miles

Partnership with commercial fishers greatly increases removals.

Effort		
Year	Seine hauls	Trap net lifts
2012	104	87
2013	57	460
2014	64	669
2015	52	682
2016	61	662
2017	28	269
Totals	366	2,829

Grass Carp Captures (Catch rate)			
Year	Seine	Trap net	Totals
2012	5 (0.05)	0 (0.0)	5
2013	5 (0.09)	2 (<0.01)	7
2014	17 (0.27)	2 (<0.01)	19
2015	1 (0.02)	6 (0.01)	7
2016	23 (0.38)	0 (0.0)	23
2017	16 (0.12)	0 (0.0)	16
Totals**	67 (0.18)	10 (<0.01)	**77**

61 Grass Carp removed from Michigan waters

****3 additional fish from other sources (angler & MDNR)**

Using telemetry to inform response and risk

- **Identify river use and timing in Lake Erie**
- **Determine areas of aggregation**
- **Determine the extent of movements in Lake Erie and potential for spread into Lakes St. Clair and Huron**

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MICHIGAN STATE UNIVERSITY

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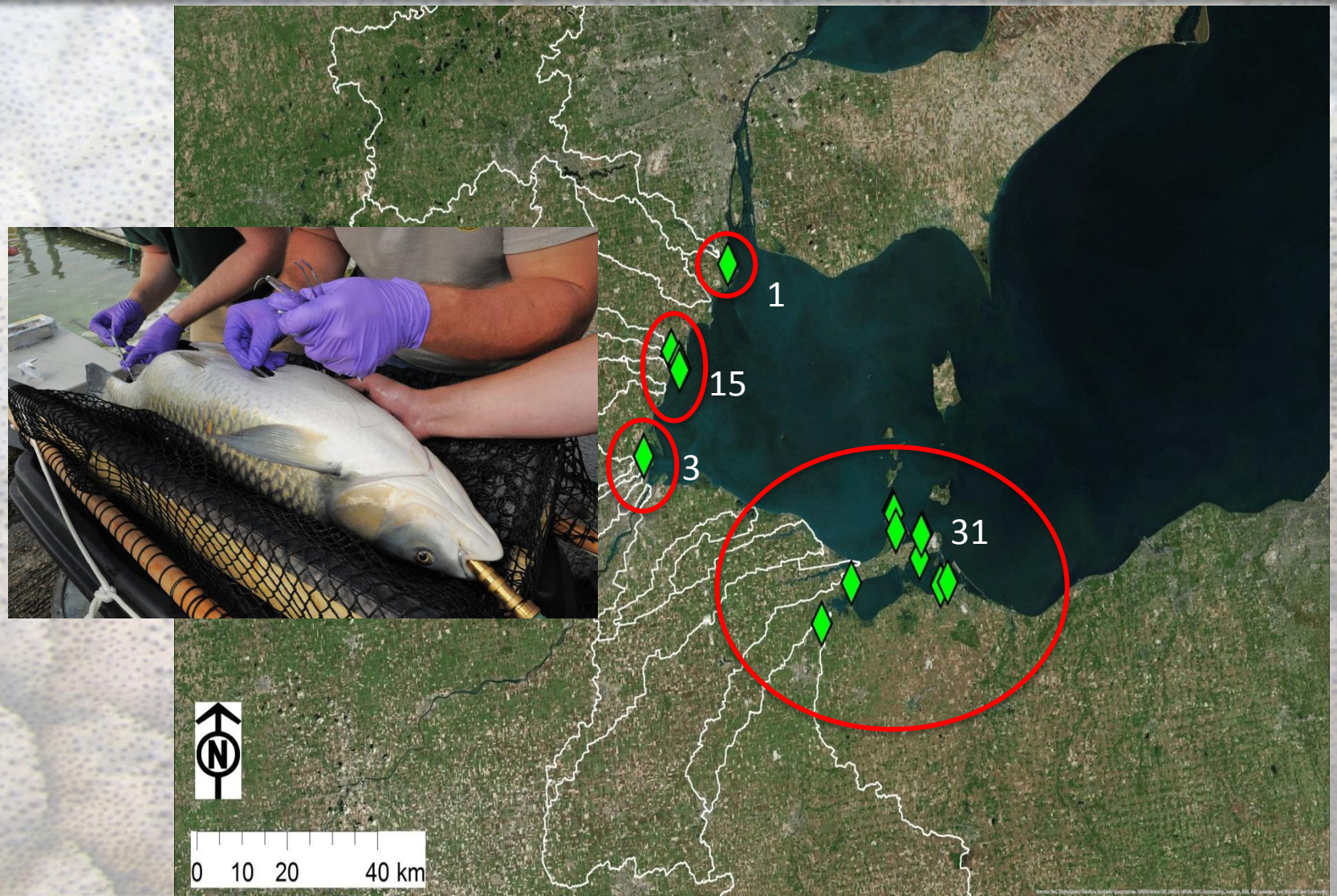
OHIO DEPARTMENT OF NATURAL RESOURCES DIVISION OF WILDLIFE

Network of Receivers to Detect Tagged Carp

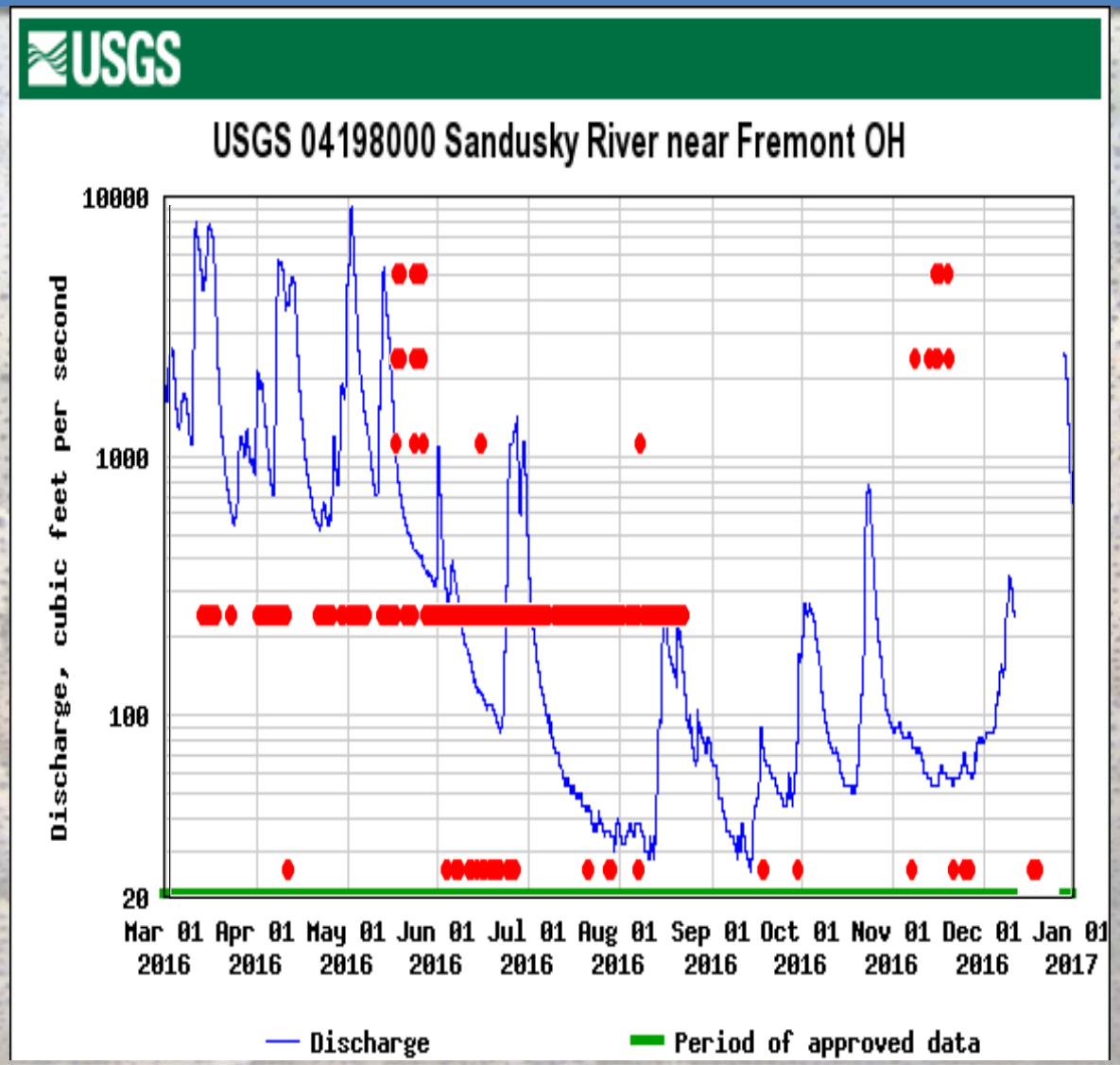
50 Grass Carp Captured, Tagged and Released



Telemetry results are guiding actions for response.

