Project 80: Birds as Indicators of Contaminant Exposure and Effects in the Great Lakes – the Maumee AOC

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Introduction

Why swallows?

Overview – GLRI project

Specifics for the Maumee AOC

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- Contaminant research on birds since the 1970s
- Worked on the East Coast and Gulf Coast before moving to the upper Midwest in 1991
- Began working with tree swallows in the mid-1990s

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Why swallows - rather than other bird species

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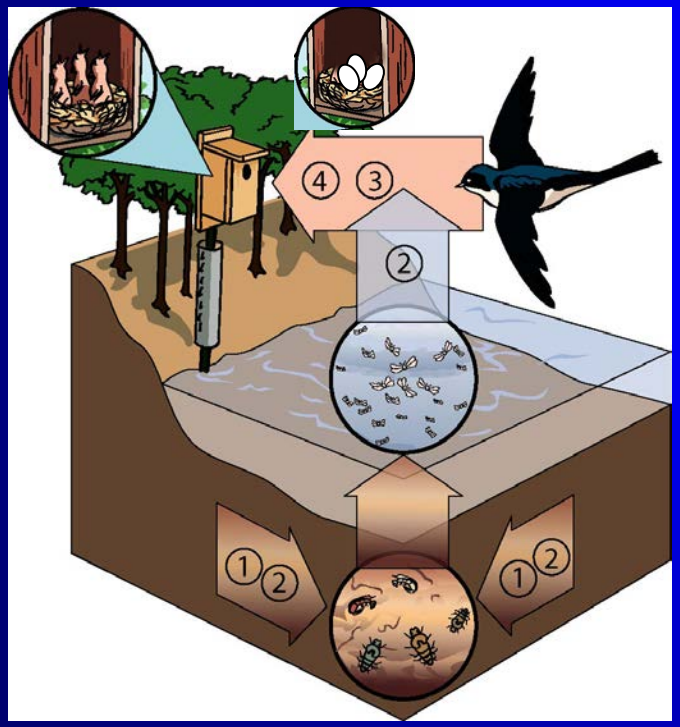

Attributes

- Feed on benthic invertebrates
- Close ties to sediment contamination
- Nest boxes at areas of interest
- Adequate sample size
- More localized feeding (± 0.5 km)
- Integrate over appropriate time and space scales
- Linkage is short
- Numerous sampling points
- Efficient to sample
- Existing data for comparison

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Scope of Work for GLRI Project 80

Use tree swallows and colonial waterbirds to:

1) Assist States & EPA in the assessment of wildlife BUIs (n = 2 BUIs)
2) Evaluate remedy effectiveness
3) Enhance our understanding of contaminant effects

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BUI assessments

1. Bird or Animal Deformities or Reproduction Problems

2. Degradation of Fish and Wildlife Populations

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Wildlife BUIs

Measure tissue concentrations (e.g. PCBs, dioxins and furans, pesticides, trace elements [Hg, Se, Cd, etc.]) in eggs, and then

Compare those to effect concentrations

Directly measure reproductive rates and

Assessing other effect endpoints (EROD, -omics, genetic damage, oxidative stress)

Using genetic damage as a surrogate for polycyclic aromatic hydrocarbons (PAHs – petroleum products)

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Overview and Progress -

- 60 sites in 25 AOCs (24 sites in 2010 ▲; 11 new in 2011 ▲; 12 more in 2012 ▲; 7 new in 2013 ▲; 6 new in 2014 ▲)

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Maumee AOC

Ottawa River (since 2010) – pre-, during, and post-dredging

Boxes at 3 landfills

Lower Maumee River (since 2011)

