Onondaga Lake Recovery: Declining Mercury in Water and Fish

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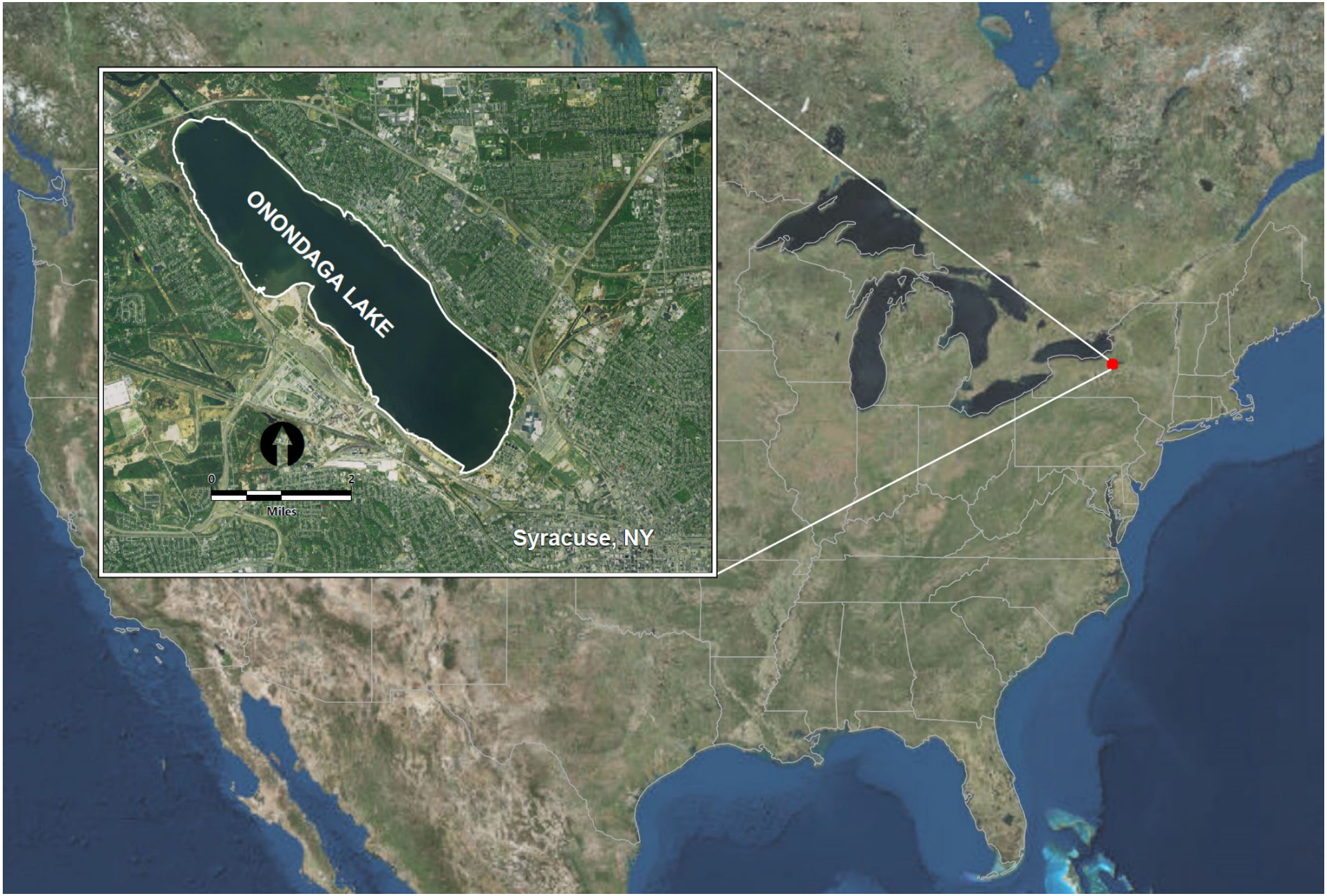
THE POWER OF **CONNECTED**