- Three high use tributaries
- Inter-basin and inter-lake movements are occurring
  - Large movements in excess of 62 miles
- Locations and timing of movements used to guide response actions
  - 2017 Sandusky River Response

Tagged fish detections are informing responses.



River Kilometer

22

21

16

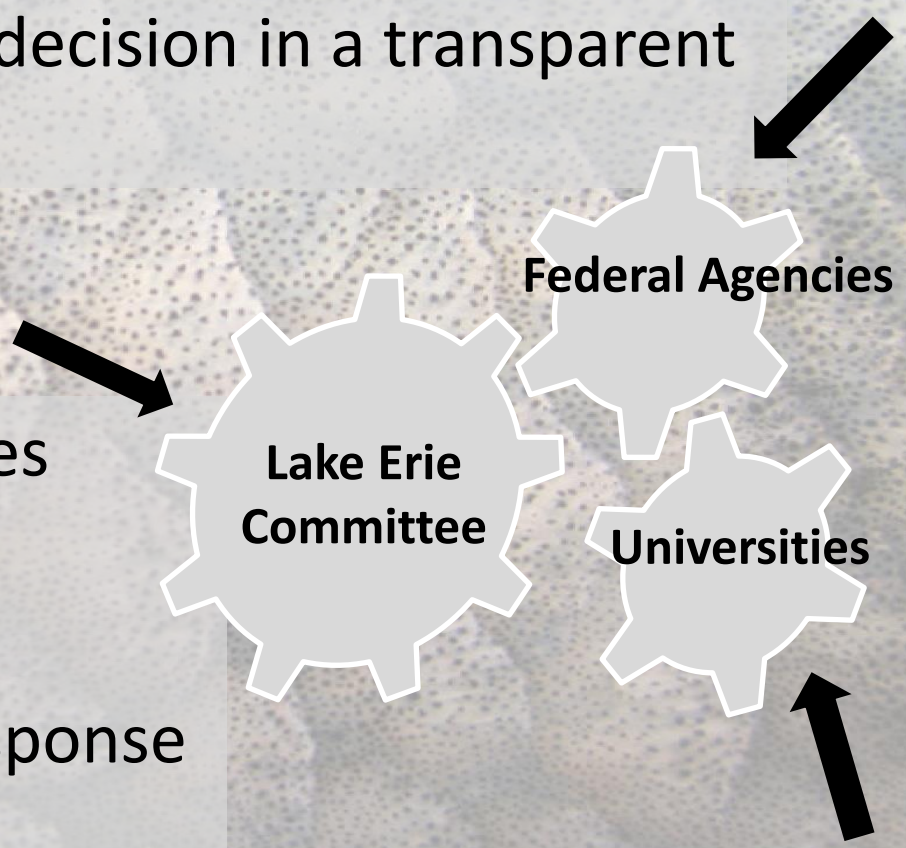
9

0.5

Structured Decision Making (SDM)

- Uses available information and stakeholders values
- Formal structure for making decision in a transparent and collaborative process

1. Establish goals and objectives using the best available information
2. Collaboratively carry out response actions



Cooperating Partners

CMU
CENTRAL MICHIGAN UNIVERSITY

USGS
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Protecting Our Fishery
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SCIENCE • SEA LAMPREY CONTROL • PARTNERSHIPS

ILLINOIS
DEPARTMENT OF NATURAL RESOURCES

PENNSYLVANIA
FISH & BOAT COMMISSION

OHIO
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE

Canada
Department of Fisheries & Oceans

DEPARTMENT OF NATURAL RESOURCES
DNR
MICHIGAN

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
NEW YORK STATE

THE UNIVERSITY OF TOLEDO
1872

Ontario
Ministry of Natural Resources and Forestry

UNIVERSITY OF TORONTO

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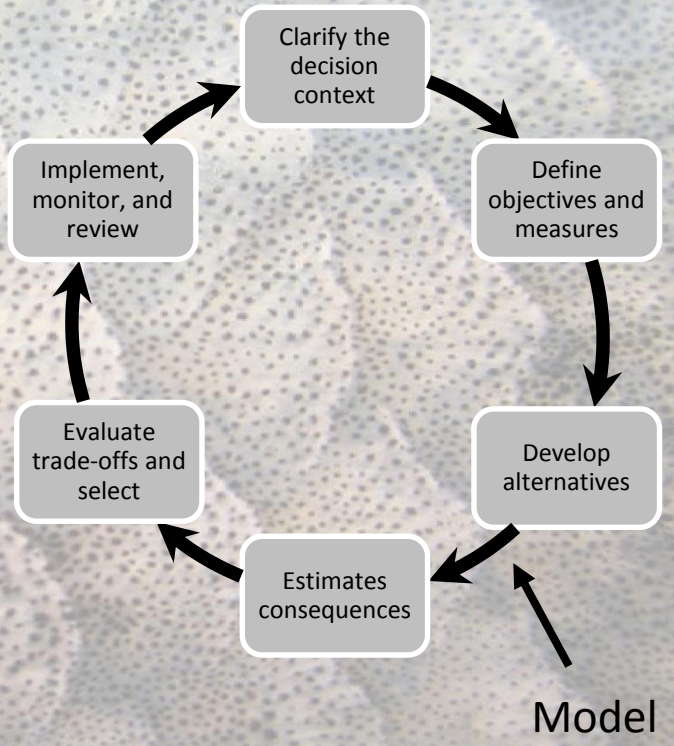
Iterative process to engage all parties through the process

Michigan State University hosted three workshops

1. December 2016 – set foundation
2. June 2017 – refine SDM components
3. September 2017 – consequences and tradeoffs
4. 2018 – taking action



SDM Recommendations

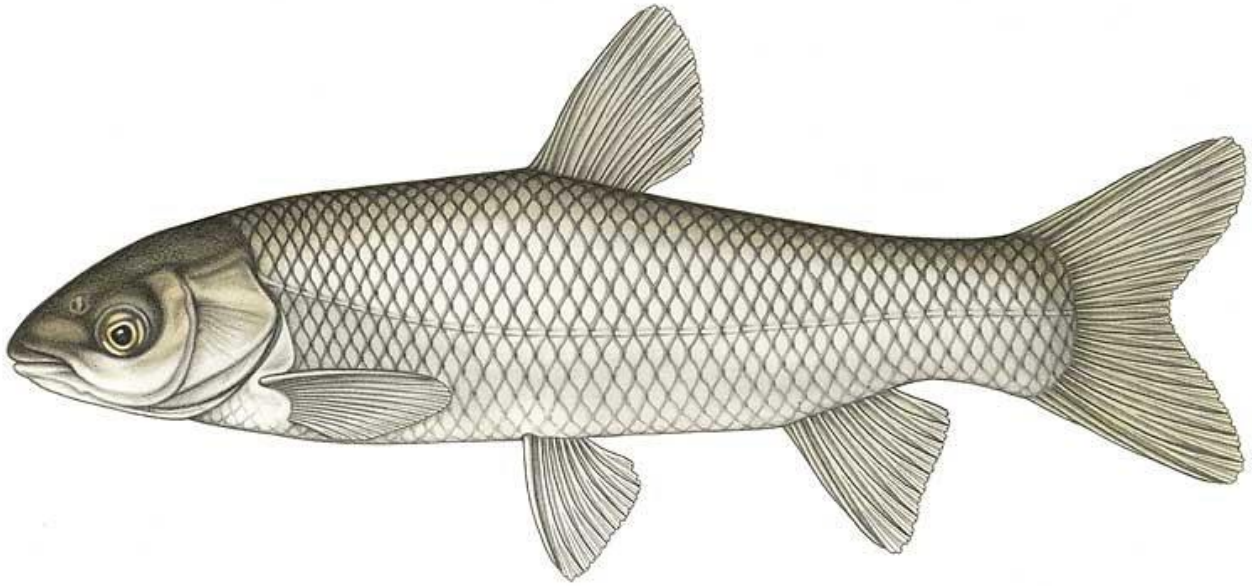
- **Response action takeaways**
  - Targeted removal in strategic locations likely effective
  - Barriers likely effective
- **More info needed to evaluate and increase response effectiveness**
  - Survival and reproduction estimates
  - Seasonal movements
  - Removal types, seasons, habitats

Lake Erie Grass Carp Adaptive Response Plan

- 5 year implementation
- Science based
  - primary focus is response
  - prevention and monitoring
- Incorporates SDM outcomes
- Maximizes likelihood of success through continued partnerships
- GLRI resources will be critical

Ohio Efforts & Response to Grass Carp

Northeast-Midwest Institute Congressional Briefing, February 6, 2018



Rich Carter, Executive Administrator

Fish Management & Research

Ohio Efforts & Response to Grass Carp

Background


Species Observations
Clustered Specimen Records
1
2 to 5
6 to 10
11 to 19
20 or more
Selected
Individual Specimens
Selected
Location of Fertile Grass Carp Captures – Great Lakes Area
Lake Michigan
Lake Huron
Lake Ontario
Lake Erie
WISCONSIN
MICHIGAN
IOWA
NEW YORK
PENNSYLVANIA
VERMONT
NEW HAMPSHIRE
MAINE
MASSACHUSETTS
CONNECTICUT
ADIRONDACK MOUNTAINS
Madison
Milwaukee
Chicago
Grand Rapids
Lansing
Sarnia
London
Windsor
Detroit
Cleveland
Toronto
Hamilton
Barrie
Owen Sound
Kingston
Rochester
Buffalo
Ottawa
Montreal
Brockville
Montpelier
Augusta
Concord
Albany
Boston
Providence
Hartford
Quebec
North Bay
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Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS, AAFC, NRCan
USGS
0 50 100mi

