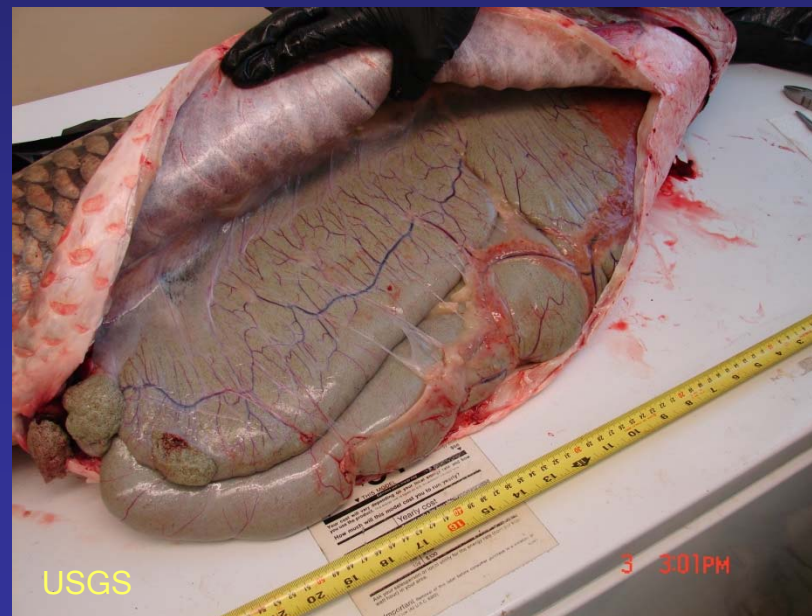


USGS/University of Toledo/MIDNR Grass Carp Research in the Sandusky River and Western Lake Erie

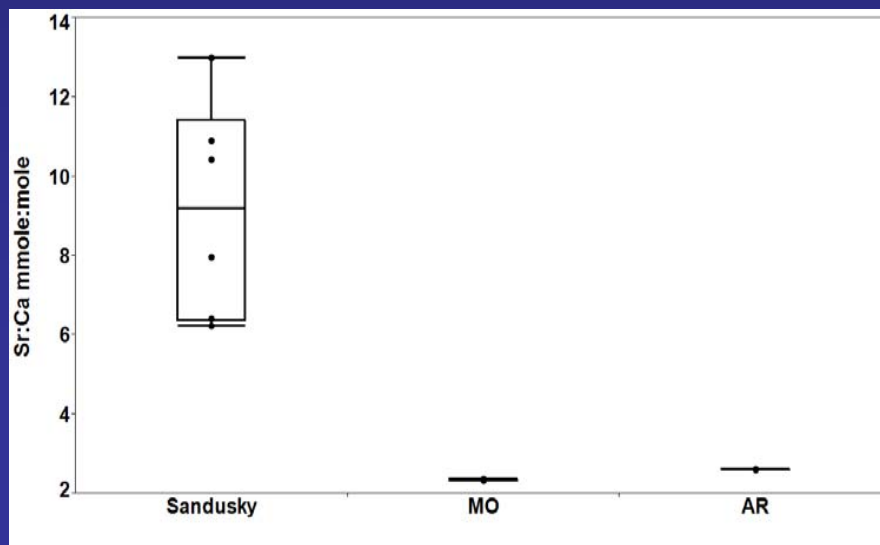
Patrick M. Kočovský¹, Holly Embke², Christine Mayer², Song Qian²