John McAuliffe


ONONDAGA LAKE
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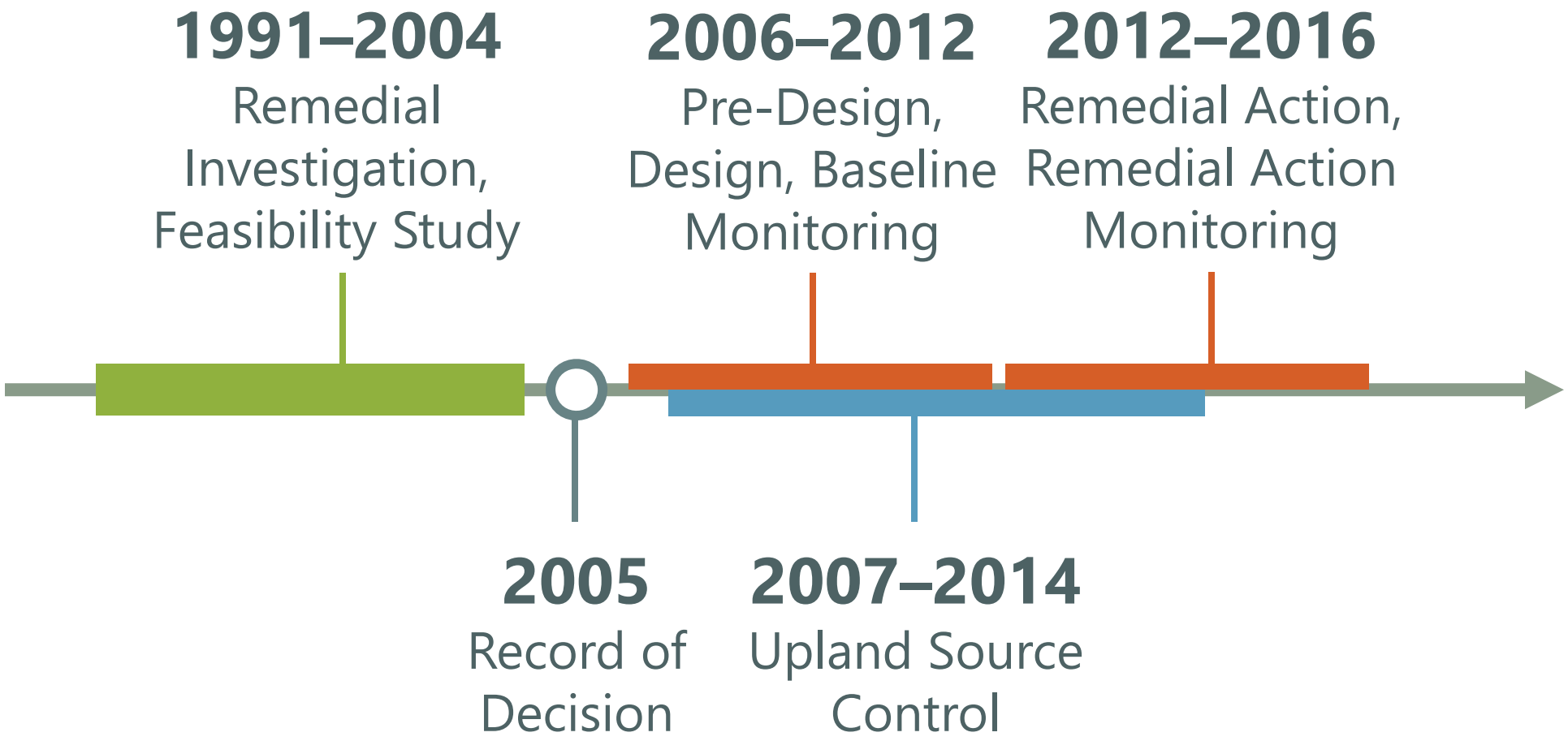
2
Miles
Syracuse, NY

