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# GLRI Project: Environmental DNA Surveillance – Applied Early Detection

**Cooperative Agreement** between the University of Notre Dame and the U.S. Fish and Wildlife Service (Mike Hoff, USFWS project manager)

**Four primary objectives:**

1. Collect approximately 3000 water samples throughout the Great Lakes and evaluate the samples for the presence of invasive species DNA
2. Collect approximately 300 water samples in Chicago Area ponds and lagoons to evaluate the contribution of organisms in trade to invasion risk
3. Develop and test a minimum of 12 eDNA markers for use in a Great Lakes surveillance program
4. Work with USFWS to add an environmental DNA surveillance capability to a larger Great Lakes invasive species detection program.

**Investigators:** Christopher Jerde, Andrew R. Mahon, W. Lindsay Chadderton, and David M. Lodges

**Project Manager:** Chris Jerde



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# Initial motivation is Asian carp





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## Forthcoming effort and connections to other GLRI projects

### Priorities

1. Process 250 samples collected with IN-DNR to evaluate the risk of Asian carp movement through the Maumee-Wabash intermittent connection at Eagle Marsh (Fort Wayne, IN). Doug Keller, IN-DNR project manager.
2. Process 138 samples collected with IL-DNR to evaluate the risk of Asian carp introduction in the bait trade. Vic Santucci, IL-DNR project manager.
3. Process remaining 375 samples taken from around the Great Lakes for bighead and silver carp.
4. Process 50 samples taken from Chicago area ponds and lagoons.
5. Calibration studies for eDNA surveillance of the bait trade.
6. Testing and evaluation of black carp and other molecular markers.

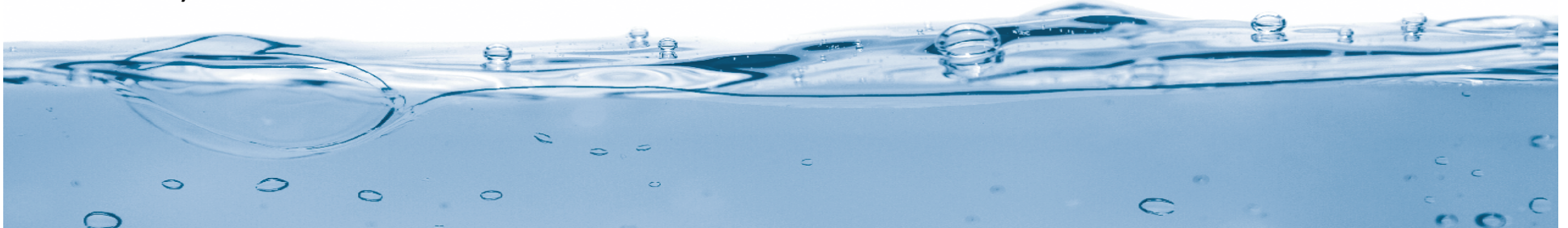




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## Progress to date

1. Ongoing development and testing of markers for: snakehead (*Channa argus*), common carp (*Cyprinus carpio*), goldfish (*Carassius auratus*), and tench (*Tinca tinca*).
2. Development of qPCR primers for Asian carp complete. Specificity testing is currently underway.
3. Site visit by USFWS geneticists complete. Markers and protocols provided. Expanded collaboration with Northwest USFWS to begin testing for Asian carp and zebra/quagga mussels.
4. Project meeting held November 4<sup>th</sup> and 5<sup>th</sup> at UND.
5. 50 samples from Chicago Area ponds collected. Ponds and lagoons prioritized by IL-DNR fish stocking records.
6. 425 samples collected from Maumee River in Ohio, Menomonee, Kinnichinnic, and Milwaukee Rivers in Wisconsin, and the St. Joseph, Paw Paw, and Galien Rivers in Michigan.
7. St. Joseph (below hydro electric dam) all negative for Asian carp DNA (19 Nov 2010, n=57)





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# Preventing Invasions from Trade in Live Organisms