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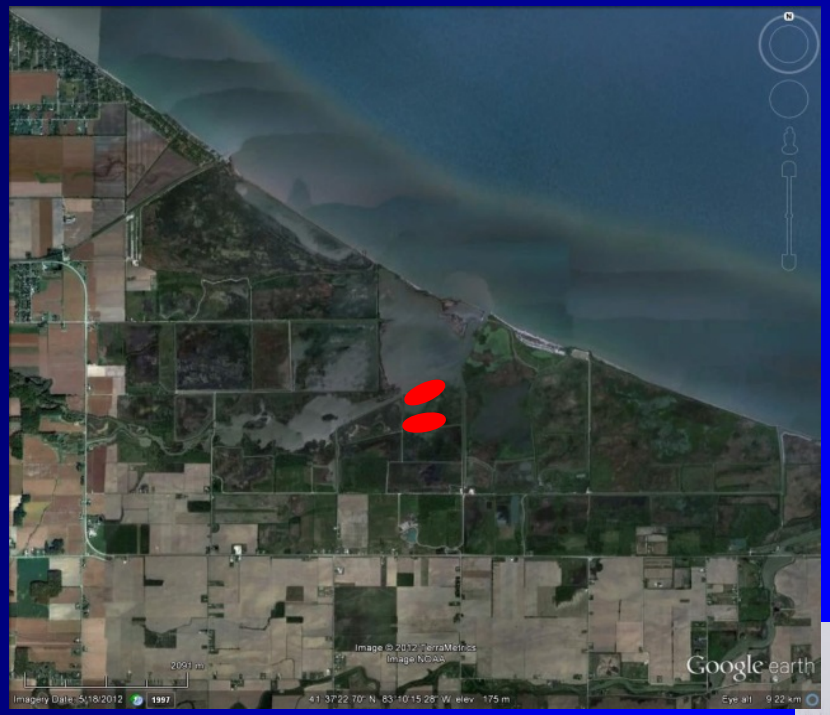

Ottawa Nat'l Wildlife Refuge

(impoundment and along Crane Creek)

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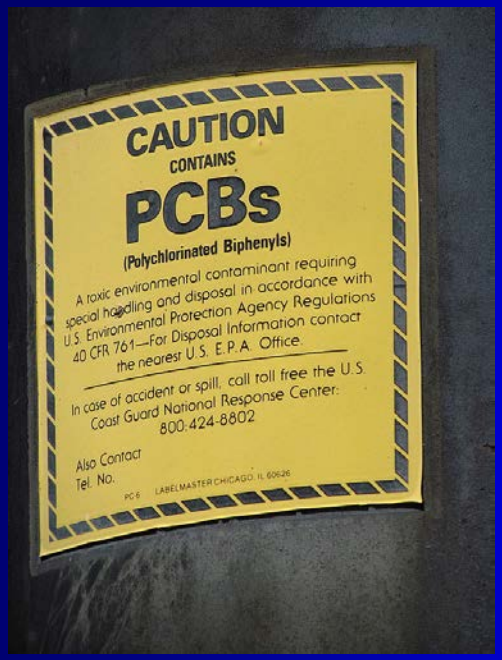
Chemical data



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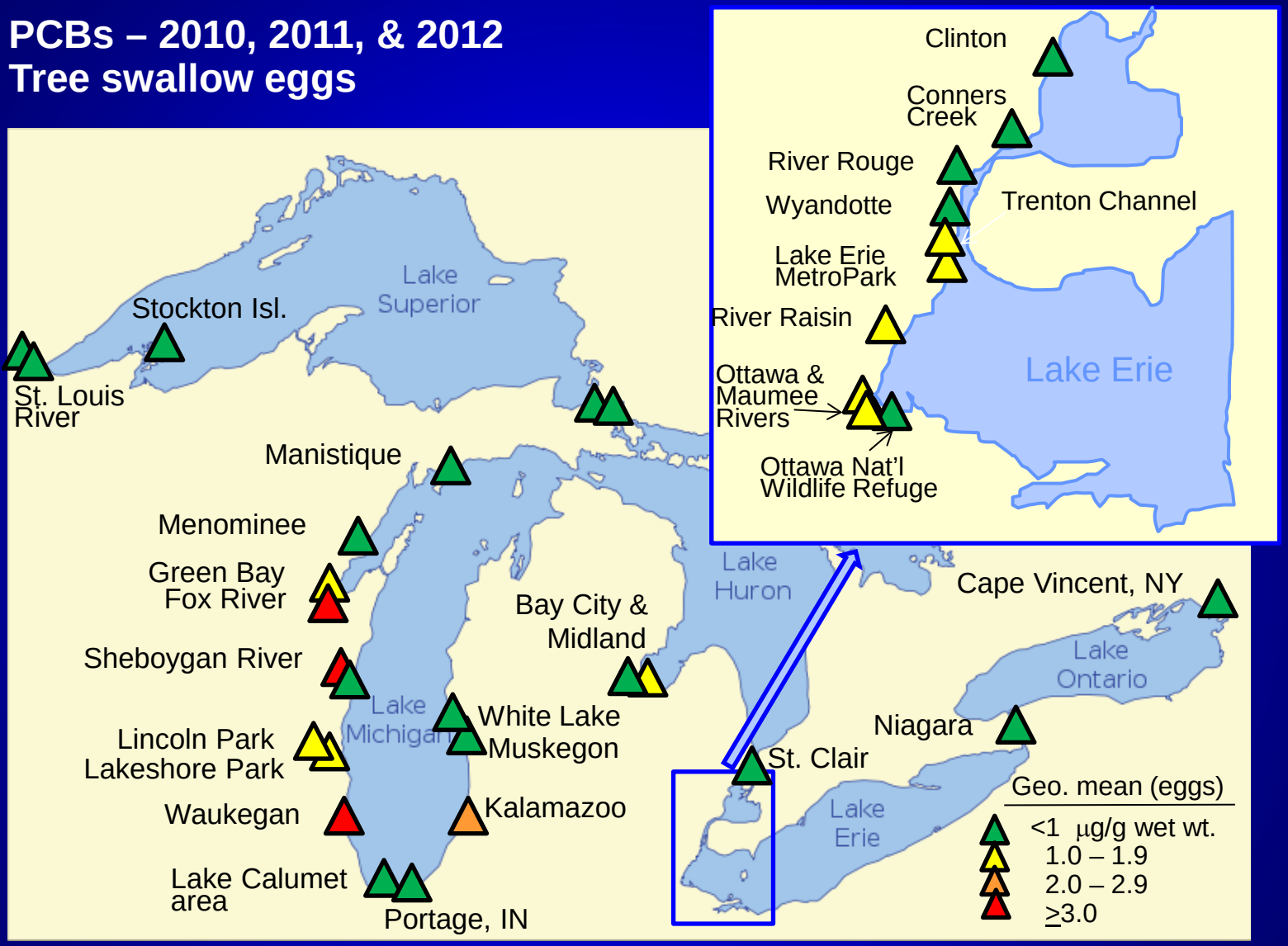
PCBs – 2010, 2011, & 2012
Tree swallow eggs