1 US Geological Survey, Lake Erie Biological Station
2 University of Toledo



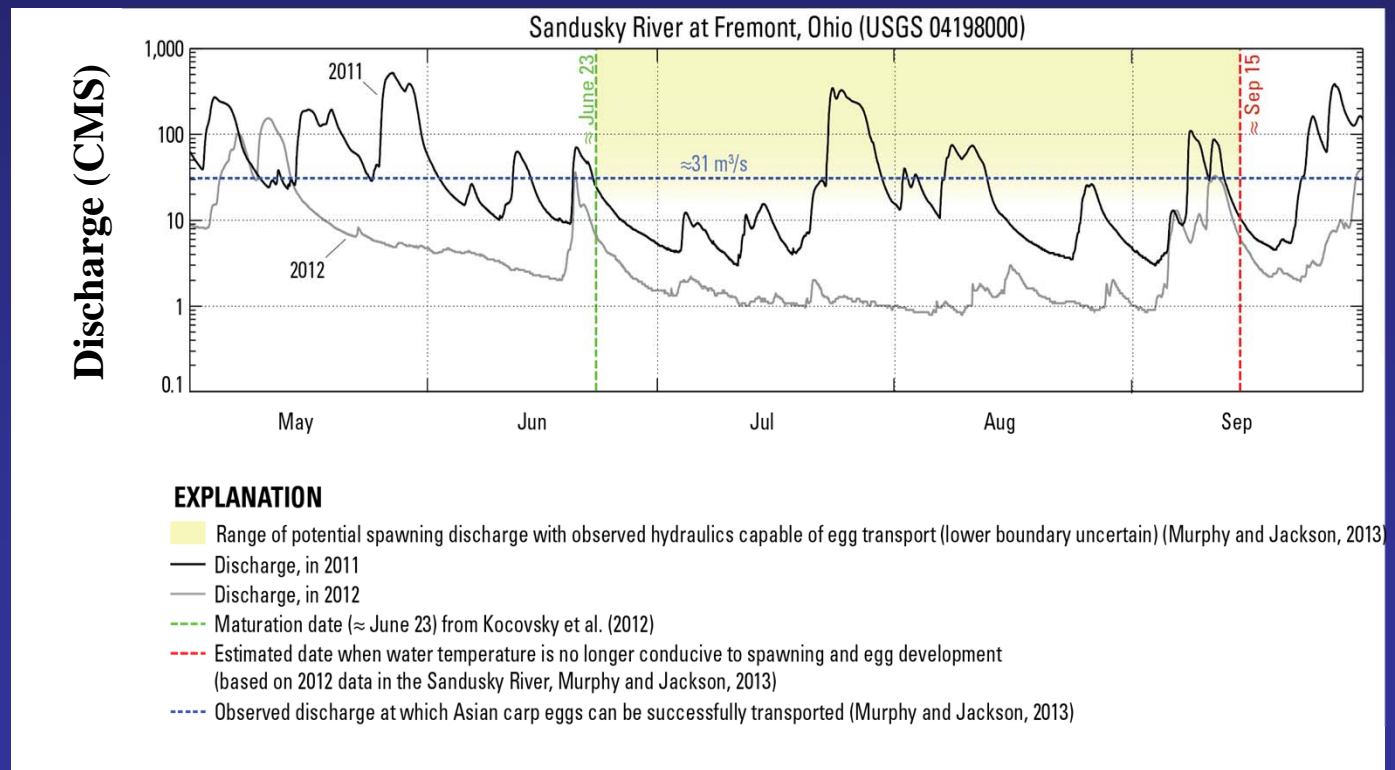
What We Know...

- Six age-1+ diploid GC (451-514 mm TL) captured in Sandusky River in October, 2012
- Otolith microchemistry consistent with Sandusky River origin



What We Know...

- USGS modeling work confirmed reach below Ballville Dam of suitable length for incubation
- Suitable flood event occurred in 2011



What We Want to Know...

- Can we find *direct evidence* of spawning?

If so, can we determine:

- where they spawned?
- if they hatched?
- where they are reared?
- if larvae recruited?

And ultimately...