**Investigators:** Reuben Keller, Nick Mandrak, Kristin TePas, Pat Charlebois, Lindsay Chadderton, and David M. Lodge

Project Manager: **Reuben Keller**

**Cooperative Agreement** between the University of Notre Dame and the U.S. Fish and Wildlife Service (Mike Hoff, USFWS project manager)

**Objective 1: Develop a Suite of Risk Assessment Tools for Aquatic Organisms in Trade**

**Objective 2: Assess a Range of Aquatic Species in Trade in the Great Lakes Basin**

**Objective 3: Communicate risk assessment tools and list of species and risks posed to policy-makers, trade leaders and other stakeholders.**



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## Preventing Invasions from Trade in Live Organisms

	method	sp. assessments	communicate
Plants:			yr 1
Mollusk:		yr 1	yr 1
Fish:	yr1-2	yr 2-3	yr 2-3
Amphibians:	yr 2-3	yr 3	yr 3
Crustacean:	yr 3	yr 3	yr 3



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## Where are we at?

1. Plant Risk Assessment method close to completion.
  - i. Accuracy analysis ~ >90% accuracy (identifying invasive and non invasives)
  - ii. ~170 species assessed
  - iii. Hold analysis will occur over Xmas to see if we cut number of questions down
2. Mollusk Risk Assessment
3. PI's met in Late November
4. Management advisory Board Met Late November





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## Forecasting spread & bioeconomic impacts of aquatic invasive species from multiple pathways to improve management & policy in the Great Lakes

### Investigators:

- **U Notre Dame**
  - David Lodge
  - Joanna McNulty, Jennifer Howeth, Chris Jerde, Ashley Baldrige, Matt Barnes
  - Rich Jensen
  - Clayton Sadler
  - **NOAA Great Lakes Environmental Research Laboratory (GLERL)**
  - Ed Rutherford
  - **U Michigan**
  - Dmitry Beletsky\*, Hongyang Zhang
  - **U Wyoming**
  - David Finnoff
  - 
  - **Resources for the Future**
  - Roger Cooke
  - **The Nature Conservancy (TNC)**
  - Lindsay Chadderton
  - **US Forest Service**
  - John Rothlisberger
  - **University of Georgia**
  - John Drake, Sean Maher\*
  - **University of Toledo**
  - Jon Bossenbroek\*
  - Jenn Sieracki, Marc Morandi
- NOAA CSCOR project Manager — Felix Martinez**  
**Lead PI: David Lodge**



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## Forecasting spread & bioeconomic impacts of aquatic invasive species from multiple pathways to improve management & policy in the Great Lakes

- **forecast the probability of establishment\***
- **forecast the potential habitat of species within the Great Lakes\***
- **forecast the potential spread of invaders within the GL\***
- **forecast ecological impacts,**
- **forecast regional economic impact,**
- **evaluate alternative management strategies\***



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## Progress to date

- Full PI meeting November
  - Set out three year work program
  - methods
- Management advisory board meeting
  - Needs assessment (which species, pathways, and issues)



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## Management advisory board role

Guide research or management priorities

Develop realistic management scenarios and cost

Peer review output – ensure user friendly to maximize uptake

Outreach and transition outputs

**David Lodge**

Professor and Director  
Center for Aquatic Conservation  
University of Notre Dame

<http://aquacon.nd.edu/>

<http://www.supremecourtus.gov/SpecMastRpt/RecentFilingsinOriginalNos.1,2&3.html>

**Christopher Jerde**

Research Assistant Professor – **GLRI eDNA Project Manager**

Center for Aquatic Conservation  
University of Notre Dame

<http://www.nd.edu/~cjerde/Contact.html>

**Reuben Keller**

Research Assistant Professor  
Center for Aquatic Conservation  
University of Notre Dame

**Lindsay Chadderton**

*Aquatic Invasive Species Director*

The Nature Conservancy  
Great Lakes Project

[nature.org](http://nature.org)



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