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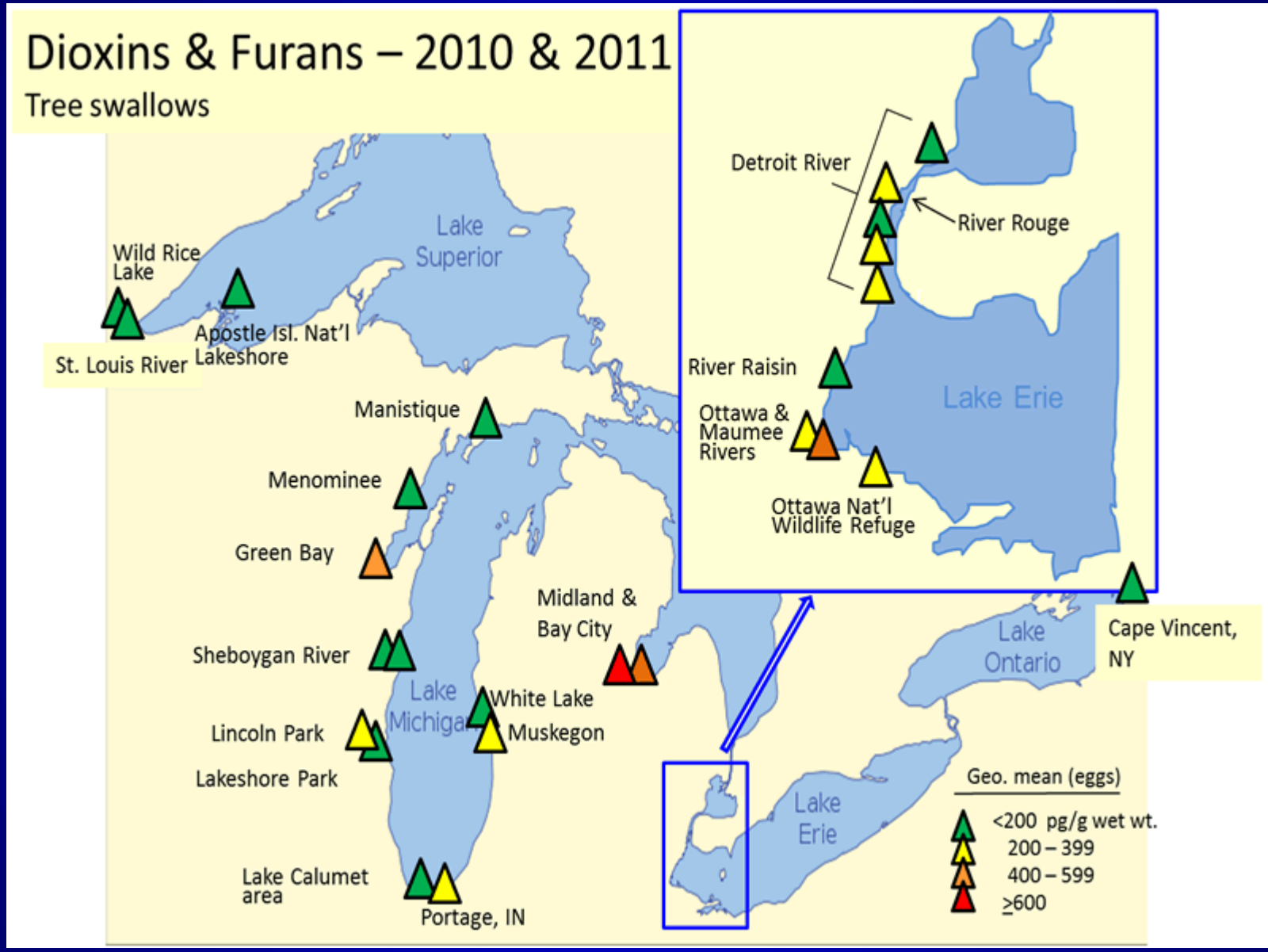
Dioxins & Furans – 2010 & 2011