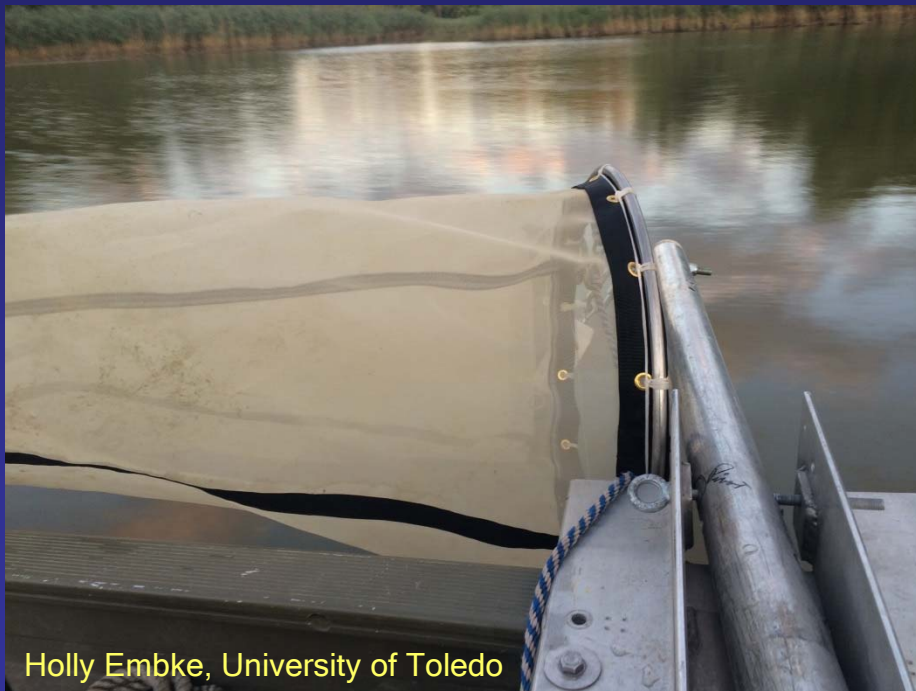
- Can we predict/prevent/disrupt spawning?
- Use research results to inform development of **management options** to **eradicate or reduce** Grass Carp?



Pilot study: Assessing Spawning in the Sandusky River

Sampling for direct evidence of spawning

- Bongo nets weekly
- Light traps in main channel and backwaters in 3 habitat types (macrophytes, wood debris, open water)
matches protocol used on MO River