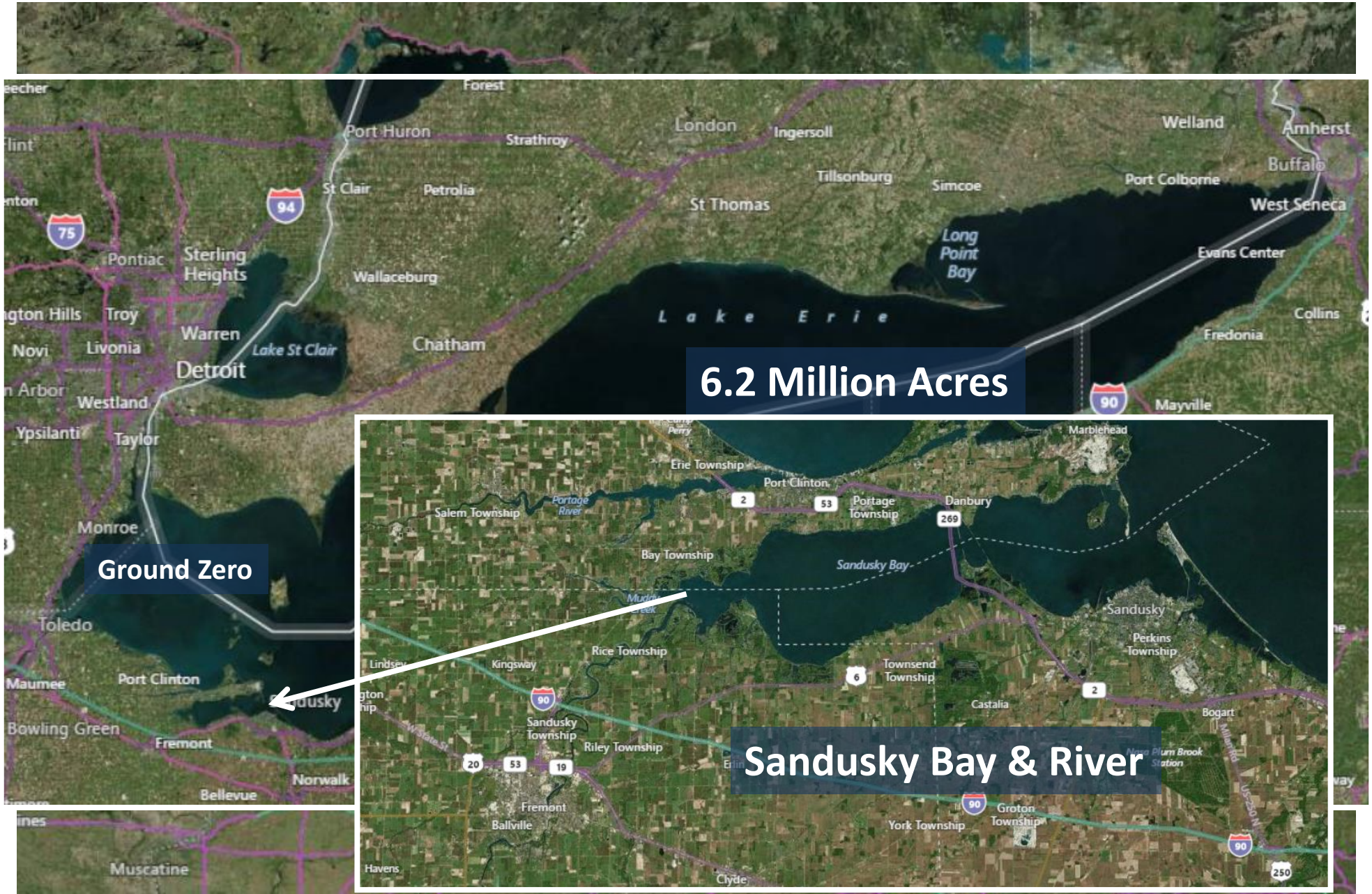
Lake Erie
Monroe
Toledo
Maumee
Port Clinton
Sandusky
Lorain
Cleveland
Euclid
Mentor
Saybrook-on-the-lake
Ashtabula
Edinboro
Corry
Warren
Kane
West Vernon
Mayfield Heights
Elyria
Parma
Bowling Green
Fremont
Norwalk
Bellevue
Strongsville
Twinsburg
Greenville
Franklin
Tionesta
Warren
Hermitage
Clarion
Brockway
62
6
80

Muscatine
Joliet
Fort Wayne
Cleveland

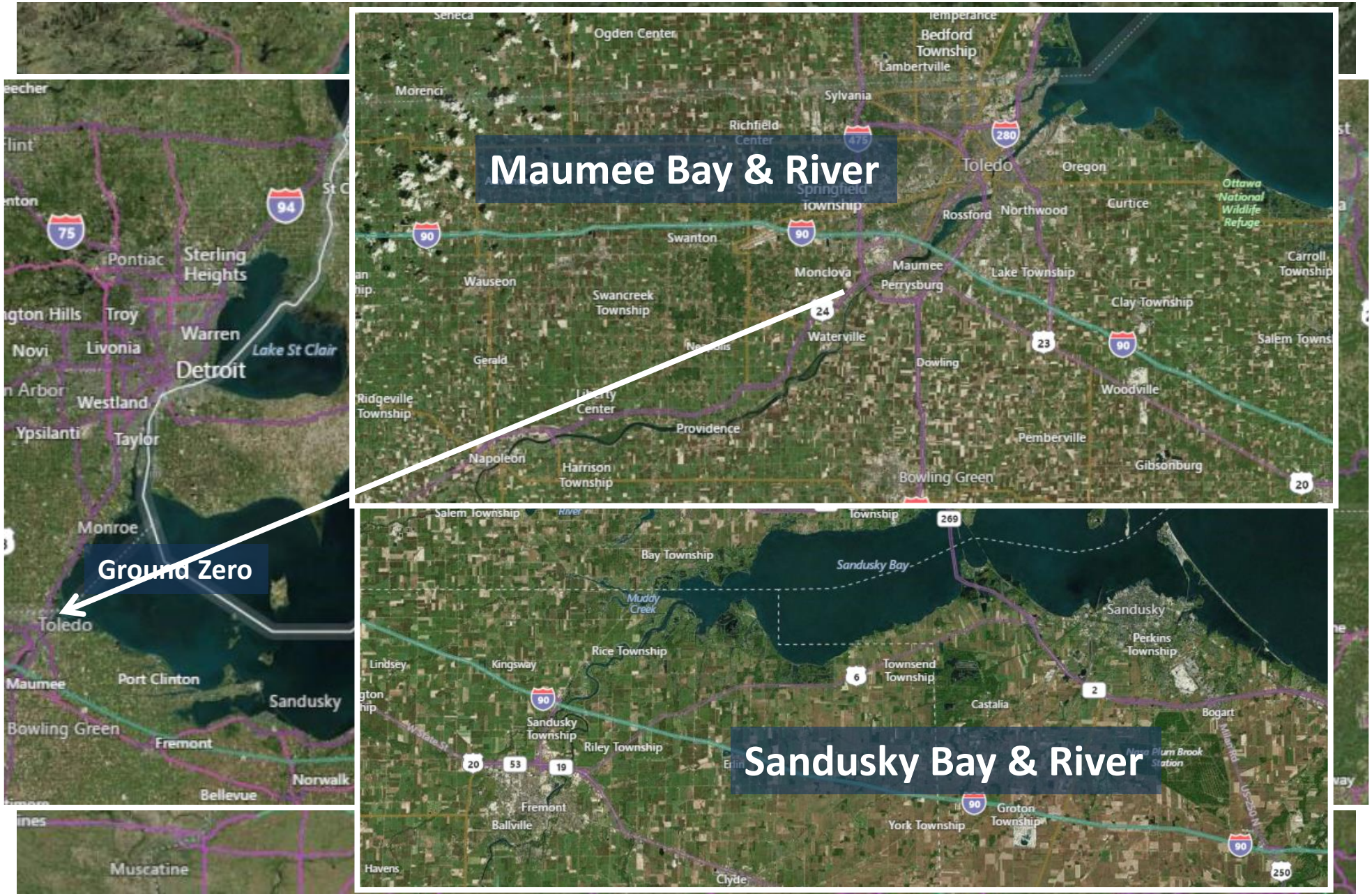
Background


6.2 Million Acres
Ground Zero
Lake Erie
Lake Erie
Port Huron
Strathroy
London
Ingersoll
Welland
Amherst
Buffalo
Tillsonburg
Simcoe
Port Colborne
West Seneca
St Clair
Petrolia
St Thomas
Long Point Bay
Evans Center
Pontiac
Sterling Heights
Wallaceburg
Collins
Fredonia
Troy
Warren
Novi
Livonia
Lake St Clair
Chatham
Detroit
Westland
Mayville
Ypsilanti
Taylor
Erie
Jamestown
Monroe
Saybrook-on-the-lake
Ashtabula
Edinboro
Corry
Warren
Toledo
Mentor
Kane
Euclid
West Vernon
Port Clinton
Cleveland
Lorain
Sandusky
Mayfield Heights
Tionesta
Bowling Green
Elyria
Parma
Greenville
Franklin
Fremont
Norwalk
Strongsville
Twinsburg
Warren
Hermitage
Clarion
Brockway
Bellevue
Muscatine
Joliet
Fort Wayne
Cleveland