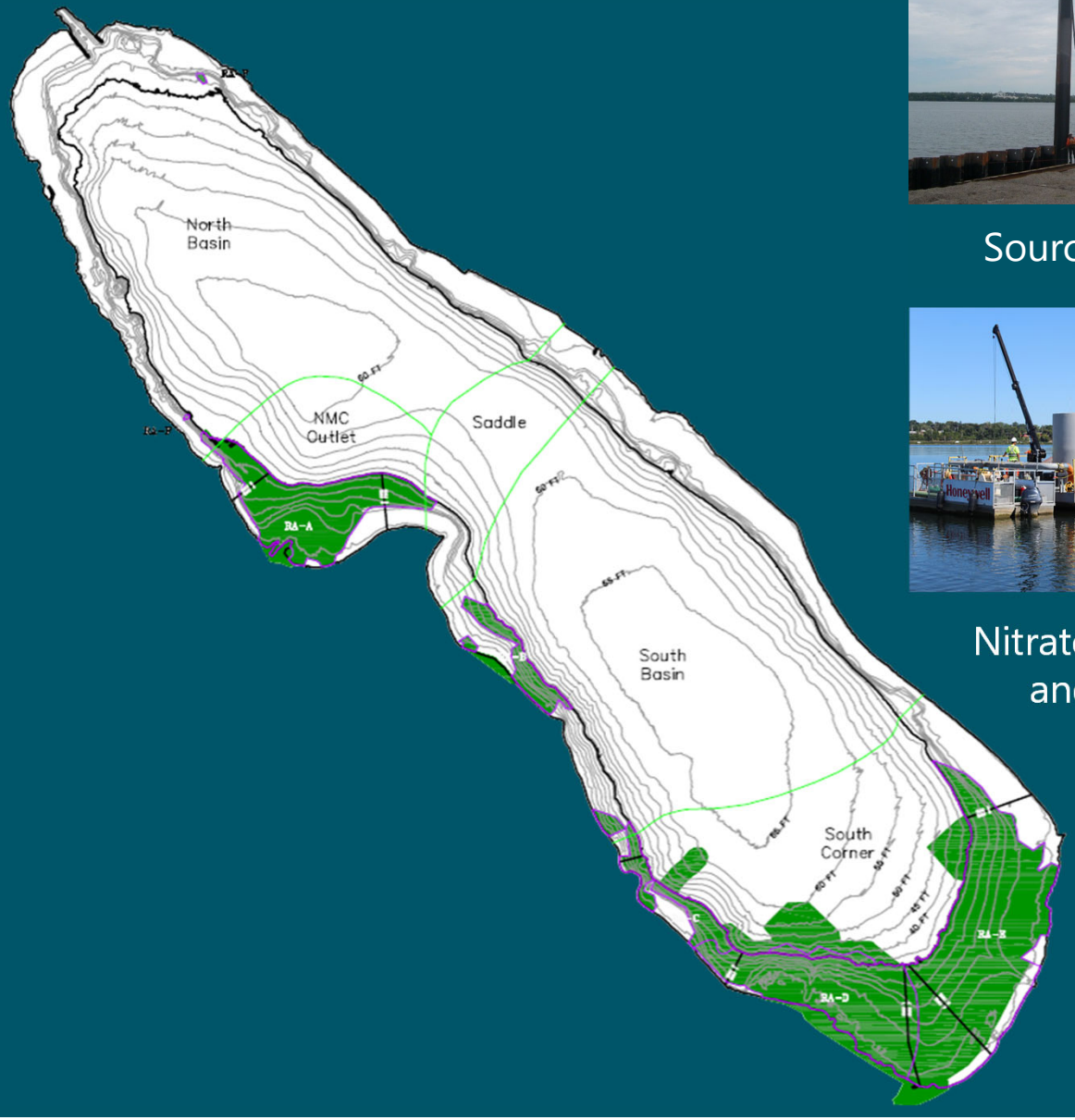

1991–2004
Remedial Investigation, Feasibility Study
2006–2012
Pre-Design, Design, Baseline Monitoring
2012–2016
Remedial Action, Remedial Action Monitoring
2005
Record of Decision
2007–2014
Upland Source Control