Holly Embke, University of Toledo



Holly Embke, University of Toledo

Pilot study: Assessing Spawning in the Sandusky River

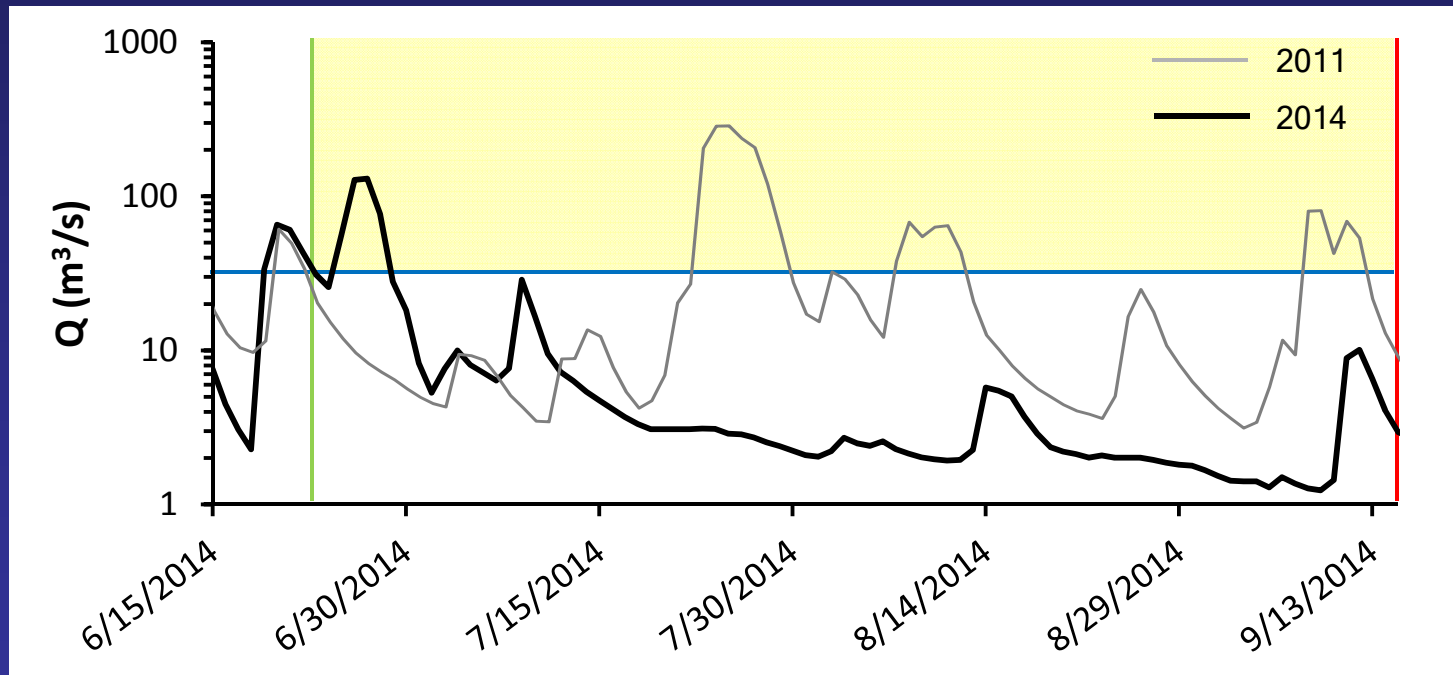


Pilot study: Assessing Spawning in the Sandusky River



2014 Pilot Year Sampling

- Proof of concept: Sandusky safe to sample during high-flow events
- 10 dates Bongo, 4 dates light traps
- No GC eggs or larvae sampled



Late June event of short duration, low % change in discharge, no eggs sampled = **low probability event**