Tree swallows



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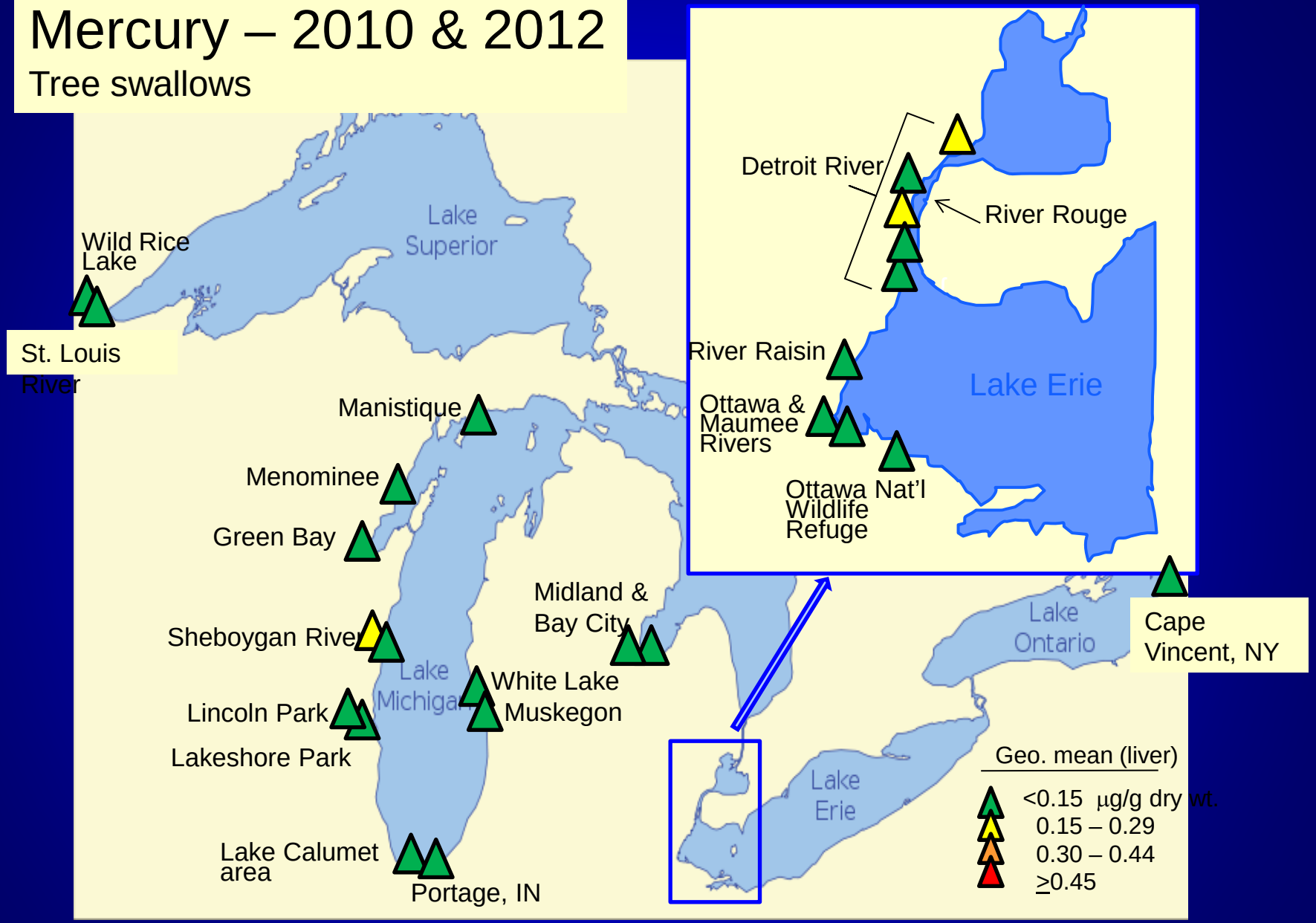
Mercury – 2010 & 2012

