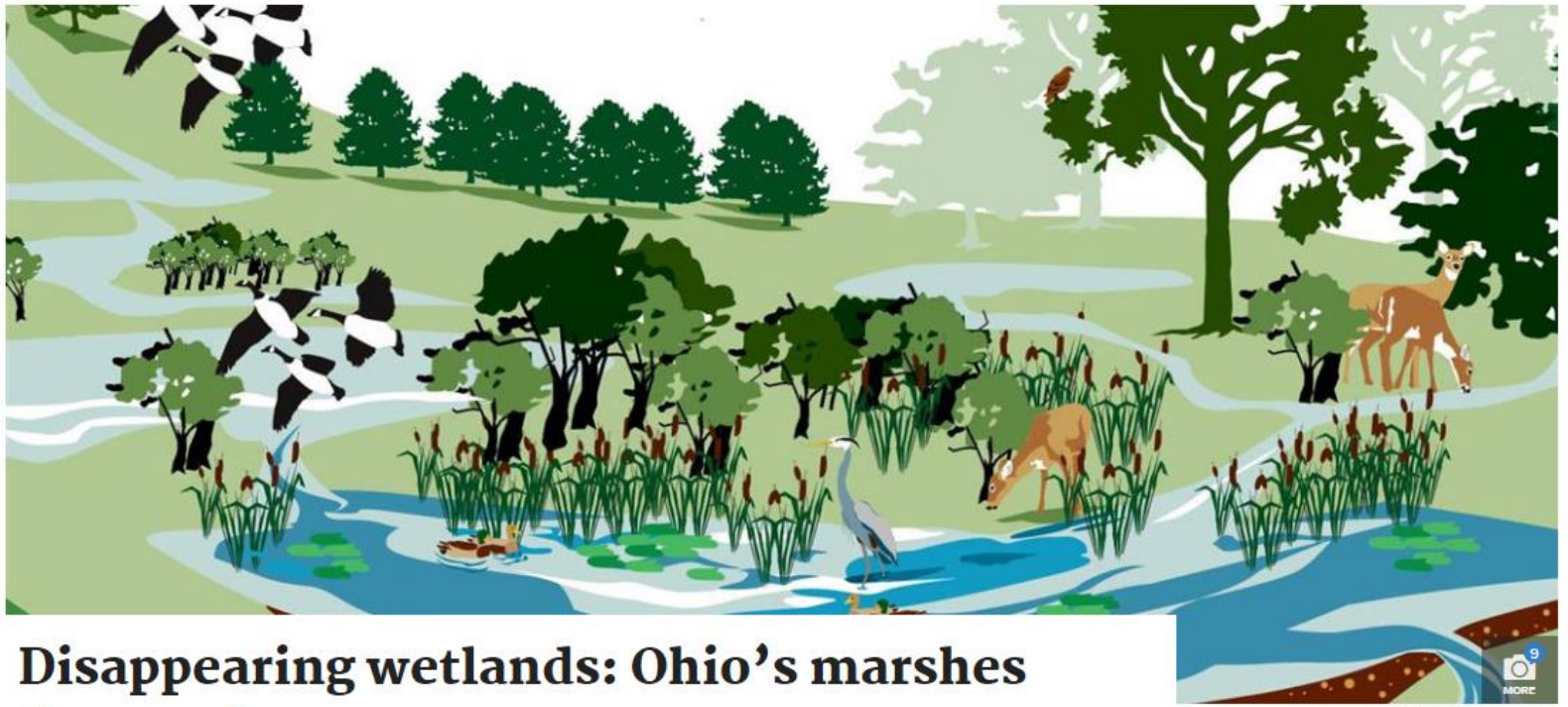
# Early Achievements in Grass Carp Control


# High grazing could threaten wetlands


World record : 92lbs



## Disappearing wetlands: Ohio's marshes then and now

BLADE OUTDOORS EDITOR MATT MARKEY AND BLADE ARTIST JEFF BASTING
The Blade

JUL 31, 2016 9:44 AM

BLADE ILLUSTRATION/JEFF BASTING

# Timeline of Grass Carp in Lake Erie


**1963** — Imported to U.S. to control aquatic vegetation

**1983** — Triploid (sterile) grass carp developed

**1980's** — Reports of grass carp captured by commercial fishers in Lake Erie

**2012** — Diploid grass carp that originated from the Sandusky River were captured

**2015** — Grass carp eggs found in the Sandusky River

**2018** — First strike teams deployed, grass carp larvae found in Maumee River

**2019-2022** — Continued effort

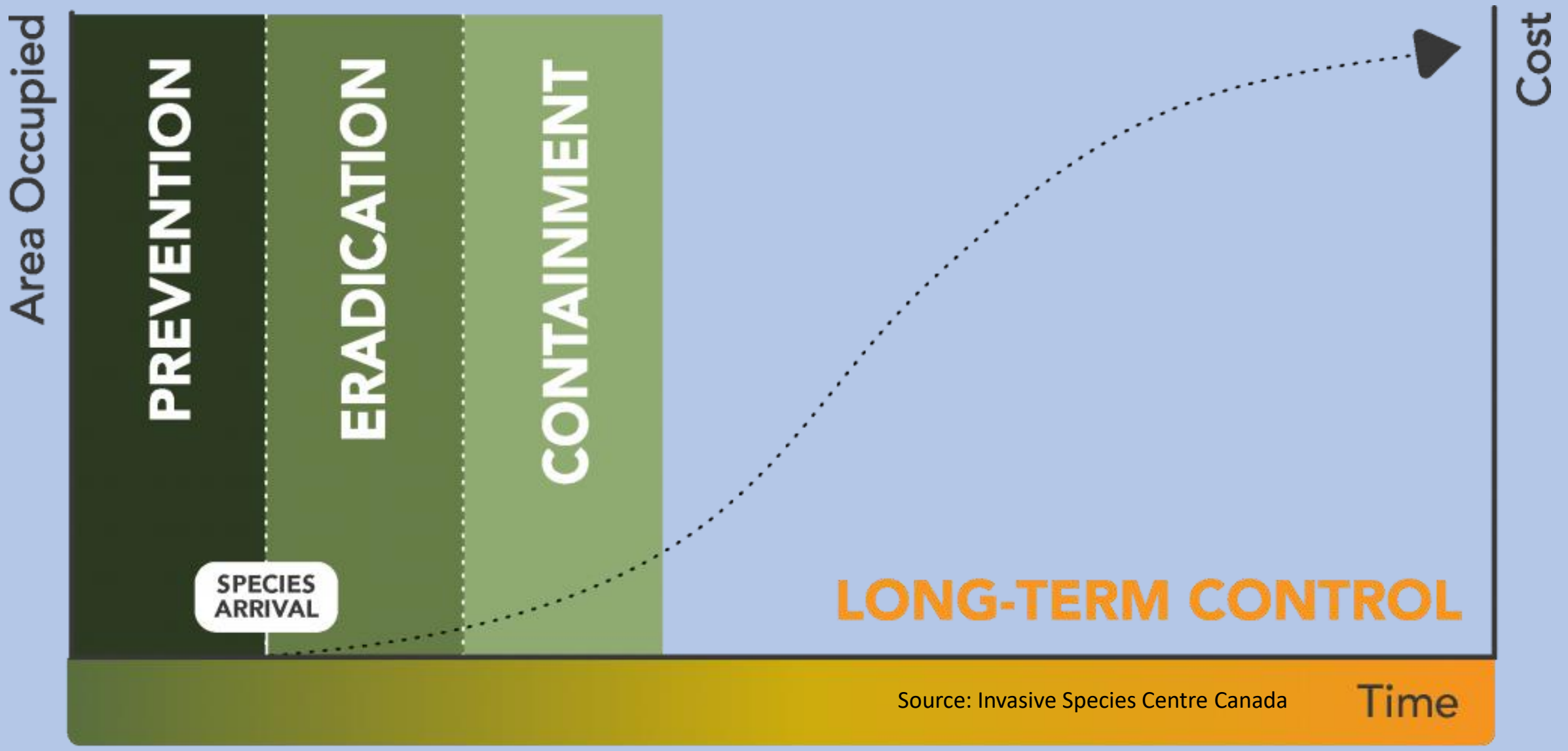
# Management Action

**Lake Erie Grass Carp Adaptive Response Strategy 2019-2023**

Photo source: J. Francis, Michigan Department of Natural Resources

- Prevent Grass Carp from attaining densities that cause adverse impacts
  - Science-based, adaptive management approach
  - Guide effective decision-making by management agencies