The Remedy

Dredging

Habitat Restoration

Capping



Source Control

Nitrate Addition and MNR

Monitoring Remedy Effectiveness

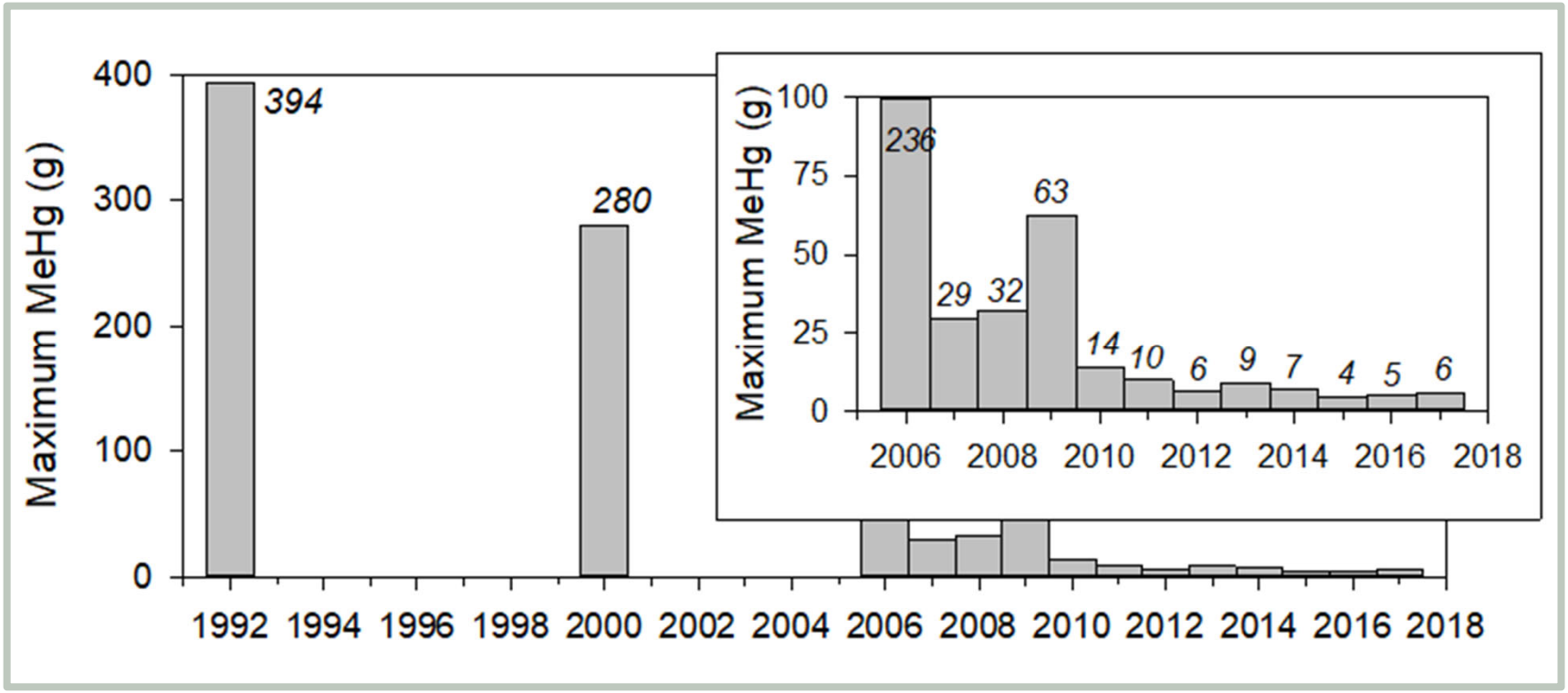
Long-term monitoring of water and fish tissue, among other media, will track the progress of the remedy in achieving remedial goals

Annual Monitoring for Surface Water and Fish

- Surface water
  - Mid-May through mid-November
  - Samples collected at various depth intervals 2 to 18 m
  - Analyzed for total mercury and methylmercury
- Fish tissue
  - 25 samples each from 4 species of adult sportfish
  - 24 large prey fish samples
  - 24 small prey fish composite samples
  - Analyzed for total mercury[1]

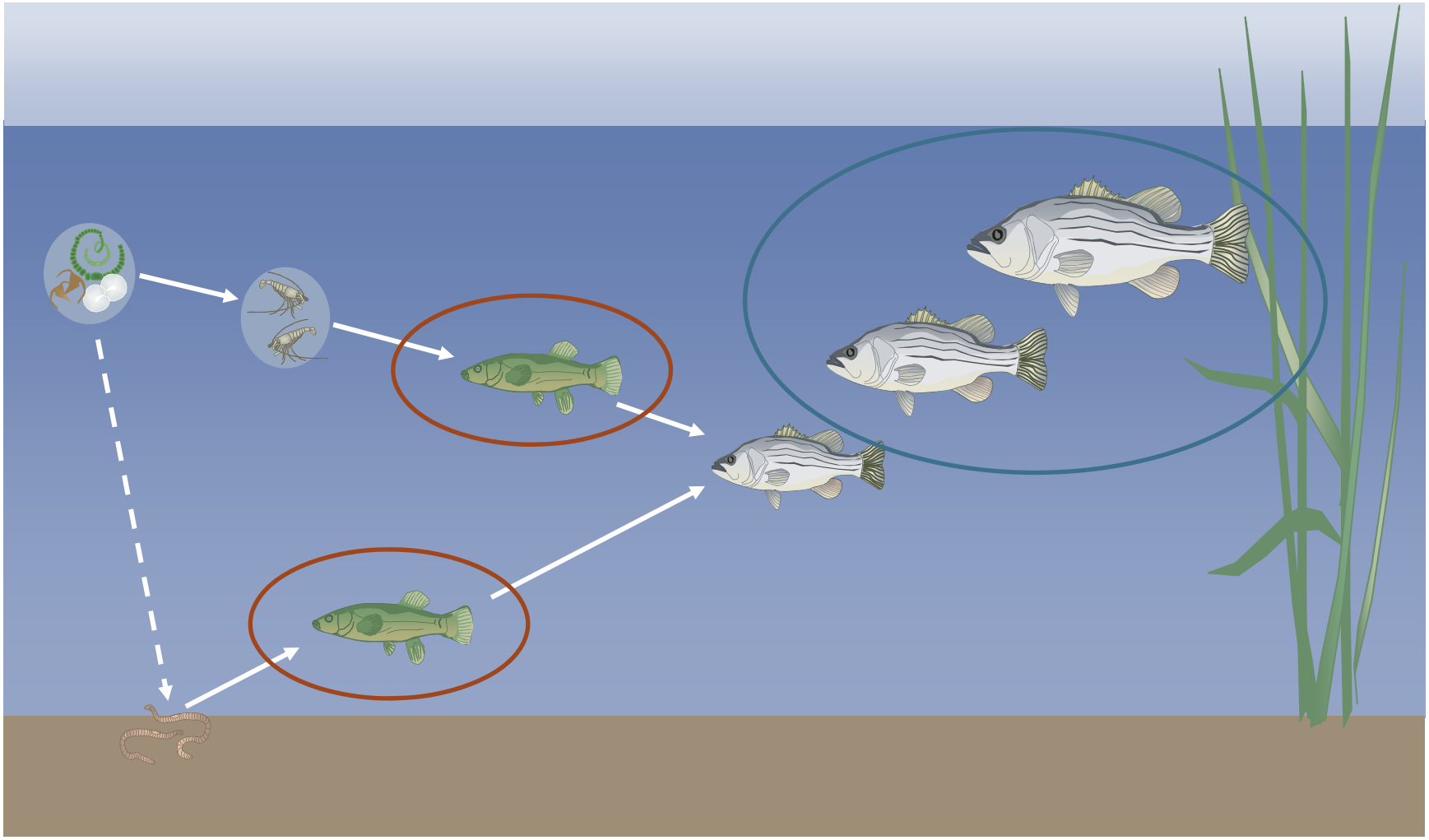
[1] Fish tissue was also analyzed for PCBs (sport and prey fish), dioxins/furans (sport fish), and DDT and metabolites (prey fish), but there are no performance standards associated with those chemicals of concern.