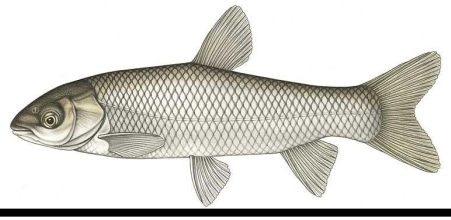
Background


6.2 Million Acres
Ground Zero
Sandusky Bay & River
Lake Erie
Long Point Bay
Lake St Clair
Port Huron
Strathroy
London
Ingersoll
Tillsonburg
Simcoe
St Thomas
Petrolia
St Clair
Wallaceburg
Chatham
Pontiac
Sterling Heights
Troy
Warren
Livonia
Detroit
Novi
Westland
Ypsilanti
Taylor
Monroe
Toledo
Maumee
Port Clinton
Bowling Green
Fremont
Norwalk
Bellevue
Muscatine
Welland
Amherst
Buffalo
Port Colborne
West Seneca
Evans Center
Collins
Fredonia
Mayville
Erie Township
Port Clinton
Portage River
Salem Township
Portage Township
Danbury
Bay Township
Sandusky Bay
Marblehead
Sandusky
Perkins Township
Rice Township
Kingsway
Townsend Township
Castalia
Bogart
Sandusky Township
Riley Township
Fremont
Ballville
York Township
Groton Township
Havens
Clyde

Background


Maumee Bay & River
Ground Zero
Sandusky Bay & River
Ogden Center
Bedford Township
Lambertville
Morenci
Sylvania
Richfield Center
Toledo
Oregon
Ottawa National Wildlife Refuge
Rossford
Northwood
Curtice
Swanton
Wauseon
Monclova
Maumee
Perrysburg
Lake Township
Carroll Township
Swancreek Township
Clay Township
Waterville
Gerald
Dowling
Woodville
Ridgeville Township
Providence
Pemberville
Napoleon
Harrison Township
Bowling Green
Gibsonburg
Pontiac
Sterling Heights
Troy
Warren
Novi
Livonia
Lake St Clair
Detroit
Westland
Ypsilanti
Taylor
Monroe
Port Clinton
Sandusky
Fremont
Norwalk
Bellevue
Muscatine
Salem Township
Bay Township
Sandusky Bay
Muddy Creek
Sandusky
Perkins Township
Rice Township
Kingsway
Lindsey
Townsend Township
Castalia
Bogart
Sandusky Township
Riley Township
Fremont
Ballville
York Township
Groton Township
Havens
Clyde

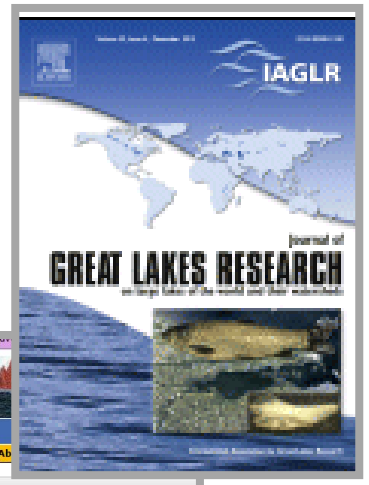
History…

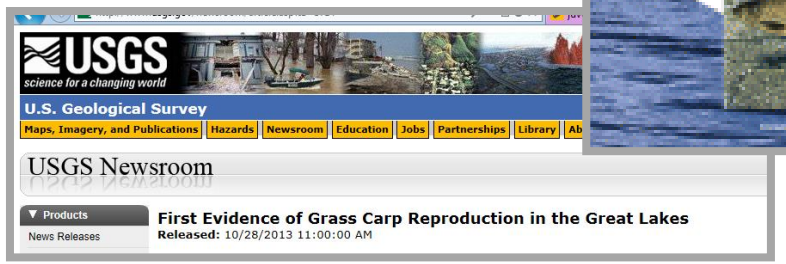


July 2012 **Increased Awareness**

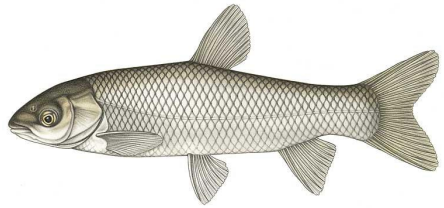
Late 2012

October 2013





Ohio's Plan for Action



Prevent Establishment

Statewide Ploidy Testing:

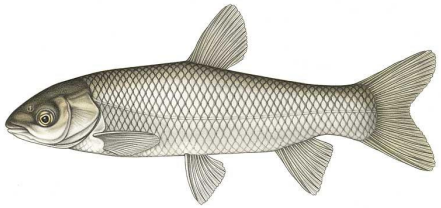
- ODNR Caught Wild Fish
- Domestic Sterile Fish

Bait Fish Inspections

Enforce Fertile Prohibition

Close Knowledge Gaps

Ohio's Plan for Action



Closing Knowledge Gaps:

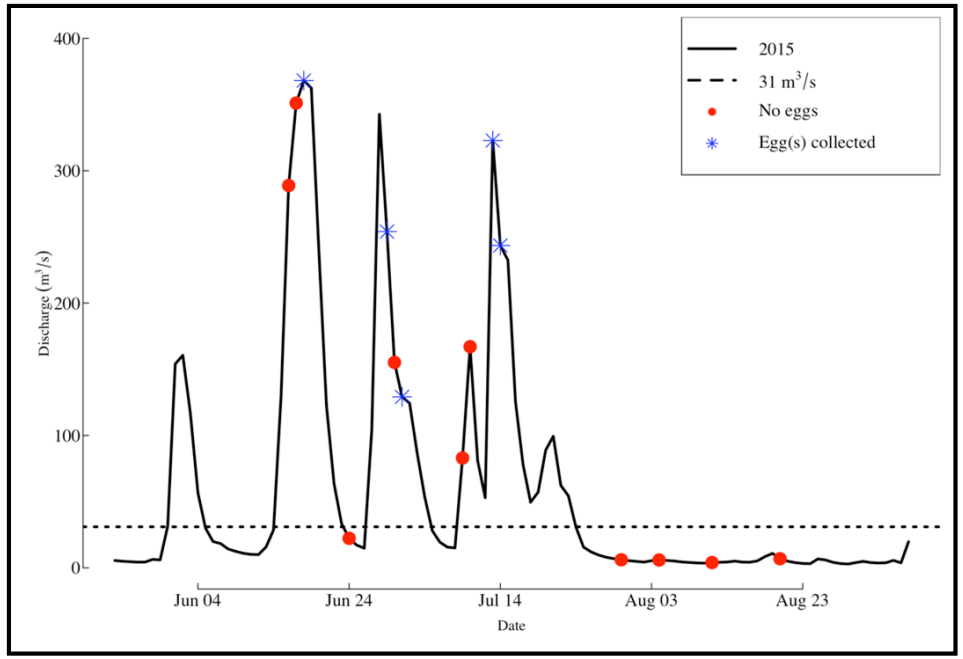
- Key to understanding opportunities to prevent establishment
- Adaptive approach
- Informed by ongoing science