# Grass Carp are relatively rare; now is the time for action

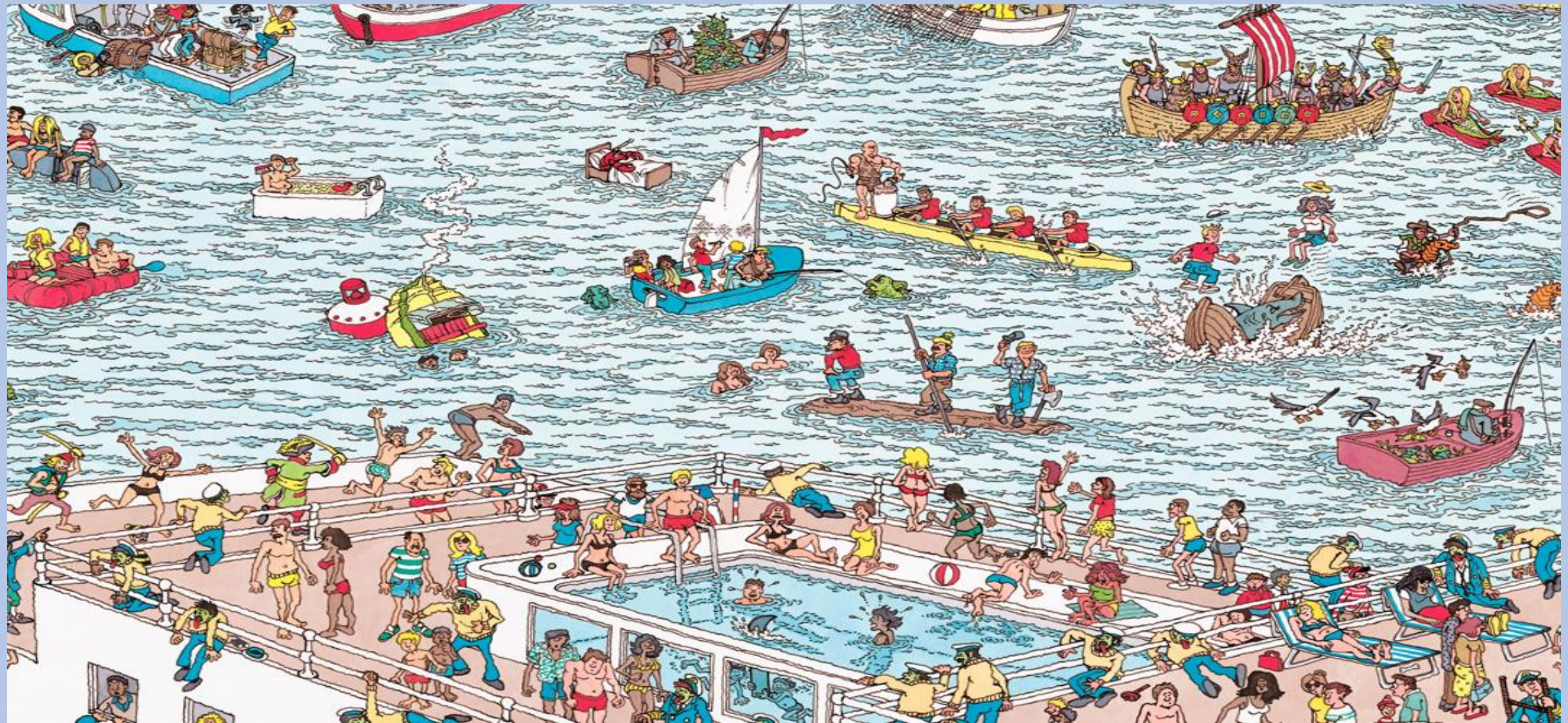



Source: Invasive Species Centre Canada

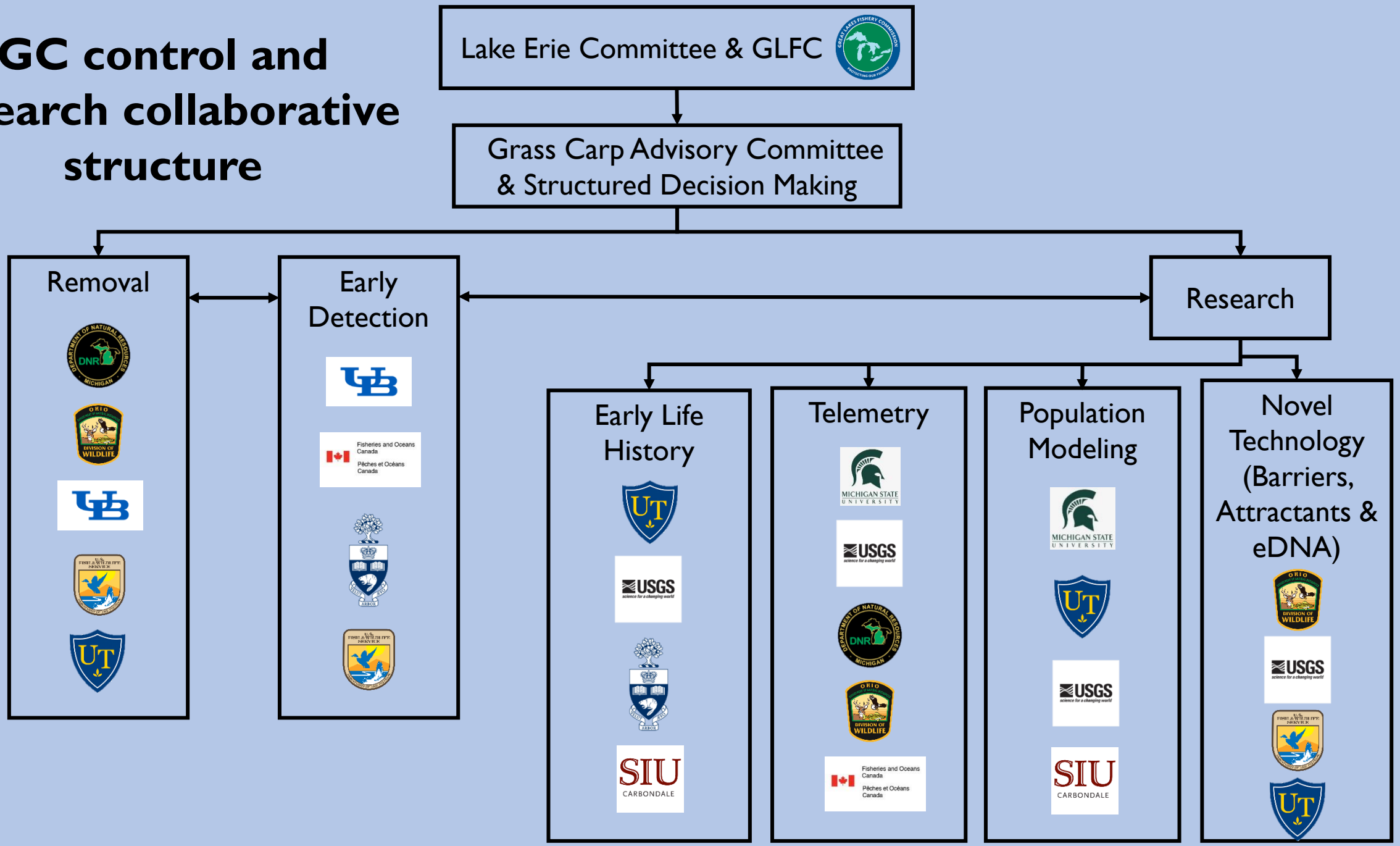
# Grass Carp are relatively rare; now is the time for action

# Grass Carp are relatively rare; now is the time for action

# But……. It is hard to find rare things in big places



# GC control and research collaborative structure



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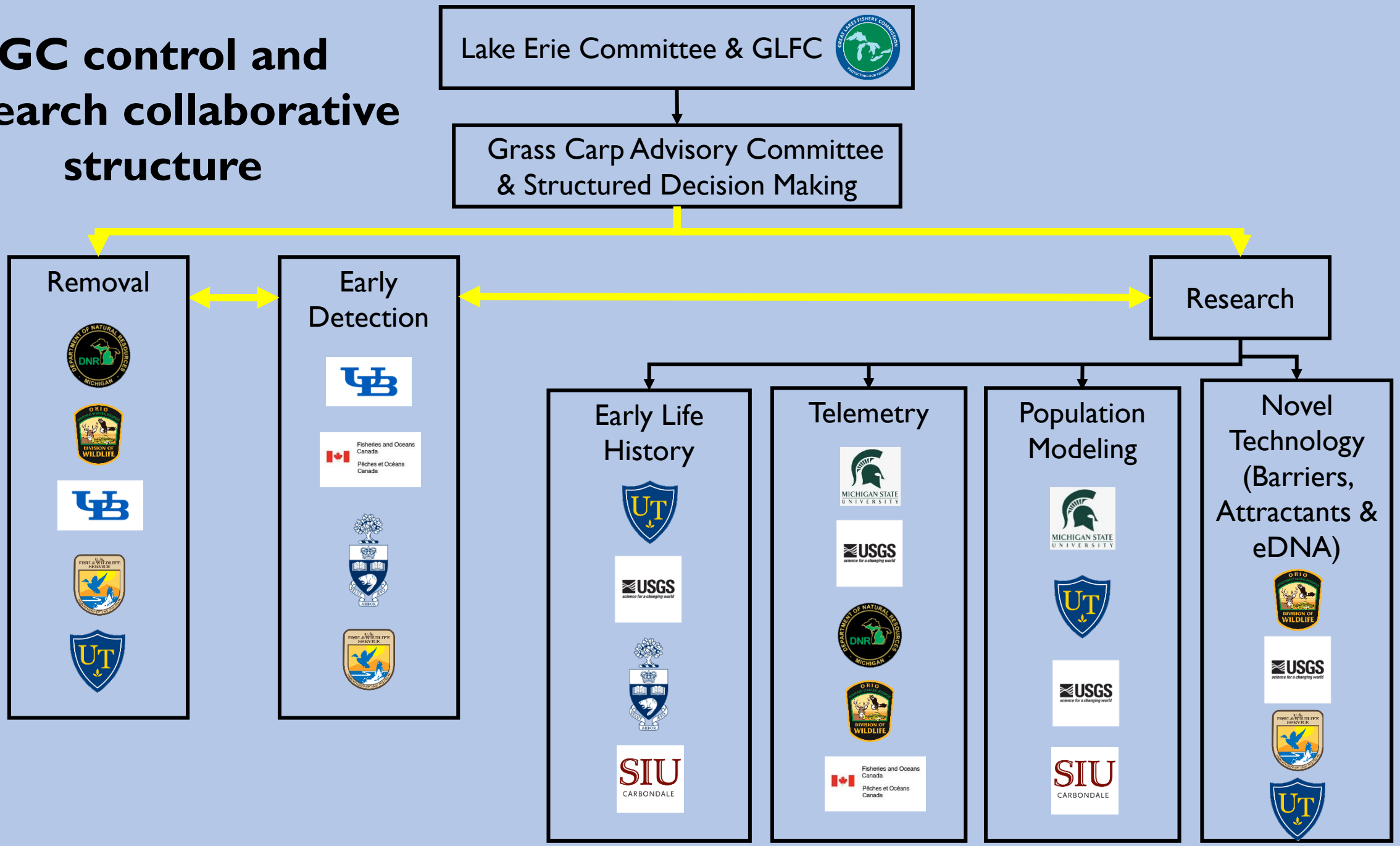
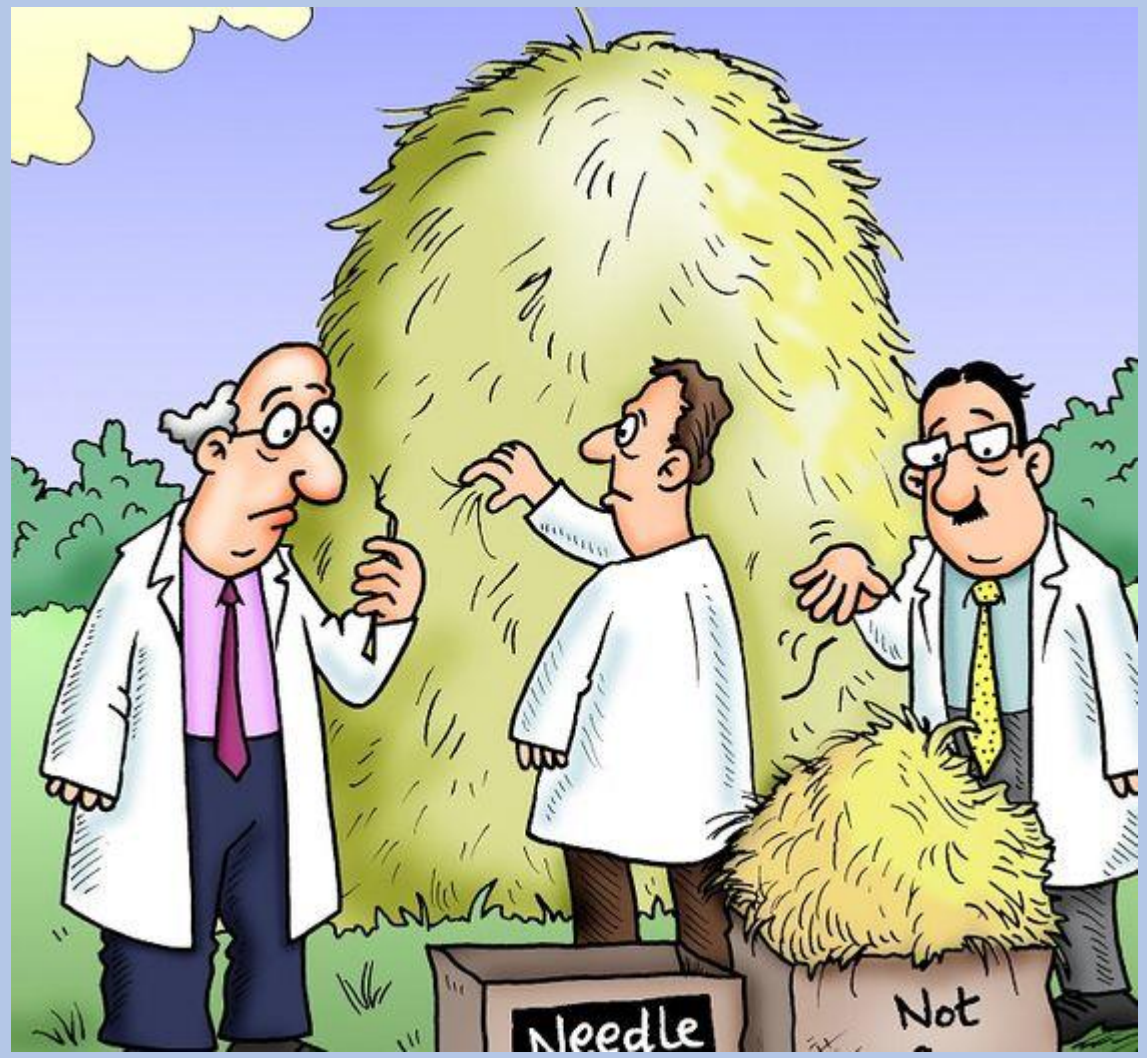