Assessing Spawning in GL Tributaries

2015 promoted to 2-year project and expanded

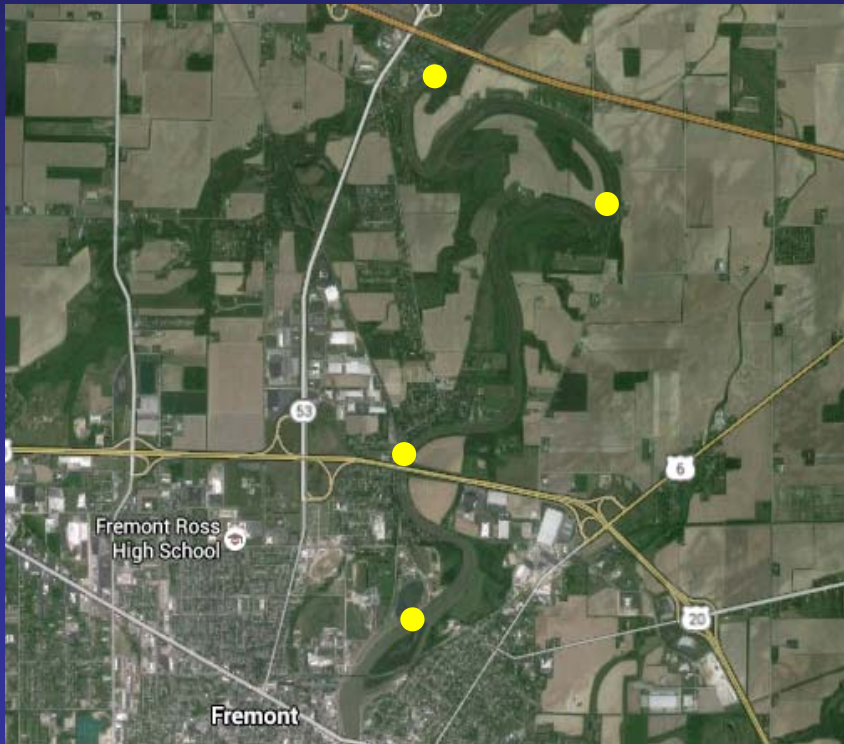


2015 Sandusky River² Raisin Sampling

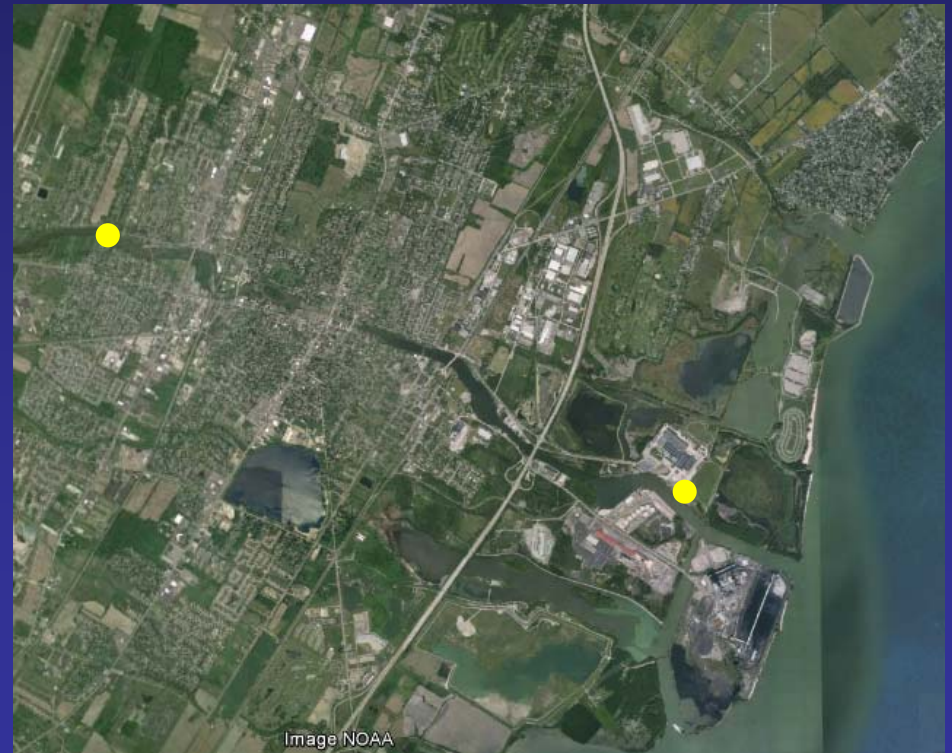
Bongos

Sandusky: Weekly June-August; 3 consecutive d during high-flow
Raisin: Weekly, 1 July – 20 August