Mass of Methylmercury in Water is Declining



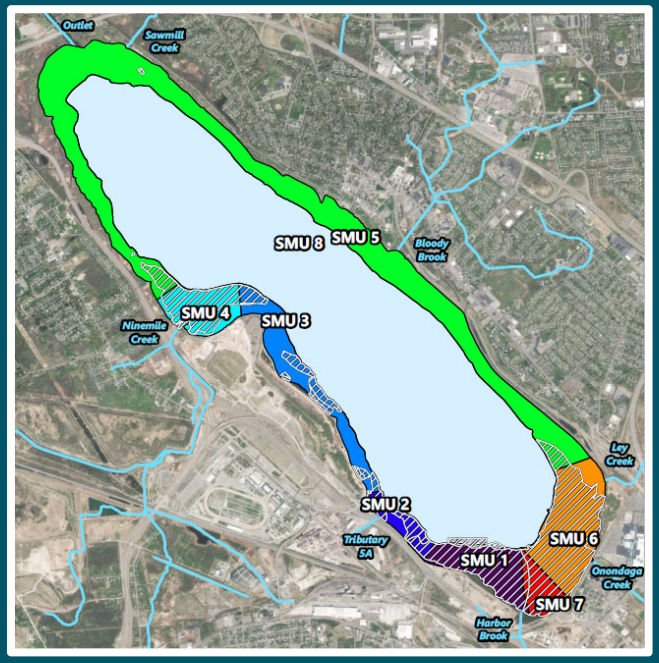
Annual maximum mass of methylmercury in the hypolimnion of Onondaga Lake from 1992 through 2017