# To find rare fish, you need to know:

**Where to look**
**When to look**
**How to catch them**

**Does it work?**



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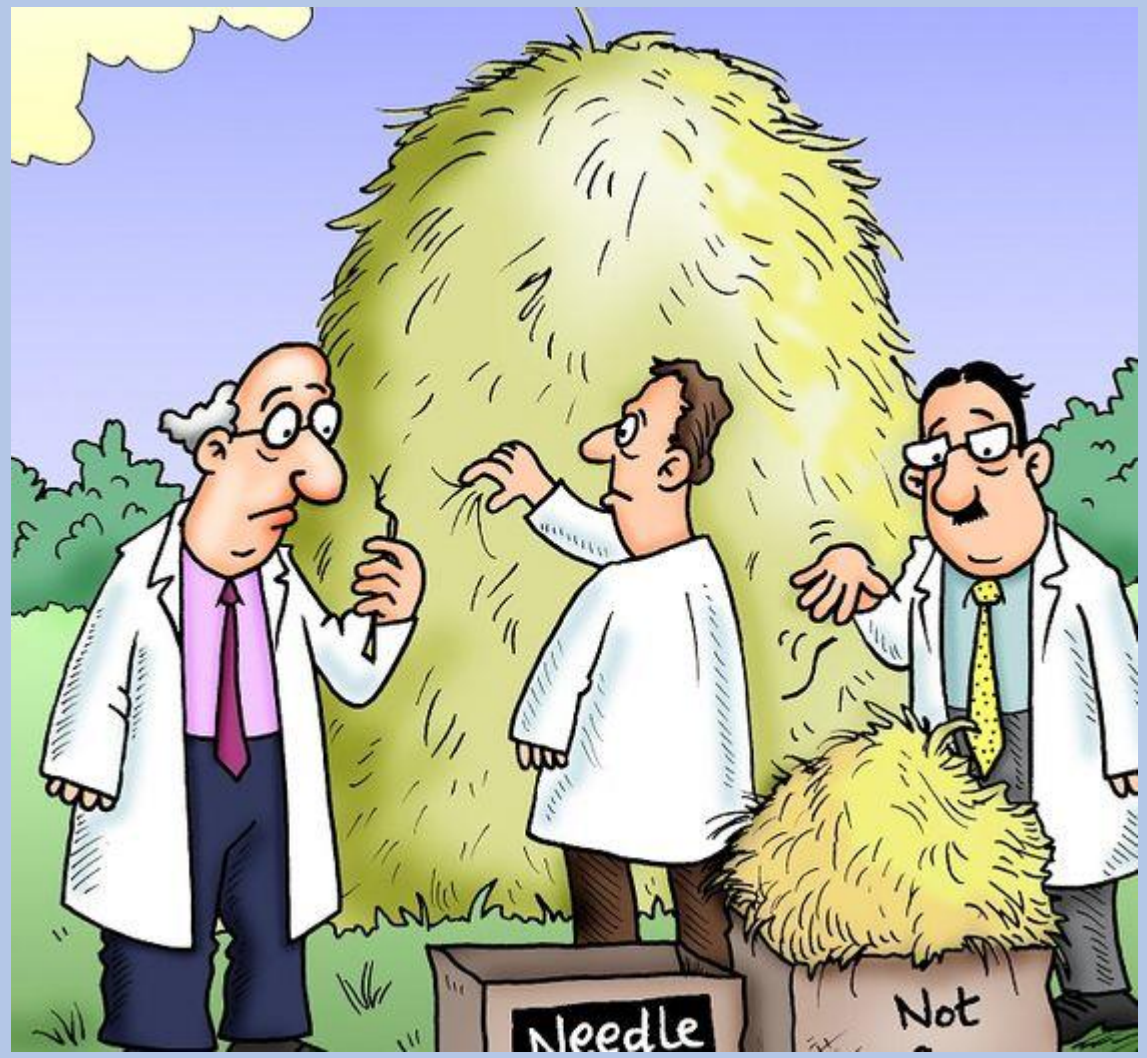
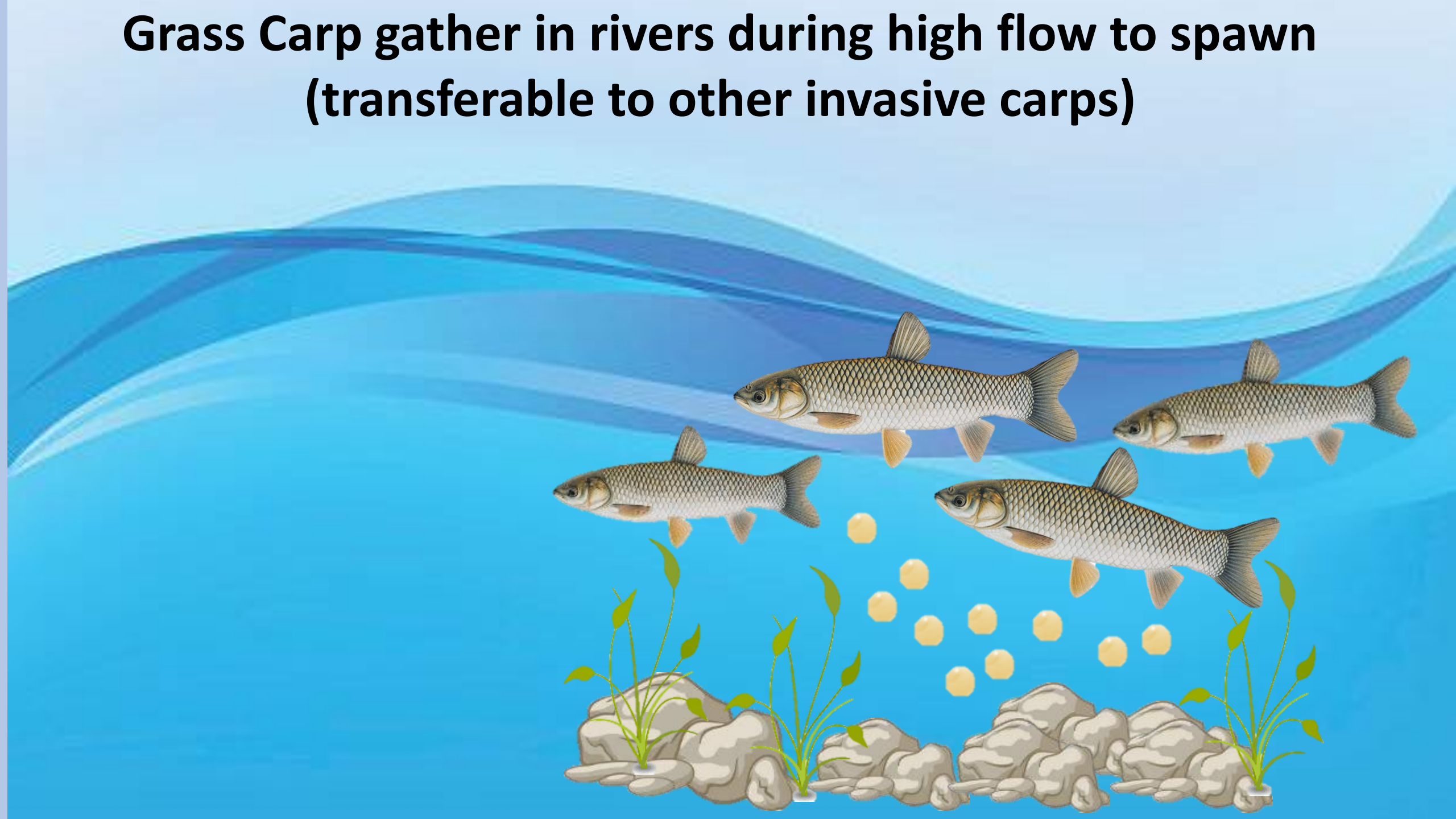