Ohio Efforts & Response to Grass Carp

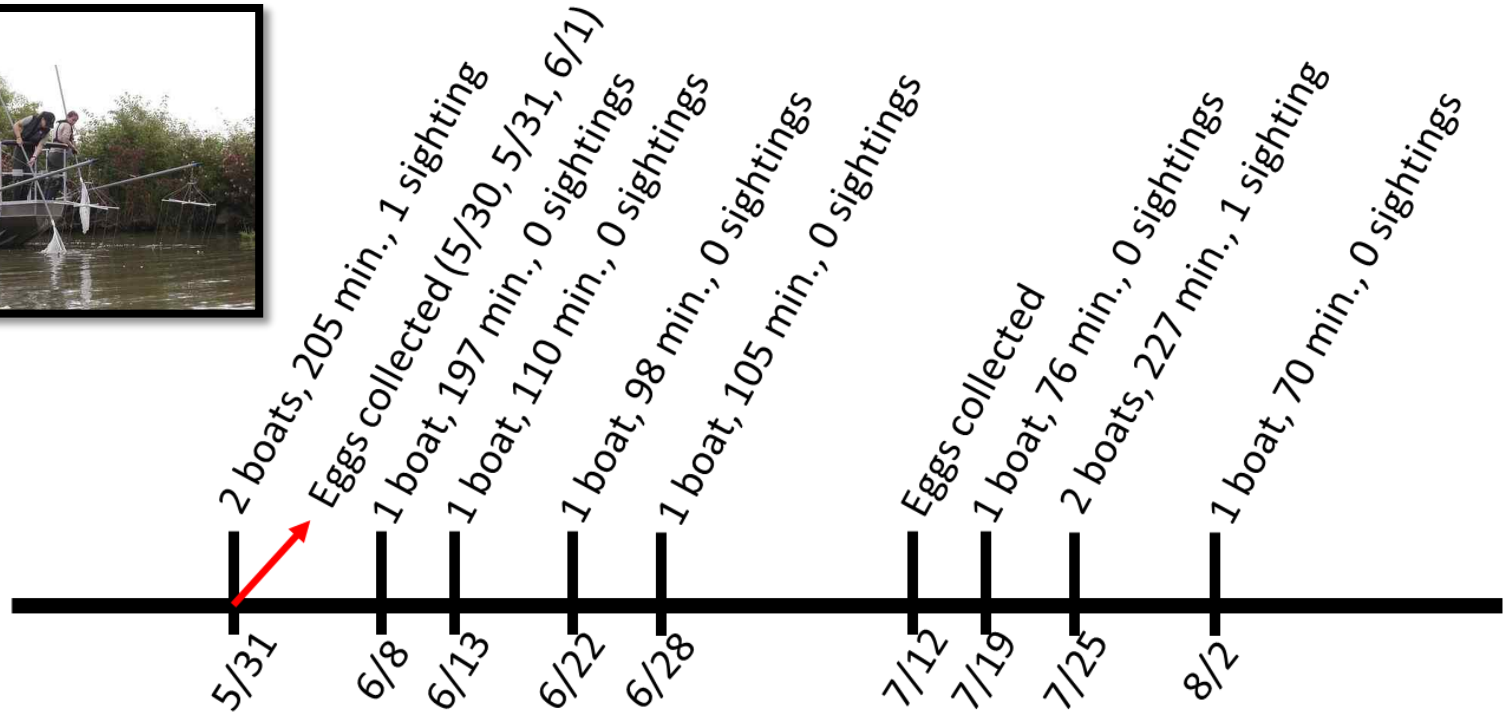
Ohio's 2017 Efforts

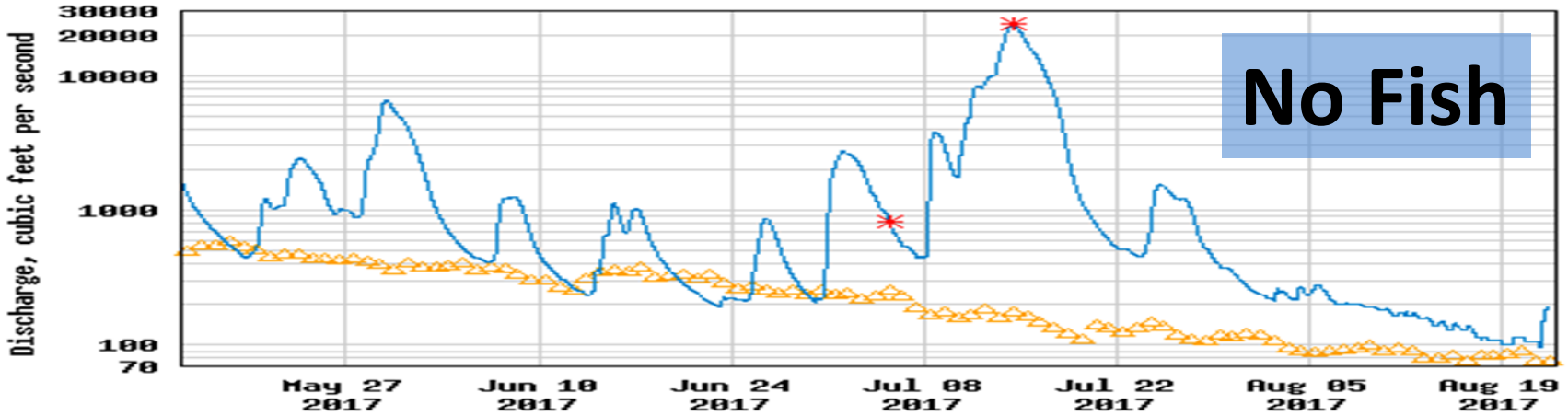
Informed by Ongoing Science…

- Reproduction in Sandusky River
  - 2012 (12 juveniles)
  - Fertilized eggs in 2015 (n=8) and 2017 (n=7,800)
  - Associated with high river discharge



Targeted Response - Summer 2017





Planned Action, August 28-31

- Lower Sandusky River
- Compare methods
  - Block GN/E-fishing
  - Enclosure GN/E-fishing
  - Enclosure TN/E-fishing
  - Mini Fyke nets for juveniles
- Plan informed through telemetry

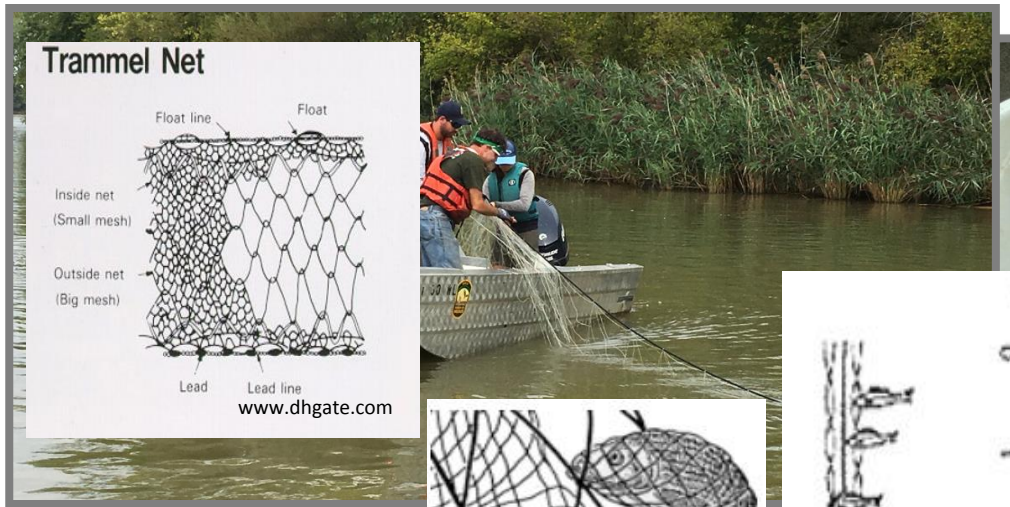
Effort

- Block GN: 13.8 hrs. soak; 9.0 pedal
- Enclosure GN: 5.8 soak; 9.4 pedal
- Enclosure Trammel: 13.9 soak; 7.2 pedal
- Mini Fyke Nets: 96 hrs. overnight

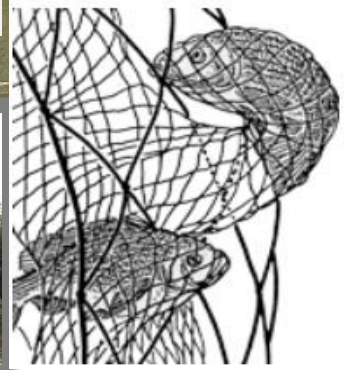
- 45 Individuals
- ~ $ 40 - 50 K

Catch

- Block GN: 1 Grass Carp
- Enclosure GN: 0 Grass Carp
- Enclosure Trammel: 7 Grass Carp ★
- Mini Fyke Nets: 0 Grass Carp