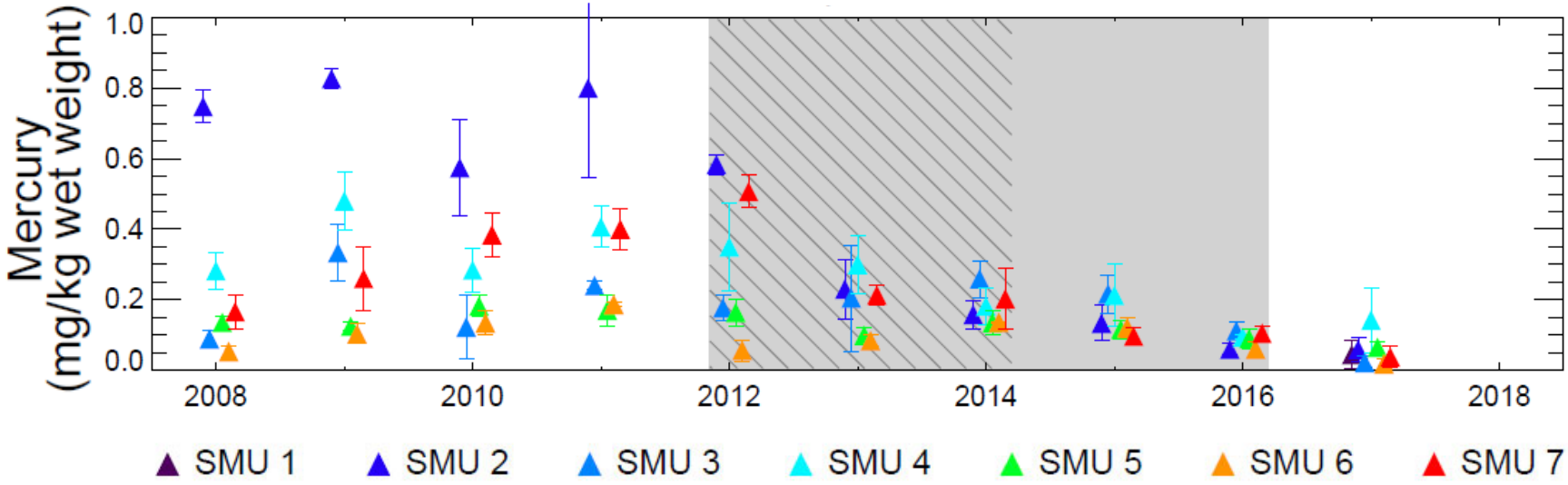
Monitoring Different Trophic Levels and Exposure Pathways



Mercury Declining in Prey Fish

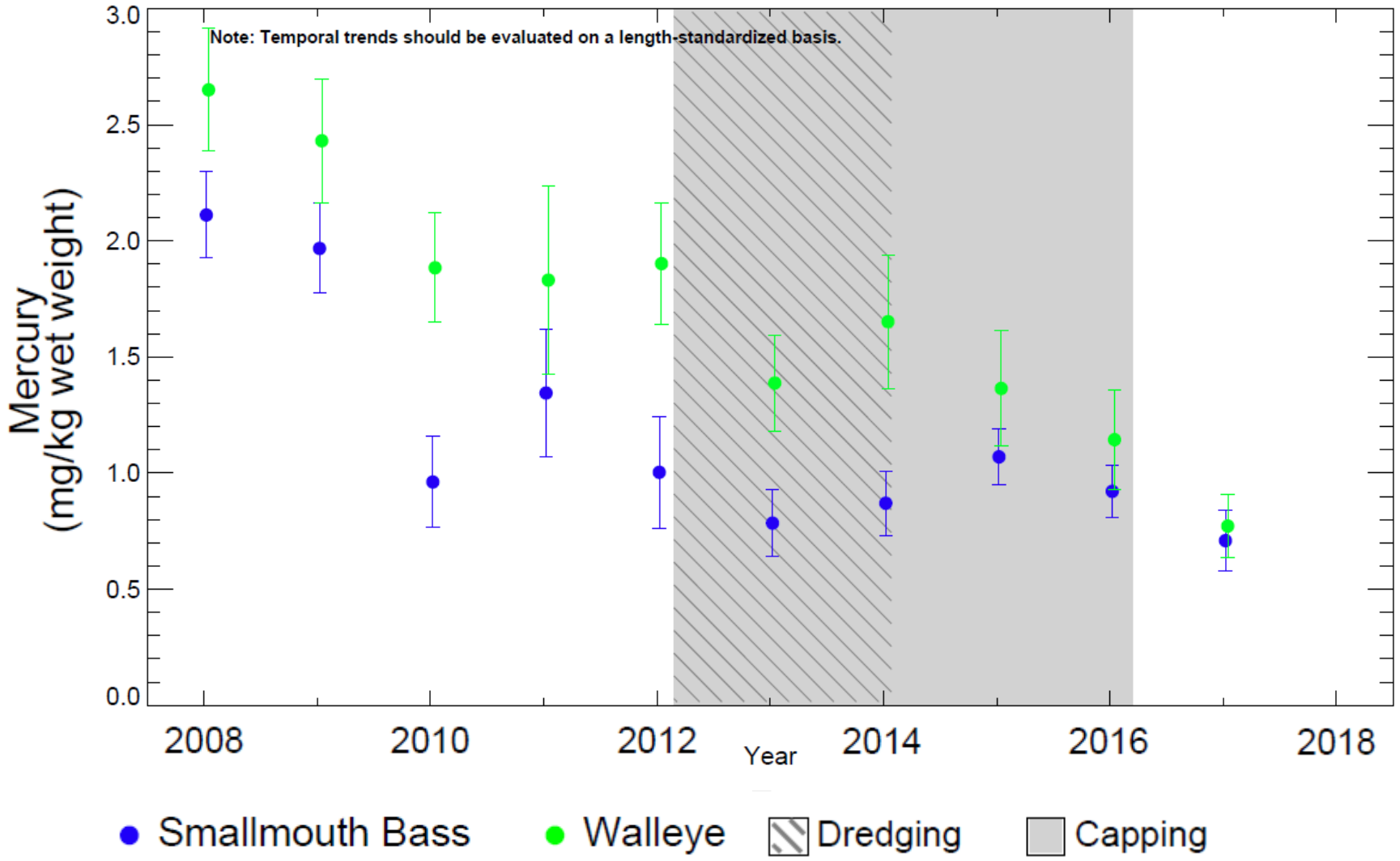
- Greatest reductions in fish observed in areas that were most contaminated previously