# Grass Carp gather in rivers during high flow to spawn (transferable to other invasive carps)

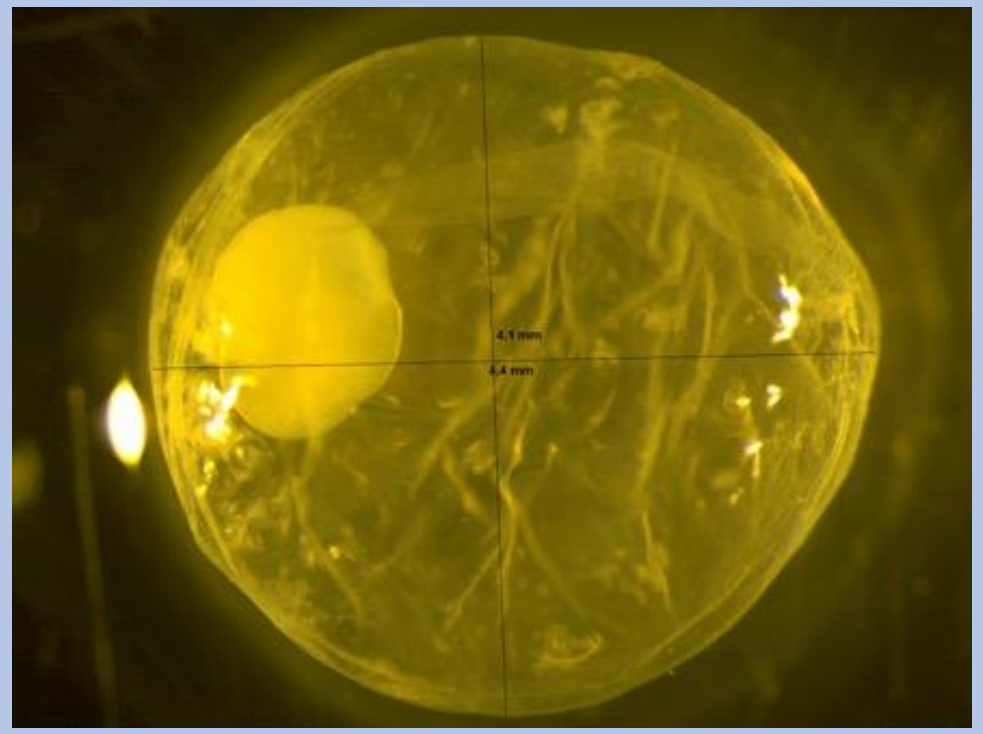


# Egg Sampling- Identified spawning locations, & early detection

- Eggs found in Sandusky and Maumee on multiple years

- Other rivers explored- no detections
  - Cuyahoga, Huron, Grand (LE)
  - St. Joseph (LM) & Tittabawassee (LH)

- Interpret non-detection, ongoing

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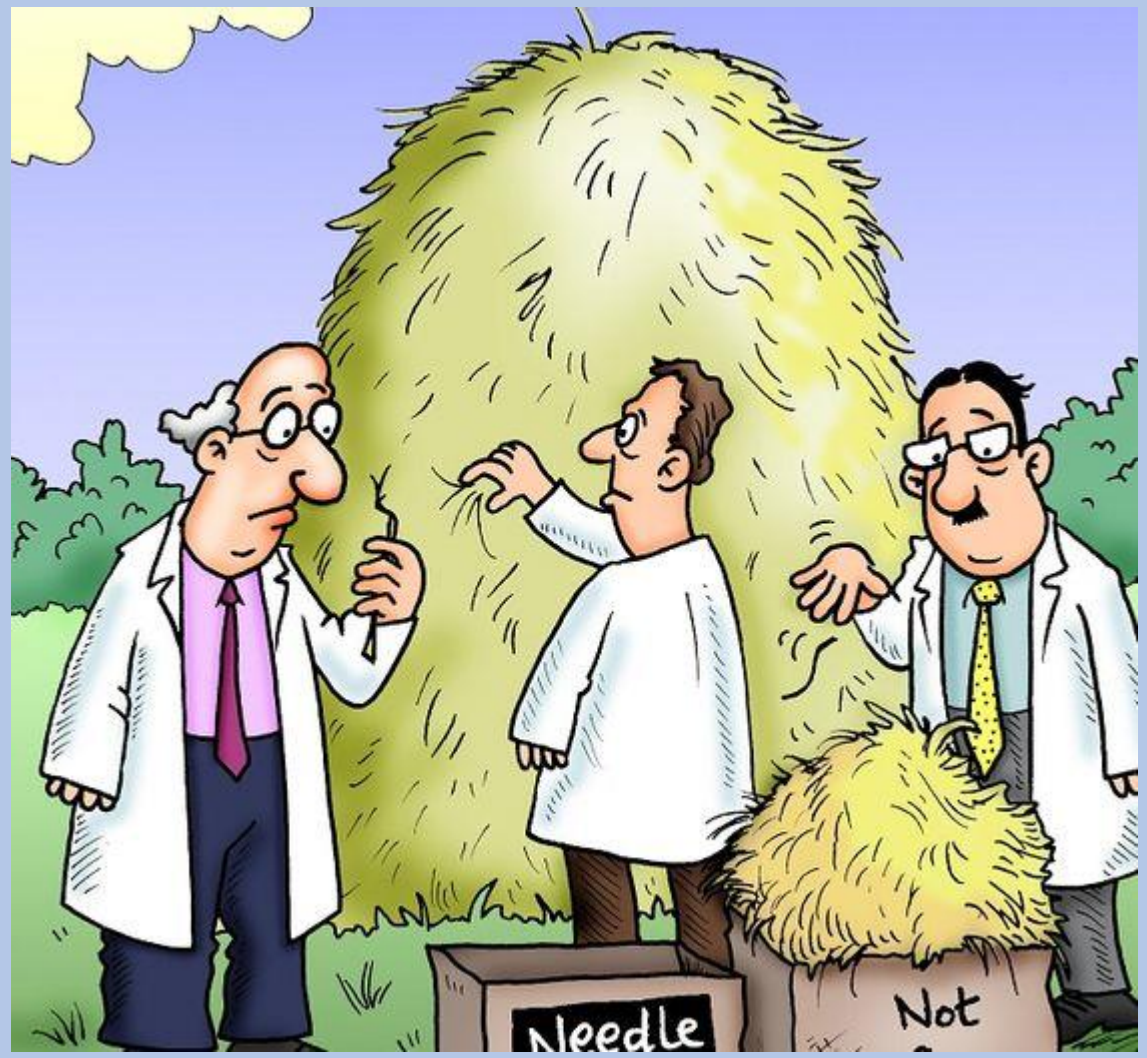
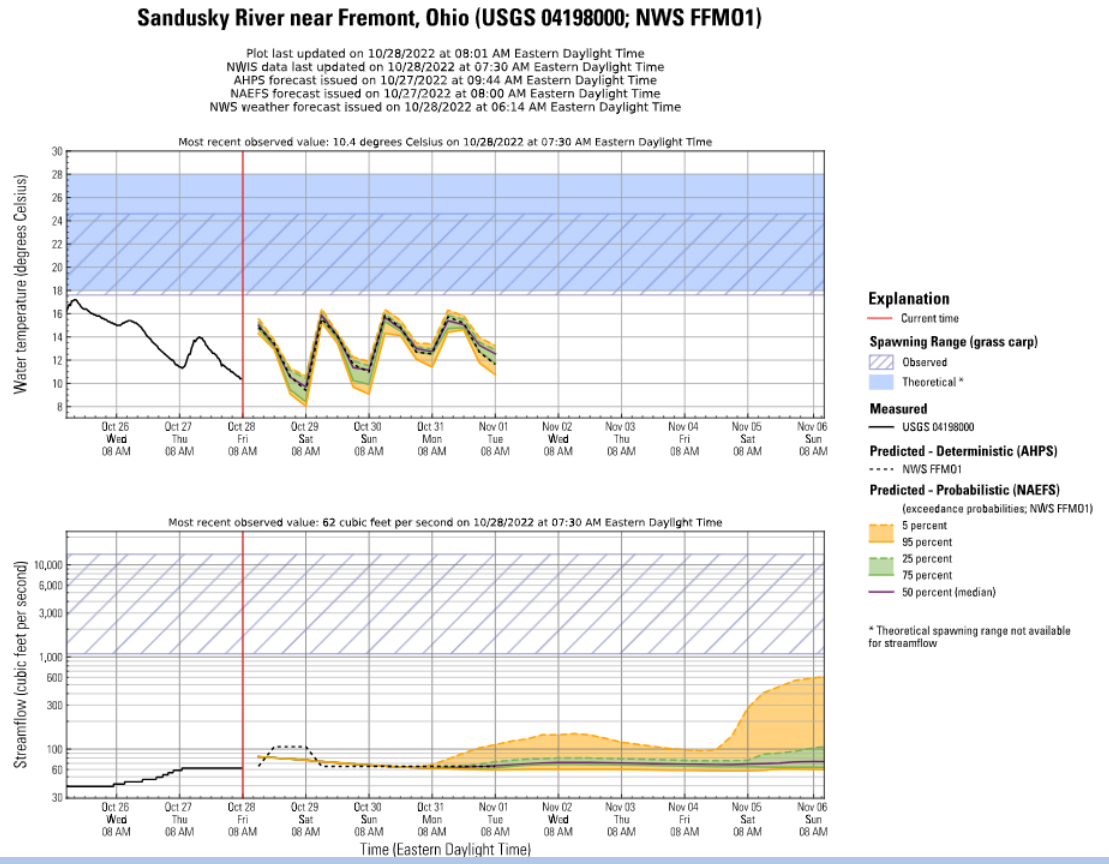


# SpawnCast tool helps determine when to target rivers

USGS science for a changing world

USGS SpawnCast

Spawning Forecast Dashboard for Rivers



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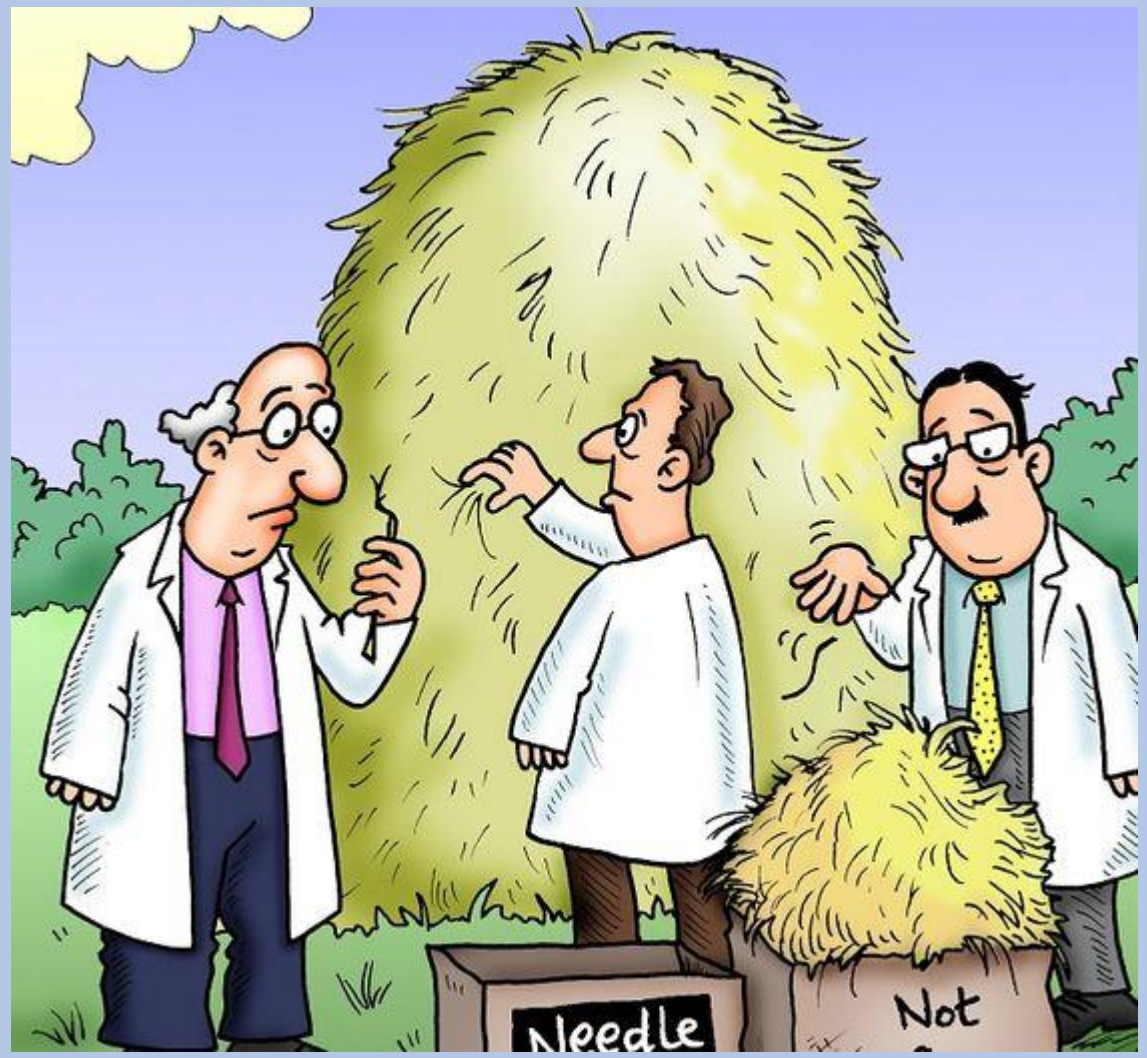