www.dhgate.com



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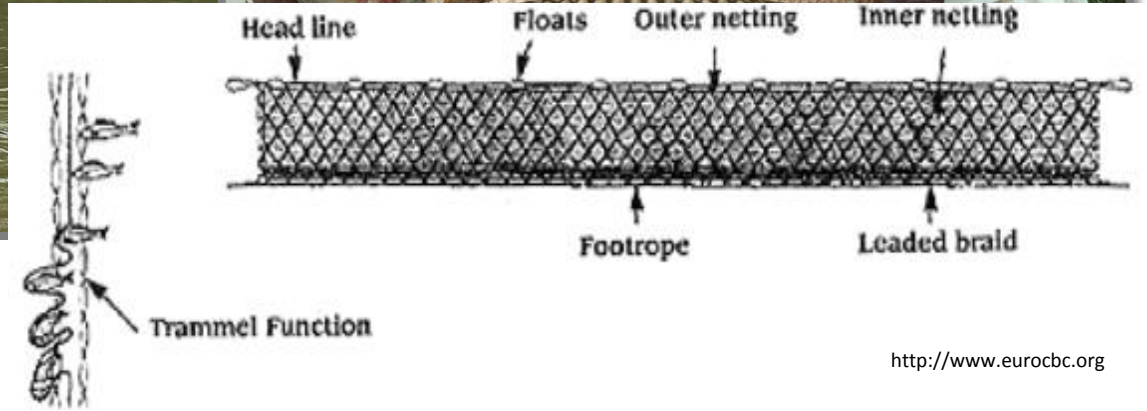
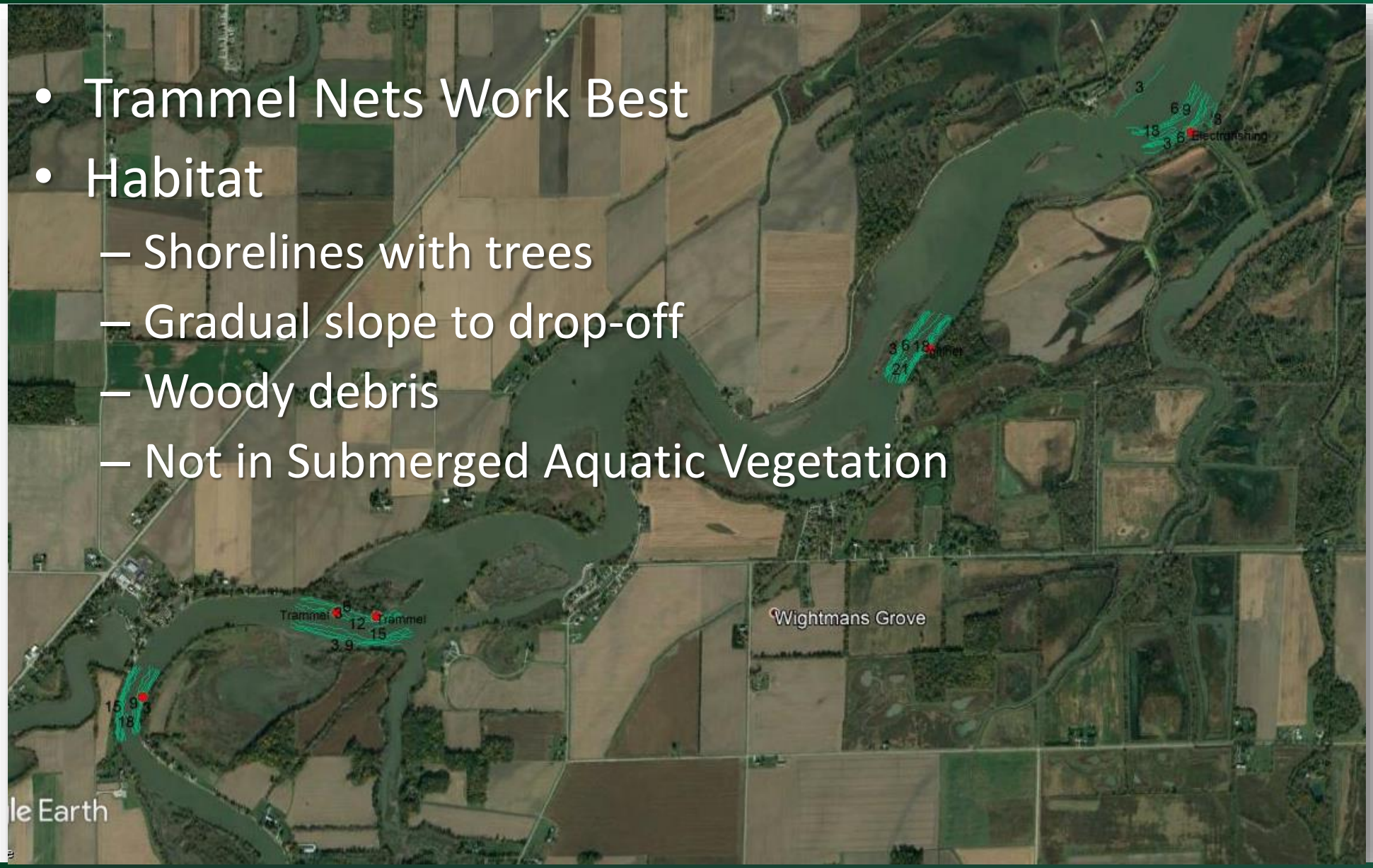


http://www.eurocbc.org

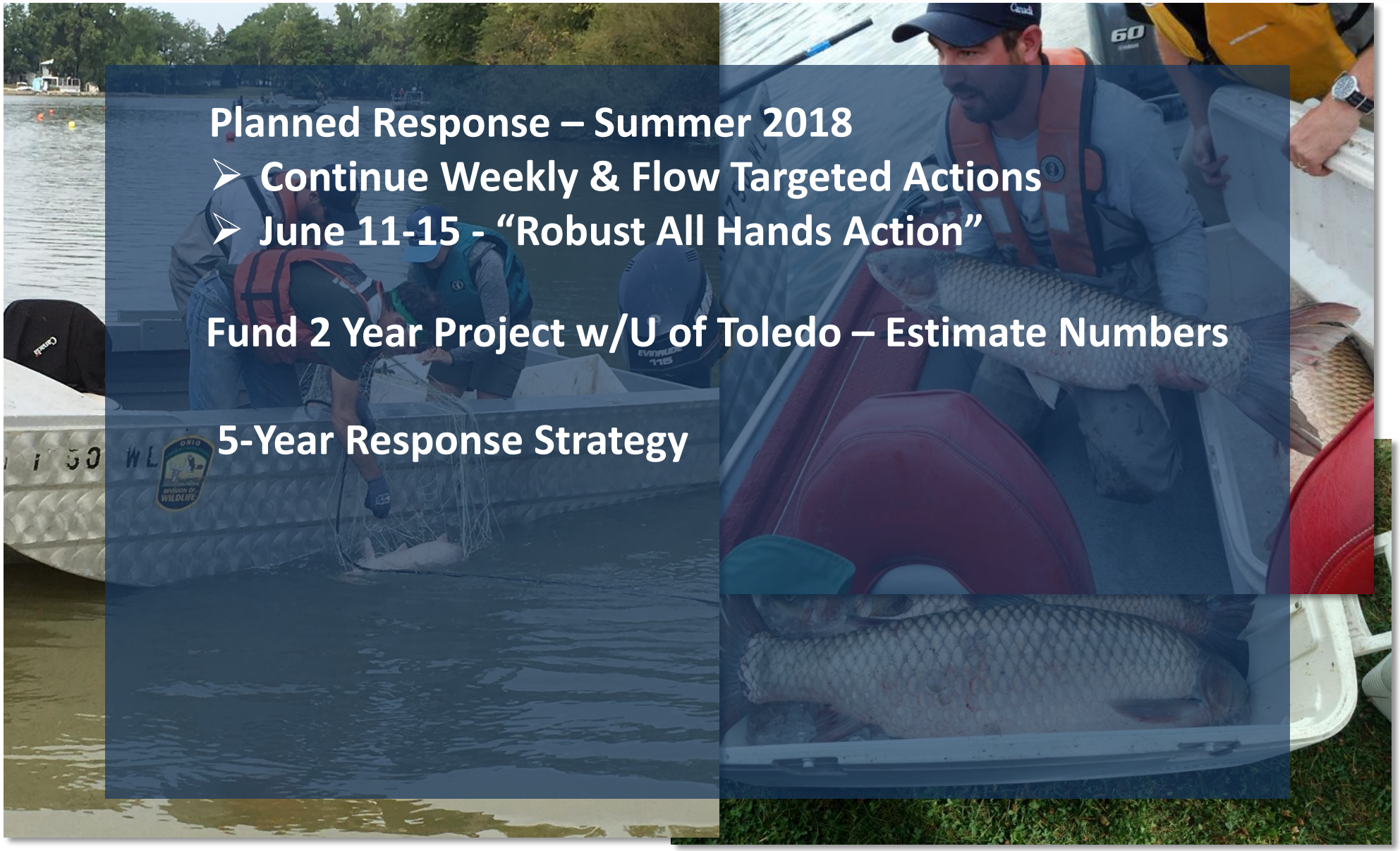
What did we learn?