Tree swallows



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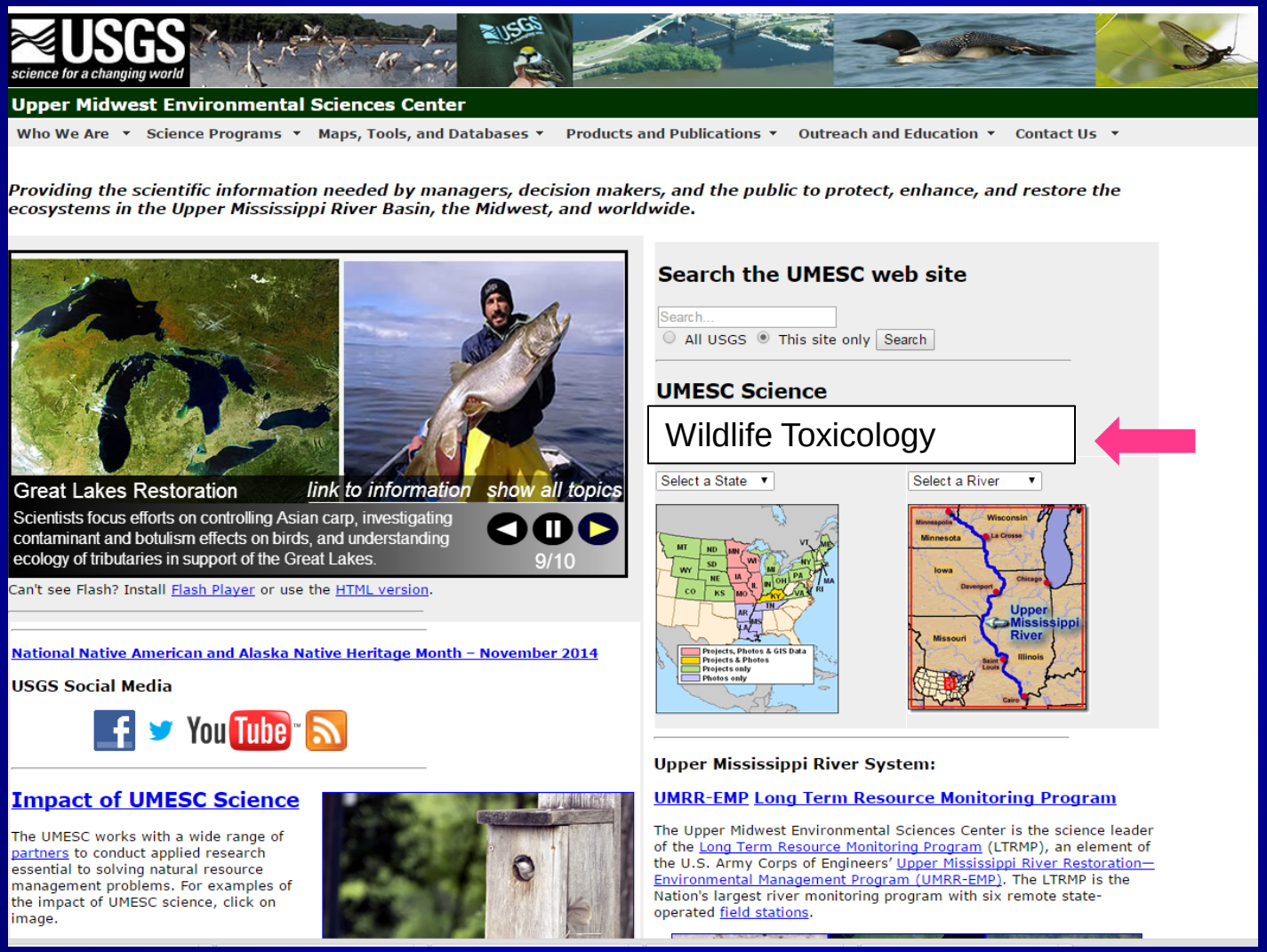
Additional contaminant information available