# How Do We Capture Adults?

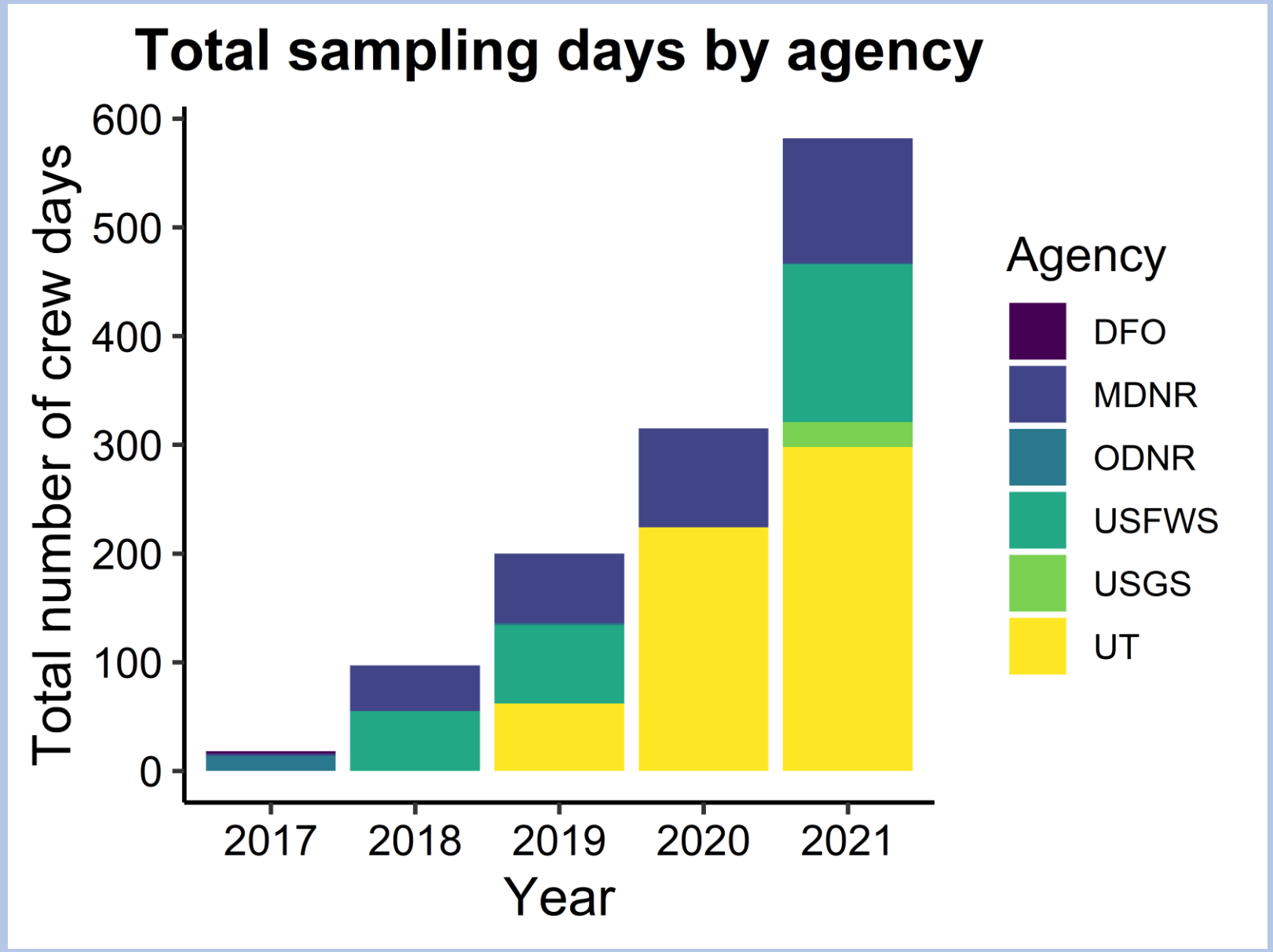
**Spawning**

- High Flows
- Multiple Boats
- Electrofishing Only
- High Catch

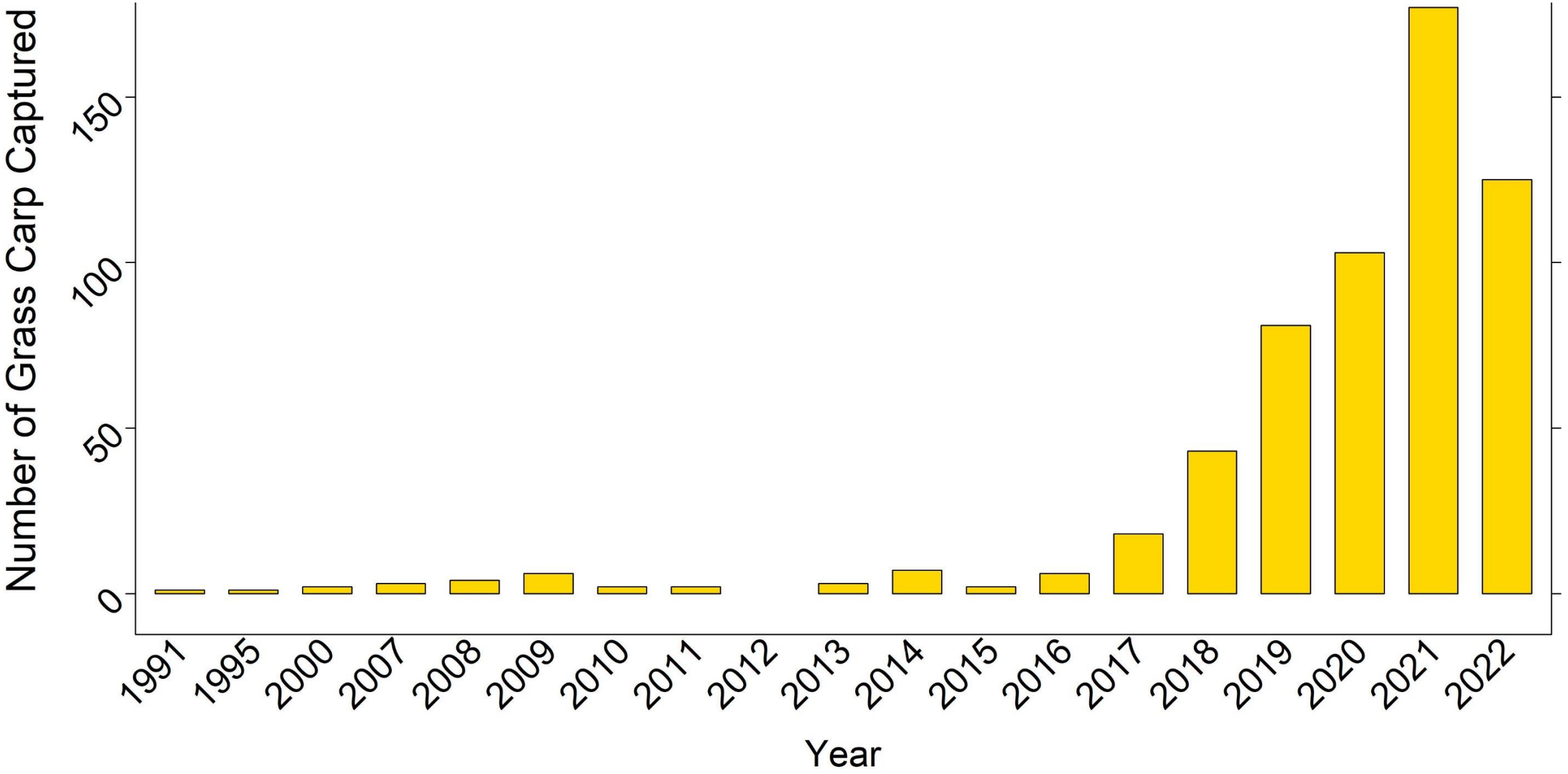
**Non-Spawning**

- Fish not Aggregated
- Usually One Boat
- Electrofishing and Trammel Nets
- Variable Catch

# Effort to manage Grass Carp is increasing



# Captures also increasing, but with variability



# Nets take longer, use where occupancy is likely

$$Y_i \sim nb(\lambda_i * hrs, r)$$

$$log(\lambda_i * hrs_i) = \beta_0 + \beta_1 Combination_i + \beta_2 Combination_{i,j} + \beta_3 Combination_{i,k}$$