Sandusky



Raisin



2015 Sandusky River² Raisin Sampling

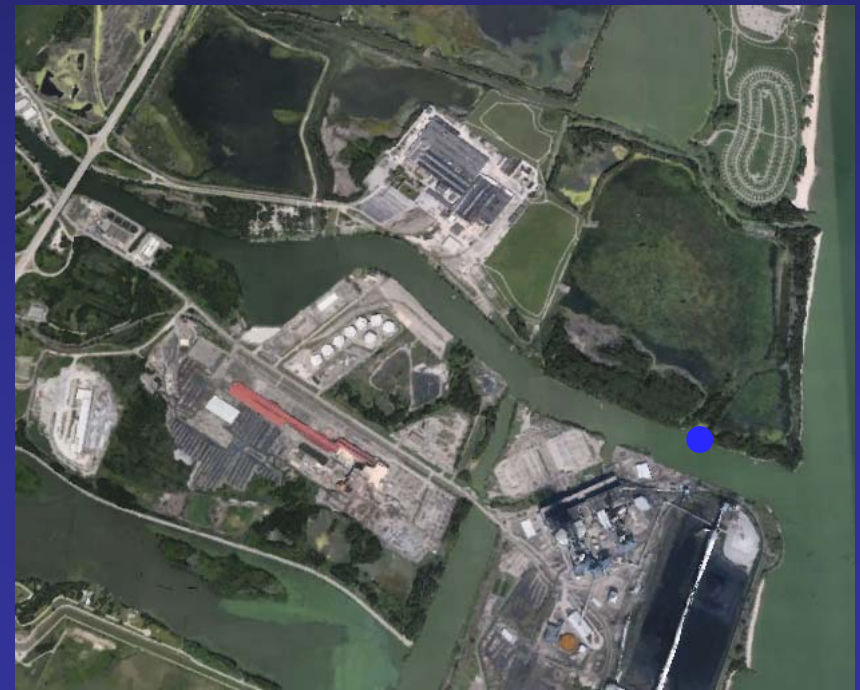
Light traps

Sandusky: Same protocol as 2014, but expanded farther downstream
6 sites in river

Raisin: single site near mouth

Raisin

Sandusky



Collaboration with USFWS

Concurrent light trap sampling

10 sites at the mouth of the Sandusky River

~1-2 hour sets

Veg-open-wood sites as in river

Different light sources

U Toledo

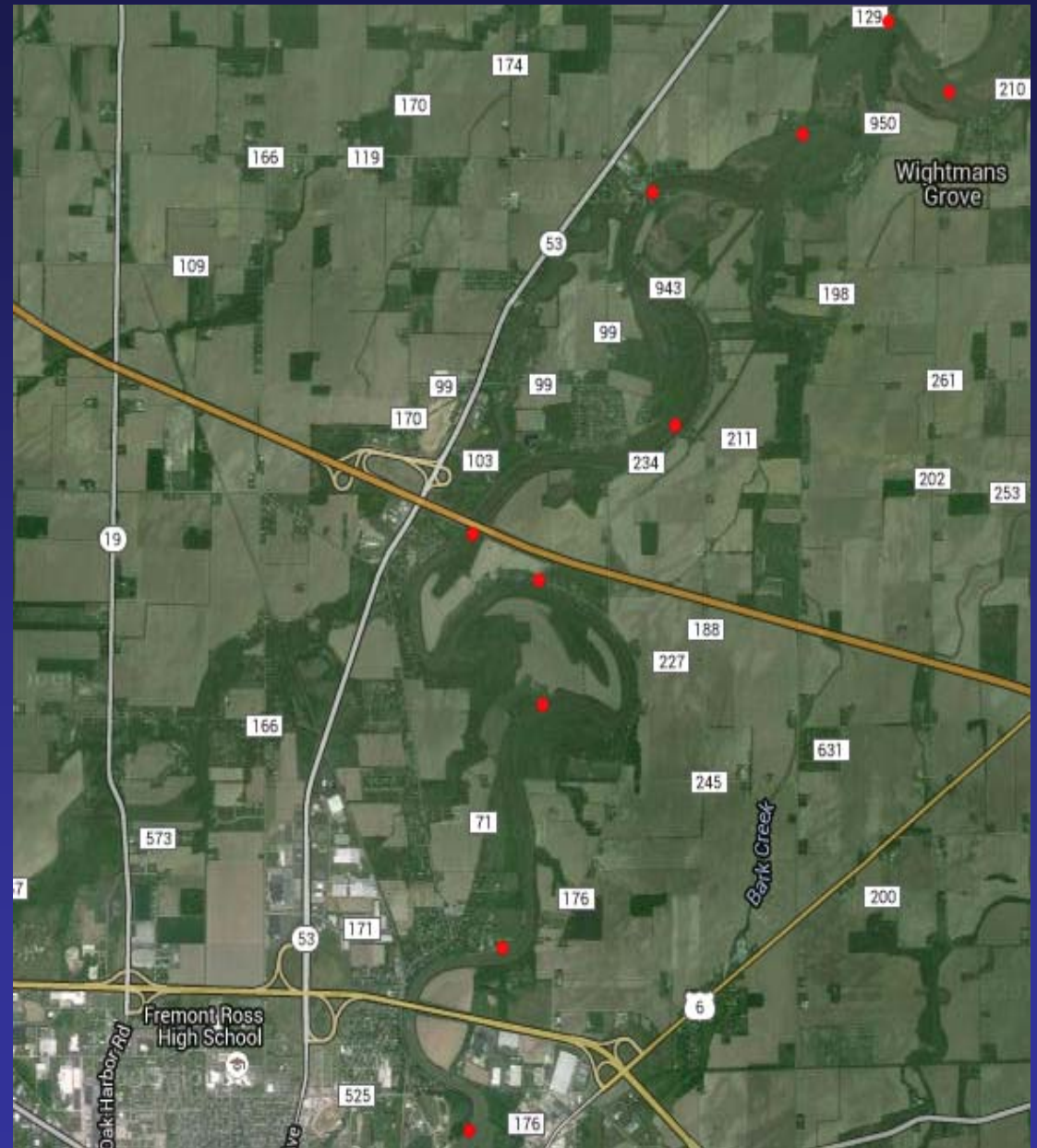
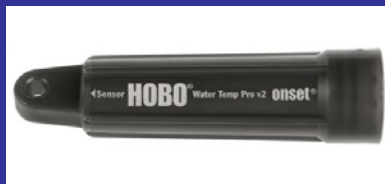