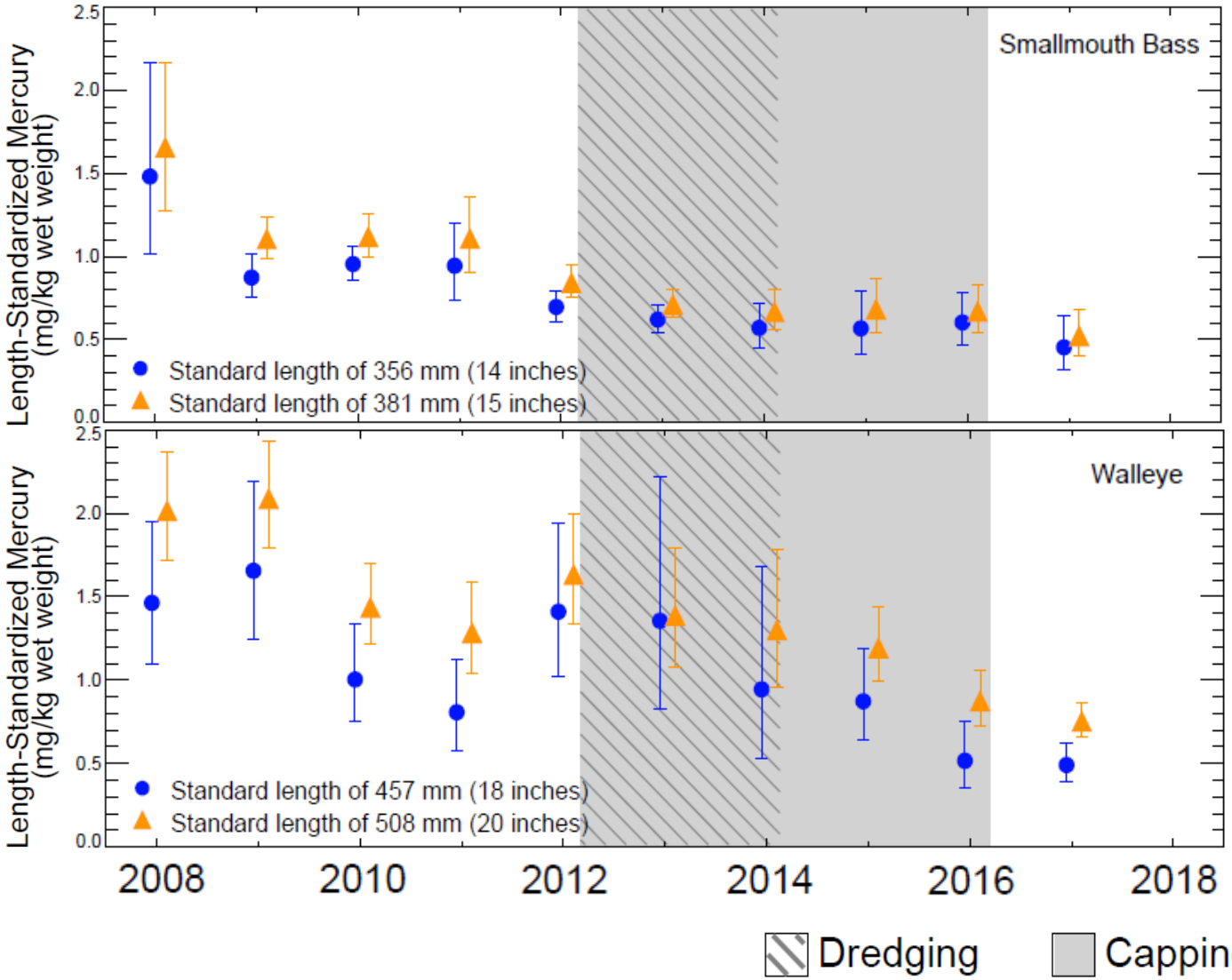


Notes: Non-detects set to half the method detection limit. Error bars represent 2 standard errors of the mean. Samples are whole-body composites. In-lake remediation began in late July 2012; fish were sampled in early August 2012.