$\lambda_i = capture$

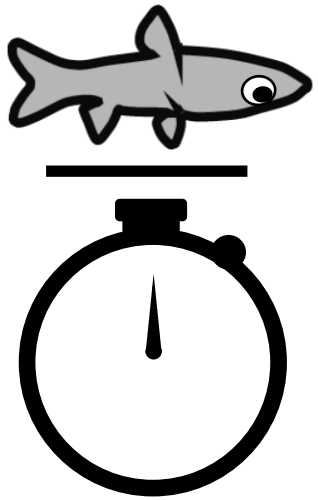
$hrs_i = hours$

$i = event$

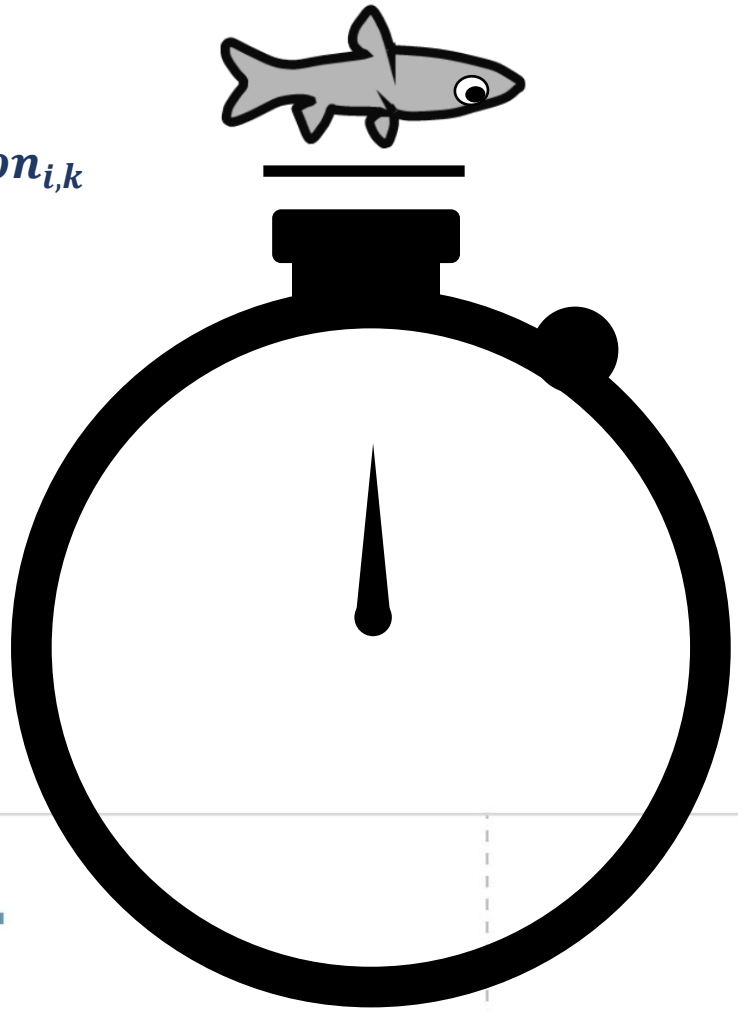
$j = year$

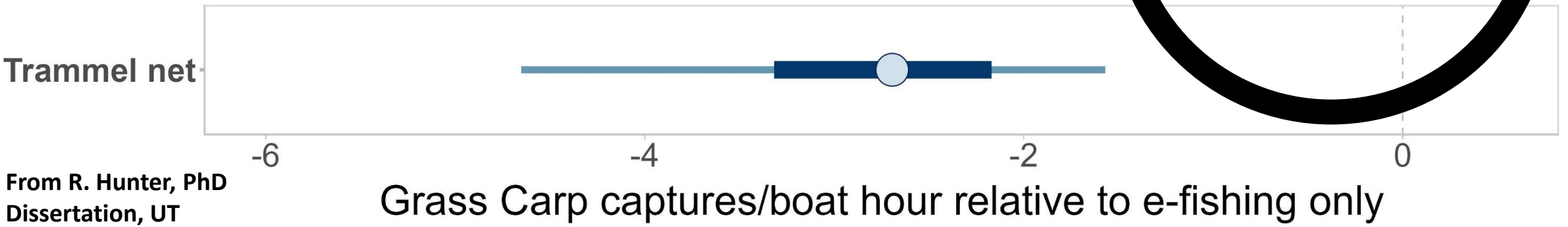
$k = segment$

e-fishing cost =

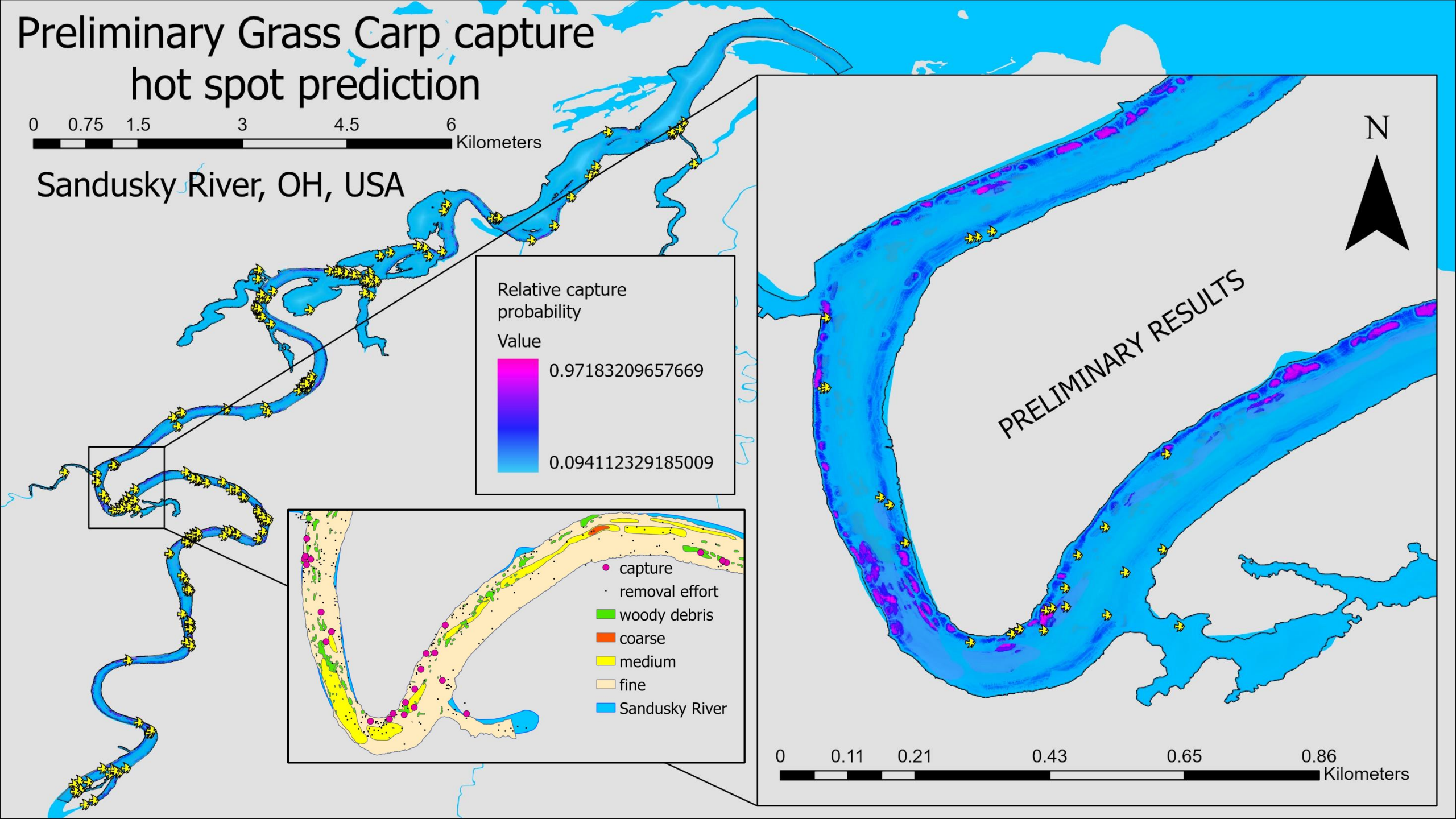


trammel net cost =






From R. Hunter, PhD Dissertation, UT


Preliminary Grass Carp capture hot spot prediction
0 0.75 1.5 3 4.5 6
Kilometers
Sandusky River, OH, USA
Relative capture probability
Value
0.97183209657669
0.094112329185009
capture
removal effort
woody debris
coarse
medium
fine
Sandusky River
N
PRELIMINARY RESULTS
0 0.11 0.21 0.43 0.65 0.86
Kilometers

# Grass Carp implanted with tags to track movement and target control

Contents lists available at ScienceDirect

Journal of Great Lakes Research

journal homepage: www.elsevier.com/locate/ijglr

Tributary use and large-scale movements of grass carp in Lake Erie

Cleyo Harris [a,b,*], Travis O. Brenden [a], Chris S. Vandergoot [a], Matthew D. Faust [c], Seth J. Herbst [d], Charles C. Krueger [a]

[a] Department of Fisheries and Wildlife, Michigan State University, East Lansing, MI 48824, United States
[b] Lake Erie Management Unit, Fisheries Division, Michigan Department of Natural Resources, Waterford, MI 48327, United States
[c] Sandusky Fisheries Research Station, Division of Wildlife, Ohio Department of Natural Resources, Sandusky, OH 44870, United States
[d] Fisheries Division, Michigan Department of Natural Resources, Lansing, MI 48909, United States

GLATOS
Great Lakes Acoustic Telemetry Observation System

Unraveling the mysteries of fish in the Great Lakes

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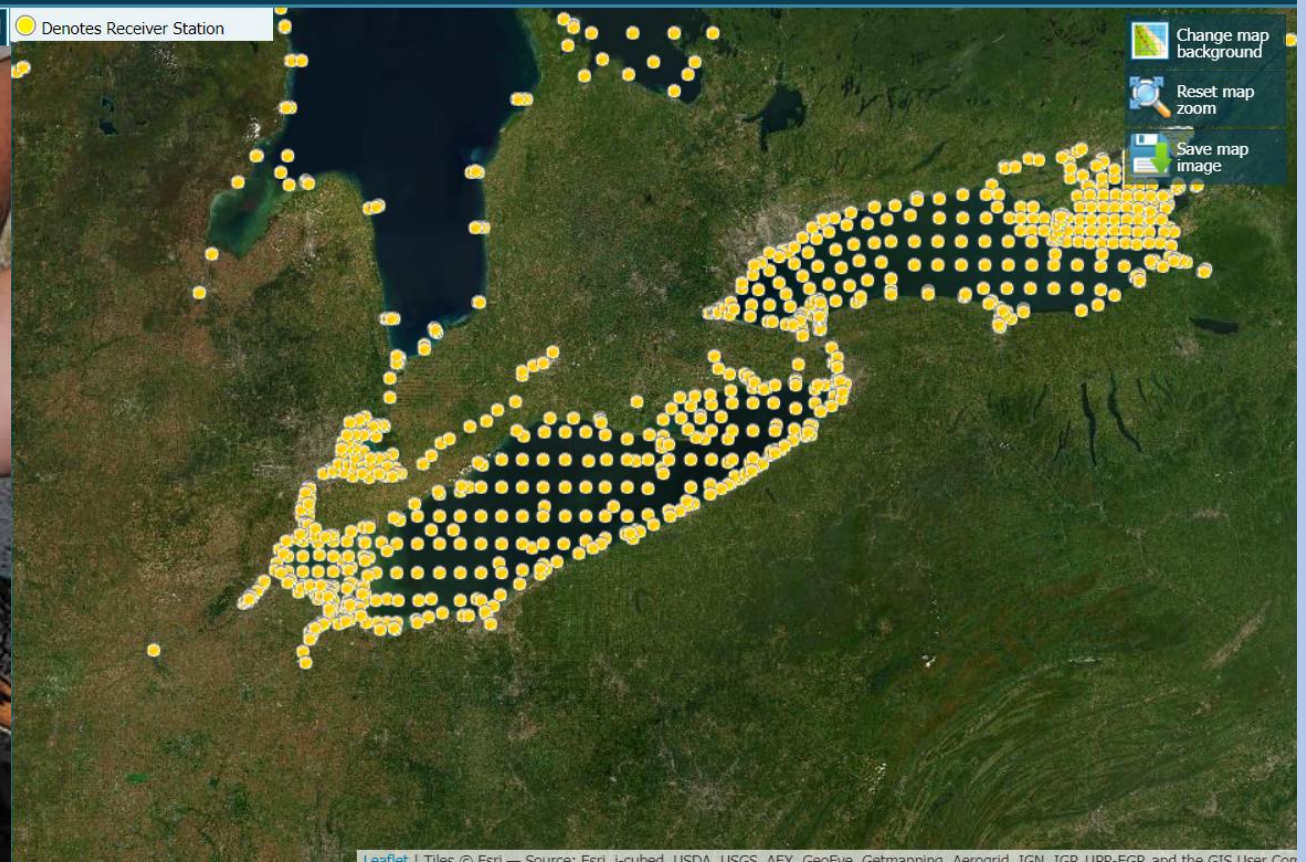