- Trammel Nets Work Best
- Habitat
  - Shorelines with trees
  - Gradual slope to drop-off
  - Woody debris
  - Not in Submerged Aquatic Vegetation



Ohio Efforts & Response to Grass Carp

Ohio's Future Plans…



Planned Response – Summer 2018

- Continue Weekly & Flow Targeted Actions
- June 11-15 - "Robust All Hands Action"

Fund 2 Year Project w/U of Toledo – Estimate Numbers

5-Year Response Strategy

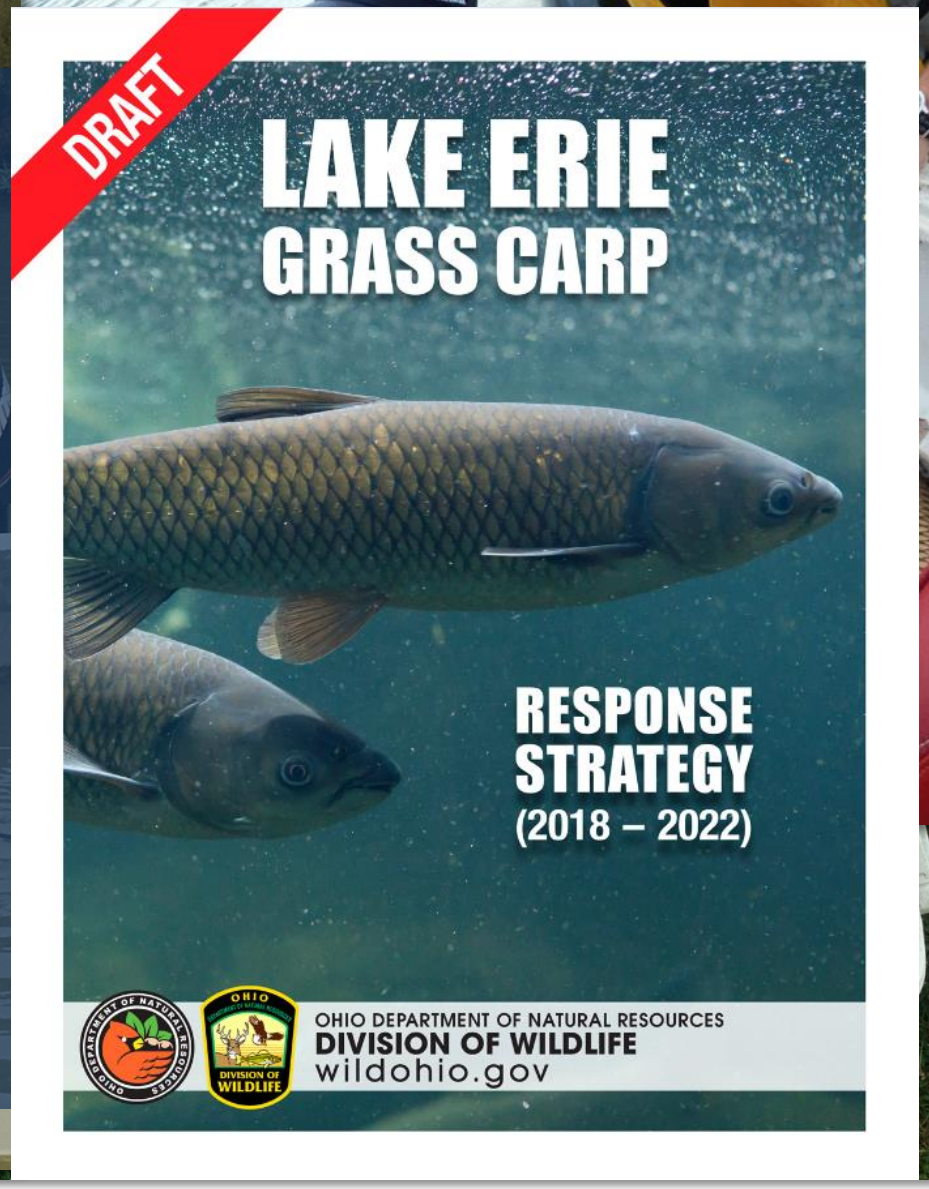
Ohio's Future Plans…

5-Year Response Strategy

- Collaborate & Integrate w/Partners Critical
- Utilizing Recommendations from SDM Process
- Use Science-Based Approach
- Inform & Develop Most Effective Removal Strategies

Funding is Necessary

Implement Strategy



Ohio Efforts & Response to Grass Carp

Research to inform Grass Carp Response in the Great Lakes

Congressional Briefing on Grass Carp

February 6 2018

U.S. Department of the Interior
U.S. Geological Survey

USGS Strategic Plan

- Determine where and when Grass Carp spawn
  - Use models to identify spawning locations
  - Identify cues that trigger spawning
  - Sample rivers for eggs and small fish
  - Understand spawning population size and behavior
- Map and monitor aquatic plants
  - Identify Grass Carp habitats to inform responses
  - Inventory aquatic plants and develop monitoring program
  - Determine the level of impacts from Grass Carp
- Develop targeted controls
  - Attractants and toxins
  - Identify aggregations to target for removal
- Inform agency efforts to eradicate Grass Carp

USGS

Reproduction in Lake Erie Tributaries

- Eggs collected in Sandusky River
  - 2015: 8 eggs (6/18-7/14)
  - 2017: 7,649 eggs (5/30-7/12)
  - Juvenile fish recruited from 2011, 2013, 2015

First egg in Sandusky River

- First eggs from Maumee River (2017)
  - 5 eggs, late developmental stage

Grass Carp embryo from the Maumee River, July 2017

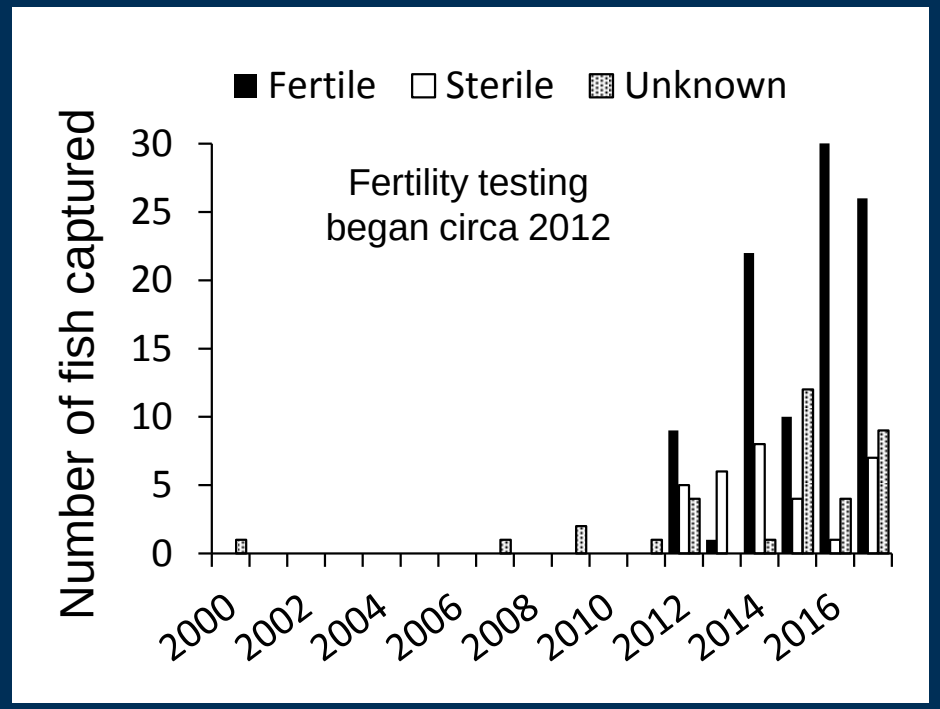
- Chemical analysis of ear bones from adult Grass Carp implies that spawning is occurring in more than the Sandusky River

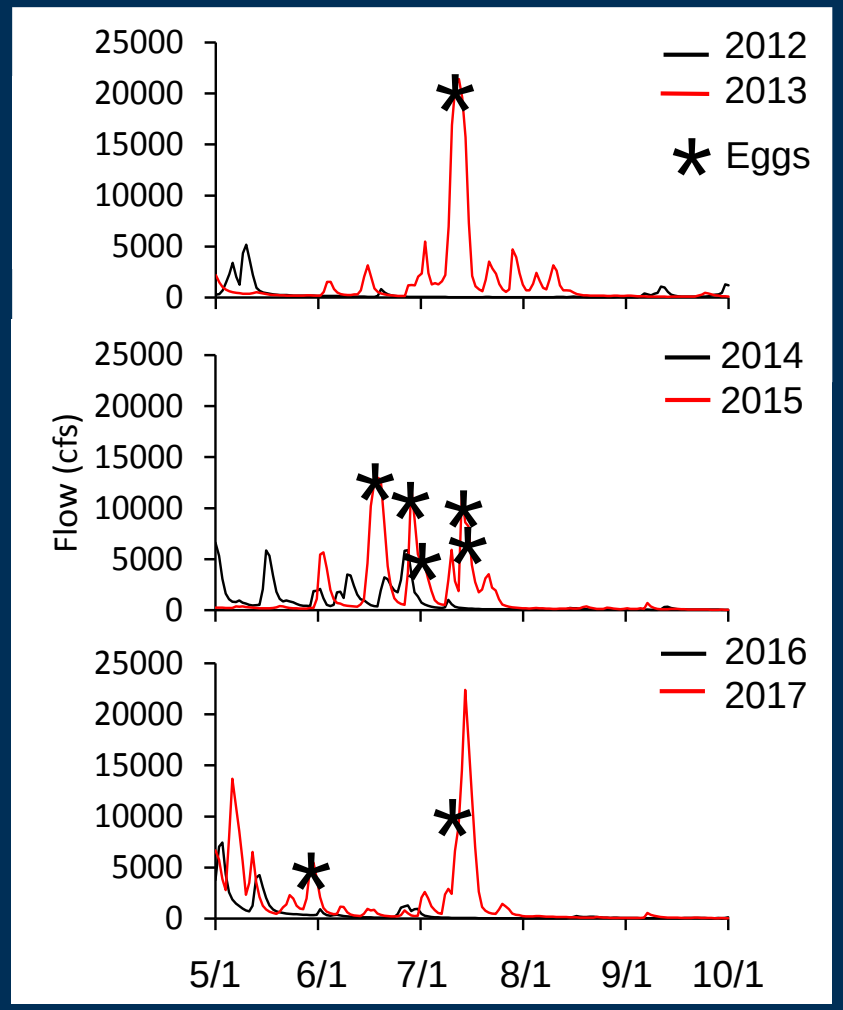
Ear bone for chemical analysis

USGS

Reproduction in Lake Erie Tributaries

- Most grass carp collected have been <u>fertile</u>
- Spawning has coincided with high flow
  - High flow events have been increasing since circa 1977