USFWS

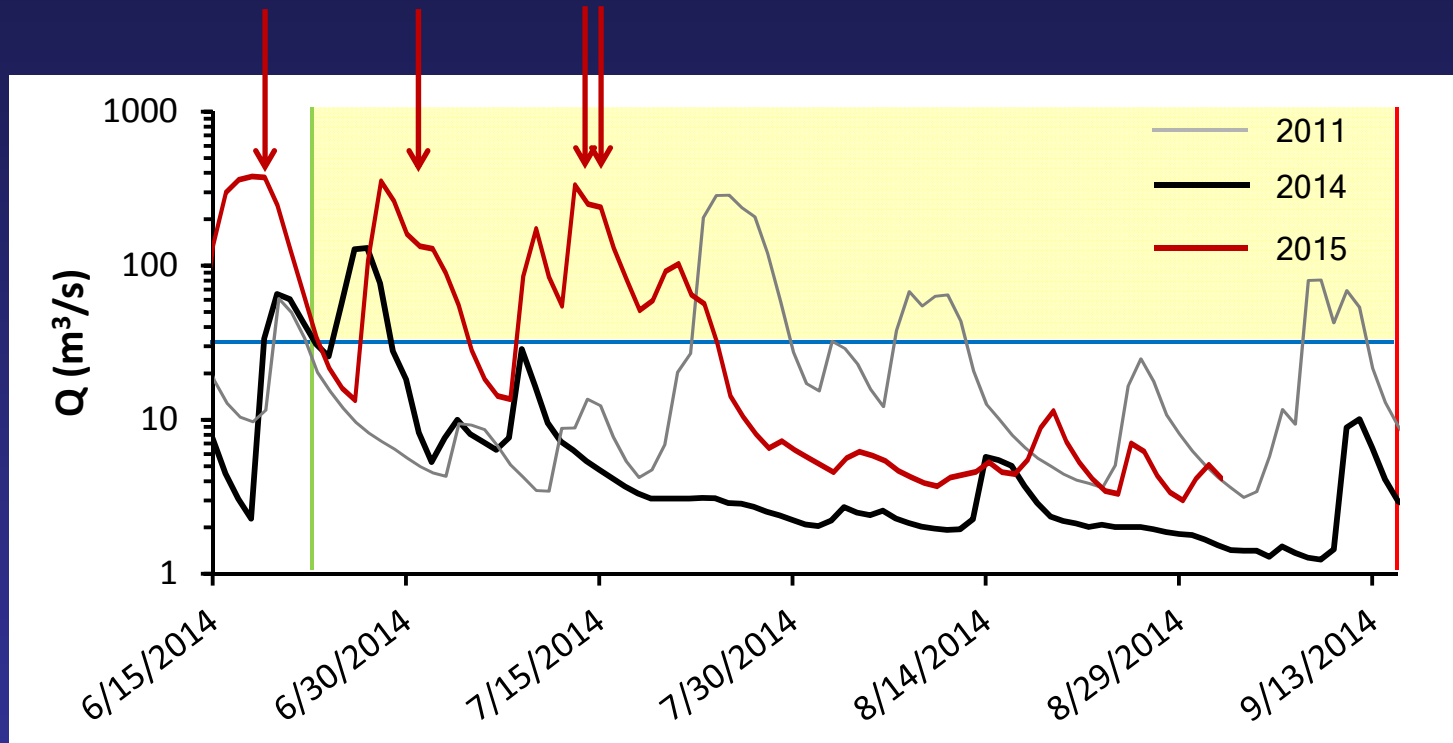


2015 Sandusky River Sampling

- Hobo temperature recorders deployed at 10 locations
- Two per site, 1 m apart
- To be used with air temperature and flow to model suitability of conditions



2015 Sandusky River Sampling



3 major events in 2015

9 eggs sampled, 6 genetically confirmed (3 retained)

Outcomes for Tributary Work

- Catch them in the act?
 - model spawning locations and probability of hatching and recruitment
 - strong confirmatory evidence of suitability of conditions
- Establish spawning chronology for Sandusky River: who and when
 - will inform potential for collateral damage if GC control measures deployed
- Establish sampling protocols for assessing spawning
- Create probabilistic models to assess risk of spawning
 - hydrologic and meteorologic variables in conjunction with USGS FluEgg model



2015-2016 Pilot Macrophyte Assessment(s)

- Assessing macrophyte communities and locations in lower Sandusky River

Objectives: near term: vegetation surveys (species richness, distributions, relative abundances) in key areas; establish baseline; identify partners

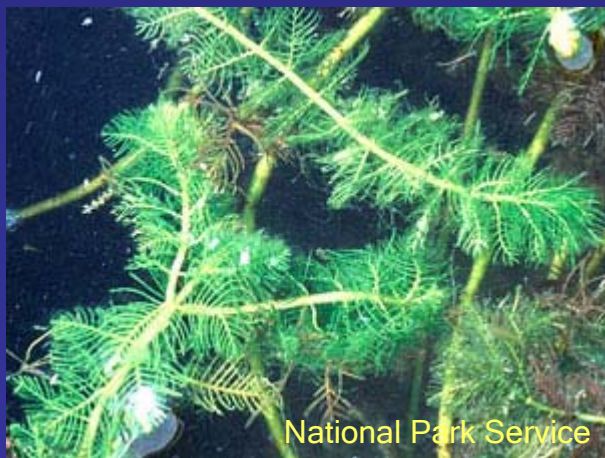
long-term: aquatic macrophyte **collaborative?**



Photo: USFWS Ottawa National Wildlife Refuge

2015-2016 Pilot Macrophyte Assessment(s)

- Not just Grass Carp!
- Invasive macrophytes
- Other invasives require macrophytes:
 - Tubenose Goby - migration corridors
 - Rusty Crayfish - herbivore
 - Red Swamp Crayfish - omnivore



2016-2018 USGS/USFWS Proposed Research

- Tributary water sampling to establish baseline water chemistry for otolith microchemistry analyses
 - Collaboration with USFWS, states/province, universities
- Telemetry of diploid and triploid GC in Truman Reservoir
 - Will inform differences in movement patterns, reveal wintering locations
- Refined models of egg transport incorporating egg mortality
 - Refined RA
- Identifying specific spawning cues
 - Increased velocity, turbidity; decreased temperature
- Models to help find spawning/rearing locations
- Provide research support to inform eradication/control options

Acknowledgments

Jeremy Pritt	USGS (now ODNR)
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Rachel Johnson	University of Toledo Lake Erie Center
Ben Kuhaneck	University of Toledo Lake Erie Center

Riverfront Marina

USGS Invasive Species Program



www.google.com, search term: silver carp image