# Releasing bait to attract Grass Carp for removal from the Sandusky River


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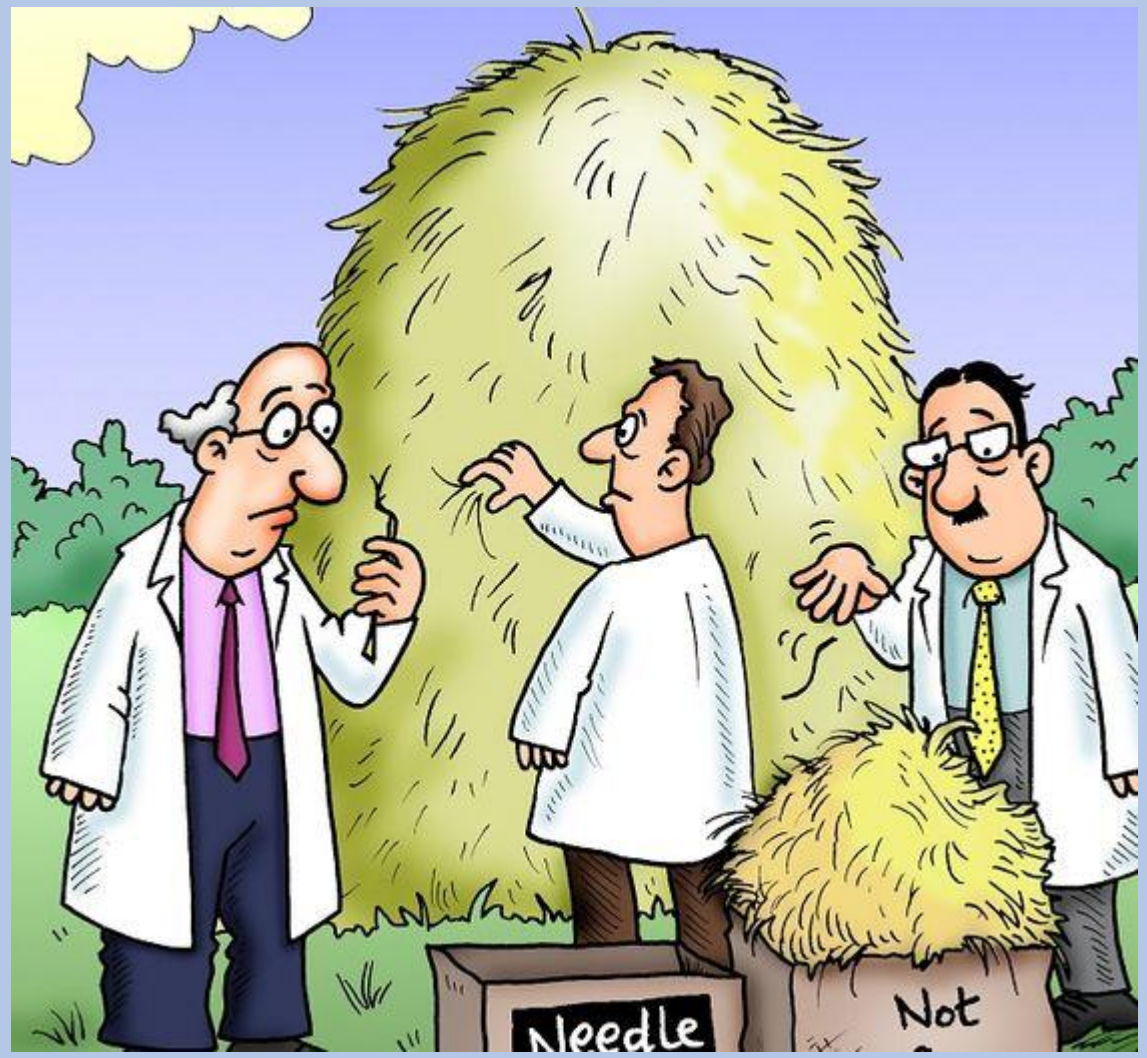
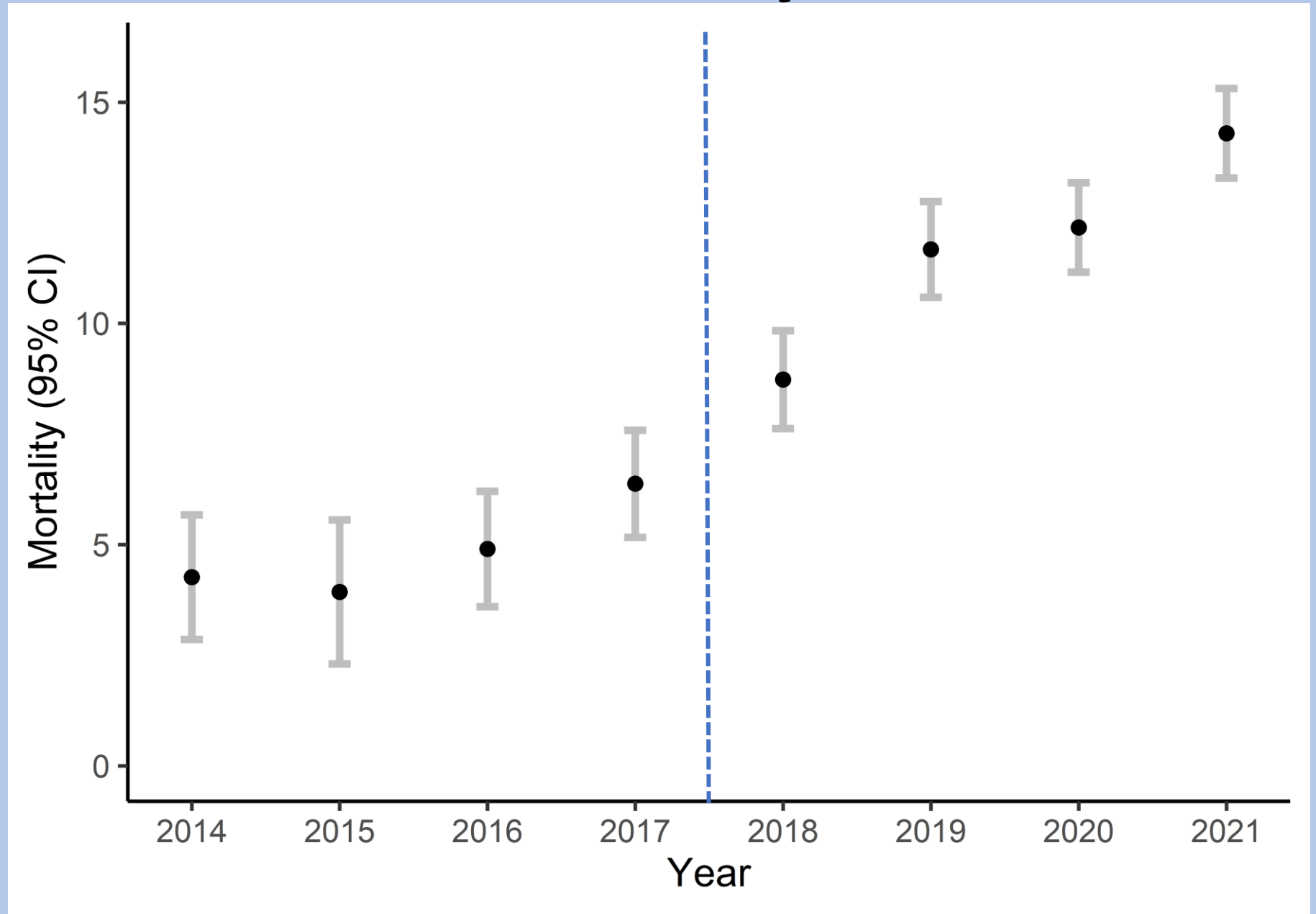
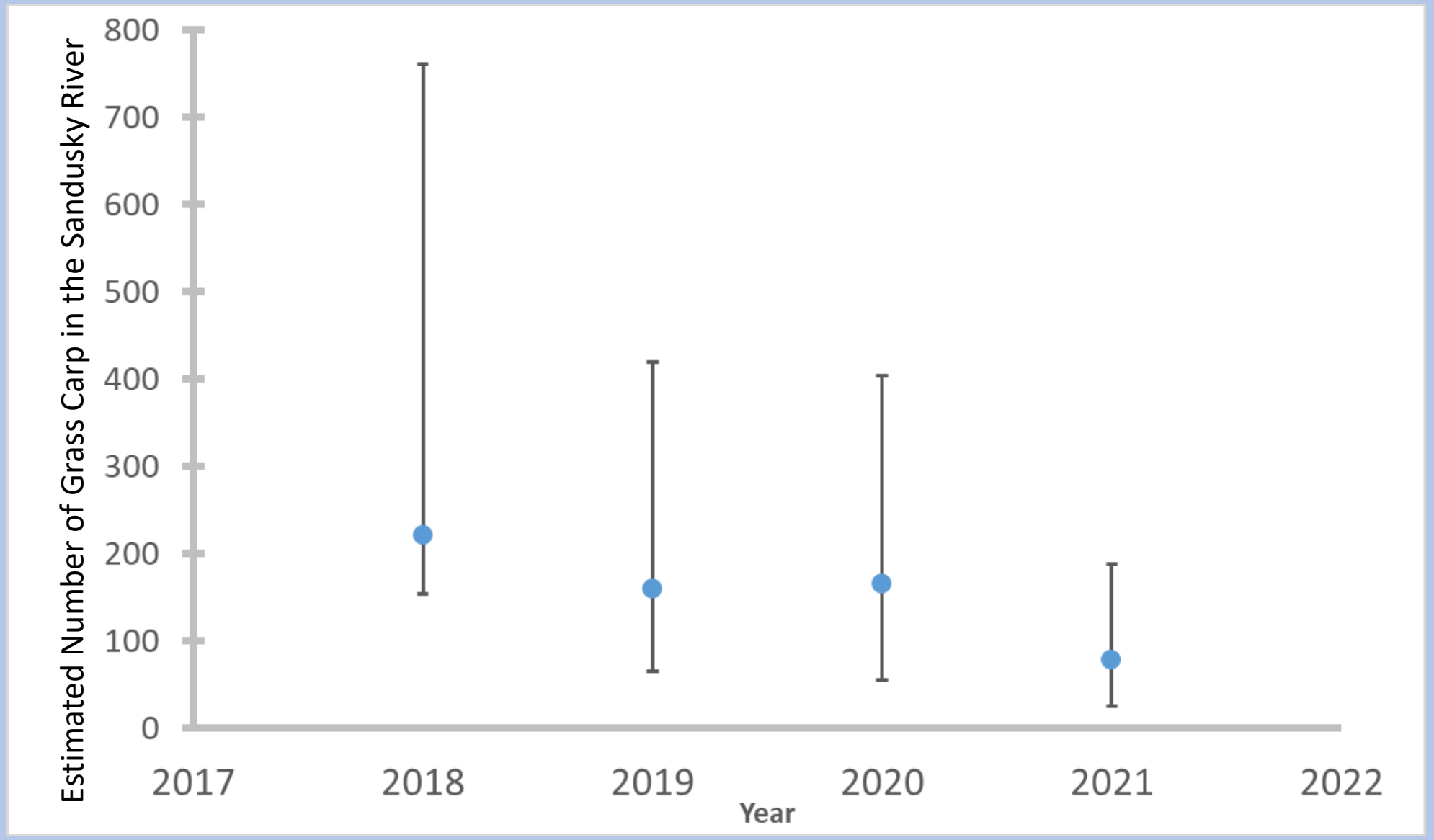