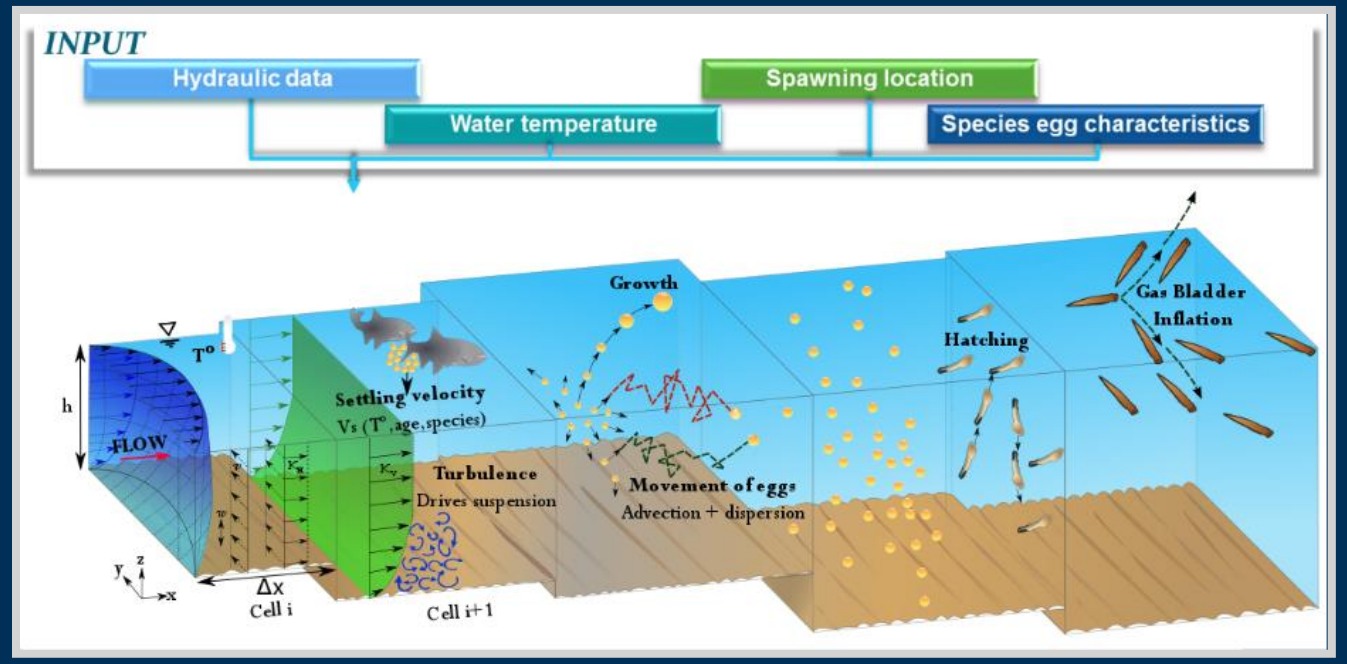




USGS

Modeling egg transport

- Supports agencies needs to identify potential hatching and spawning locations
  - Informs risk and potential response locations
- Sandusky River (Fremont OH) ~21 km from Sandusky Bay
  - New USGS gage in lower Sandusky R. informs model refinement
- Maumee: Cannot predict – no suitable hydraulic model



USGS

Population Estimates

- **Genetic information from eggs and adult tissues will:**
  - **provide estimates of the effective spawning population size**
  - **determine whether the Maumee River and Sandusky River are distinct spawning populations?**
    - **Separate populations = greater threat**

Female Grass Carp taken from Lake Erie to date (collected 2014, near Cedar Point) (~59.2 lbs, ~ 10 lbs eggs [>1 million eggs])

Grass Carp Eggs (arrows) from Sandusky River, May 2017

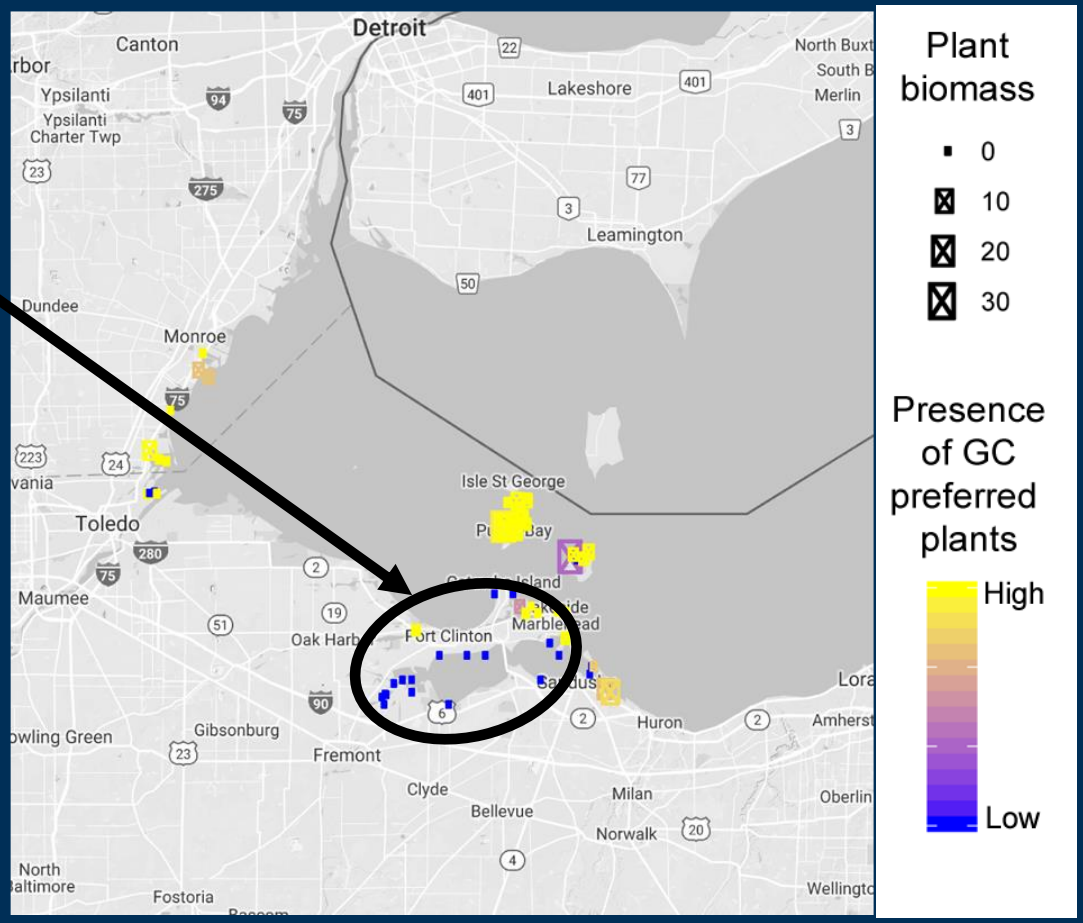
USGS

Vegetation mapping and monitoring

- Satellite imagery, hydroacoustics, and on-the-water sampling to map and assess vegetation

- <u>Most Grass Carp were captured</u> from locations where their preferred plants were in low abundance.

- Grass Carp could impact plants that provide fish and duck habitat



USGS

Grass Carp toxin

- Formulated bait for selective delivery
  - Can be used with new or current lethal control agents
  - Developing methods to apply bait
- Identified candidate lethal control chemical selective for GC
  - Assessing registration requirements

USGS

Next Steps –

- Focus on spawning
  - Identify rivers that need hydraulic models – very few available
  - Use FluEgg model to identify rivers where eggs may hatch
  - Expand monitoring efforts to other rivers to detect spawning
  - Removal of Ballville Dam (Sandusky River) may change spawning success – need to expand hydraulic model above Ballville Dam
  - Use National Water Model (near, medium and long-term forecasts) to predict high flow events and spawning
  - Complete genetic analyses to estimate relative spawning population and number of spawning populations
- Monitor aquatic vegetation to assess impacts to fish and duck habitat and water quality
- Test control tools in research ponds then field settings
- Support state agency response efforts

USGS