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BUI – Bird or Animal Deformity or Reproductive Problems

- Number of nests initiated
- Number of eggs laid
- Number (%) that hatch
- Number of young fledged

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Ottawa River sites (n=3 sites, 5 years) – normal reproduction

- Nearly all nests hatch and fledge young

Ottawa Nat'l Wildlife Refuge – normal reproduction

Maumee River site (n=1 site) – nearly total reproductive failure in 2014 and poor reproduction in 2012 & 2013

Nests are initiated, eggs are laid, but then many nests abandoned

It's a mystery that we wish to solve!

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Options we've ruled in or ruled out.

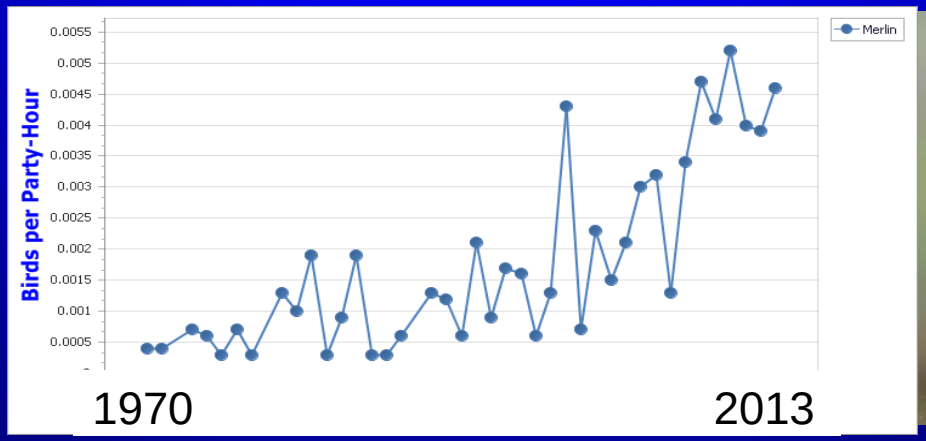
Weather – similar between Ottawa and Maumee sites

Predators – boxes are protected from ground predators, but an aerial predator could be possible

Solution: add new box arrays upstream or downstream to see if other nearby sites are similarly affected

Exposure to unidentified contaminants

Solution: biomarkers may help parse out and direct this assessment



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2015 and beyond

Continue collecting samples and monitoring reproduction at the Maumee site

Expand sites on the Maumee River (upstream and downstream) and add other locations of particular interest

See what information we can glean from our biomarker data as well as other information for the Maumee

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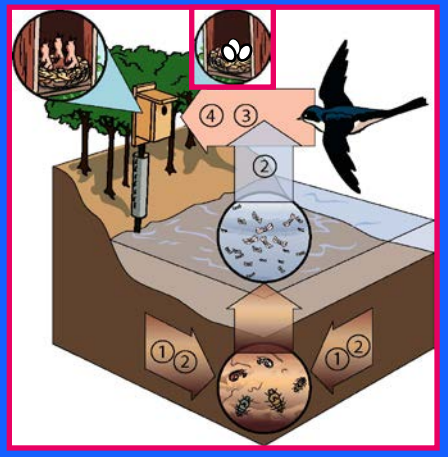
http://www.umesc.usgs.gov/wildlife_toxicology/glri_project80.html

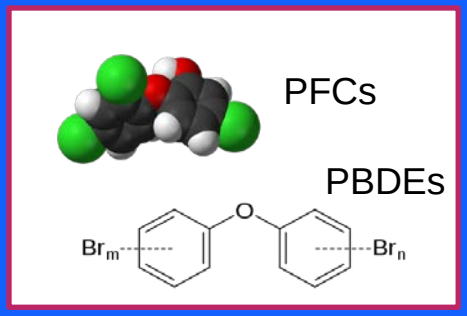
Goals and objectives

Maps and habitats at current study sites



Why use swallows?

Preliminary results



Thank you