# Multilevel linear mortality estimates increasing




K. Lang MS thesis, DES UT

# Little change in modeled abundance of GC in Sandusky River




Adapted from Gouveia *et al.* in review

# Cause for Cautious Optimism

- Large and coordinated removal and research effort
  - New technologies being deployed
  - Learning to improve capture methods
- Removal increases with effort and new knowledge
- Mortality has increased- not yet known if sufficient to reduce population
- No evidence that Sandusky River numbers increasing

# Beyond removal: Proposed spawning barrier in Sandusky River

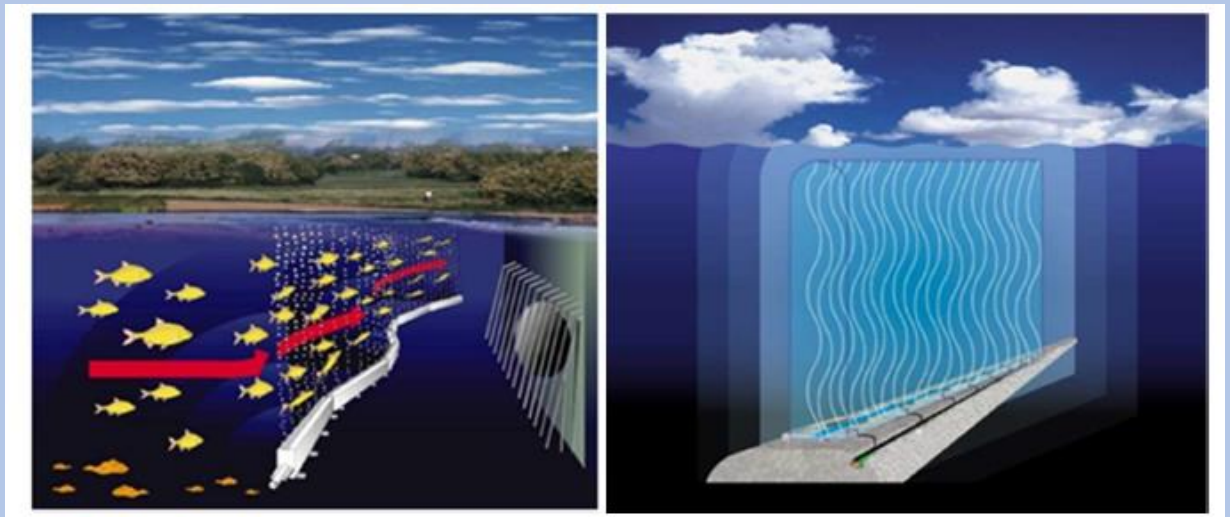


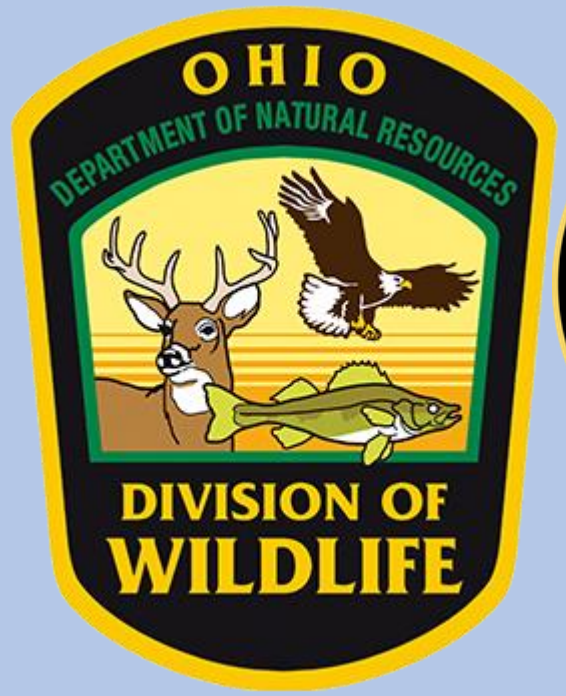

Image source: Fish Guidance Systems 2004
Map source: Aecom/Kleinschmidt

# Thank You


GREAT LAKES FISHERY COMMISSION
PROTECTING OUR FISHERY


UT
THE UNIVERSITY OF
TOLEDO


U.S.
FISH & WILDLIFE
SERVICE
DEPARTMENT OF THE INTERIOR

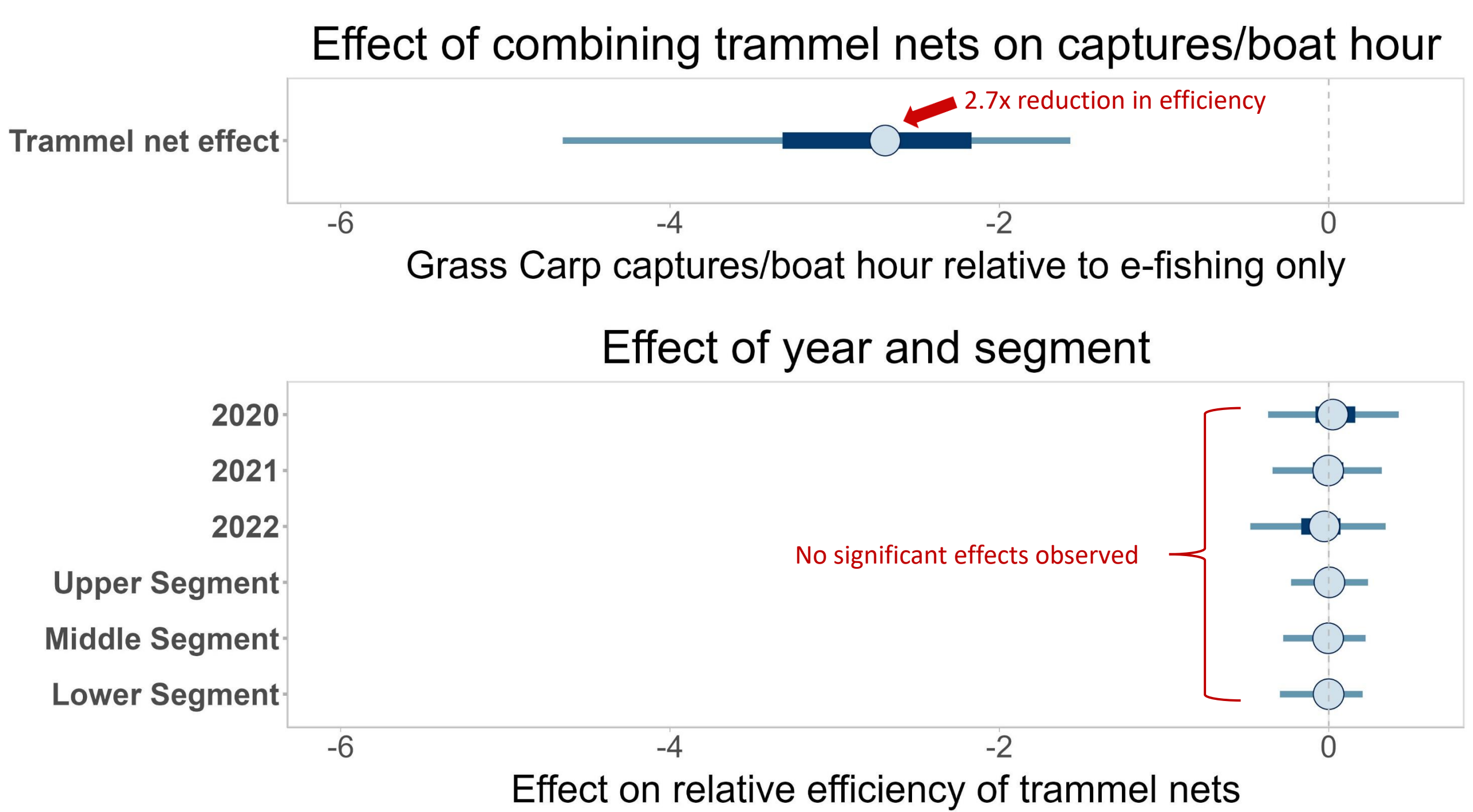

OHIO
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF
WILDLIFE


DEPARTMENT OF NATURAL RESOURCES
DNR
MICHIGAN


University at Buffalo


USGS
science for a changing world


SIU
CARBONDALE


Effect of combining trammel nets on captures/boat hour
Trammel net effect
2.7x reduction in efficiency
-6
-4
-2
0
Grass Carp captures/boat hour relative to e-fishing only
Effect of year and segment
2020
2021
2022
Upper Segment
Middle Segment
Lower Segment
No significant effects observed
-6
-4
-2
0
Effect on relative efficiency of trammel nets