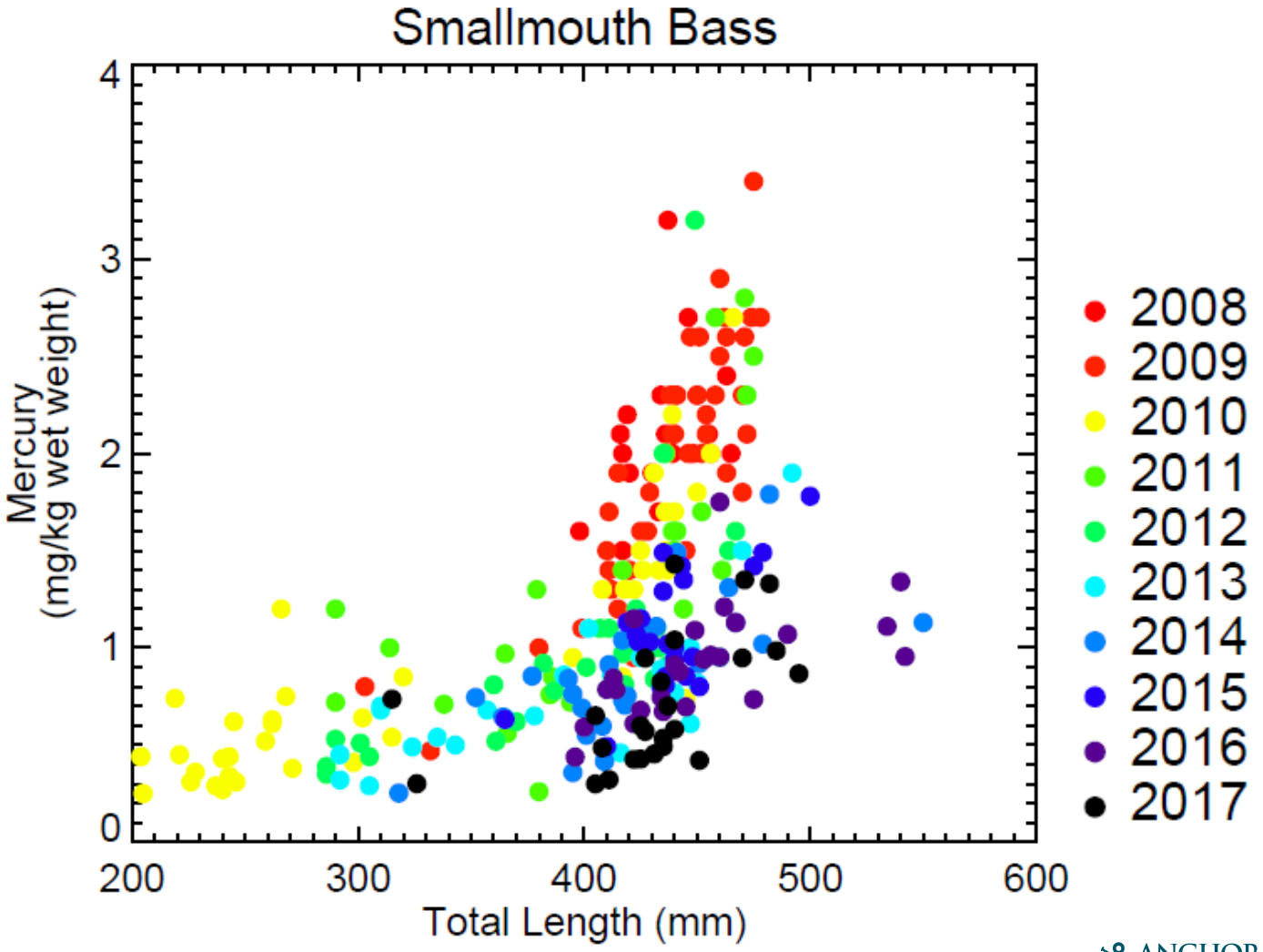
Mercury in Sport Fish is Declining



Declines are Apparent on Standard Length Basis



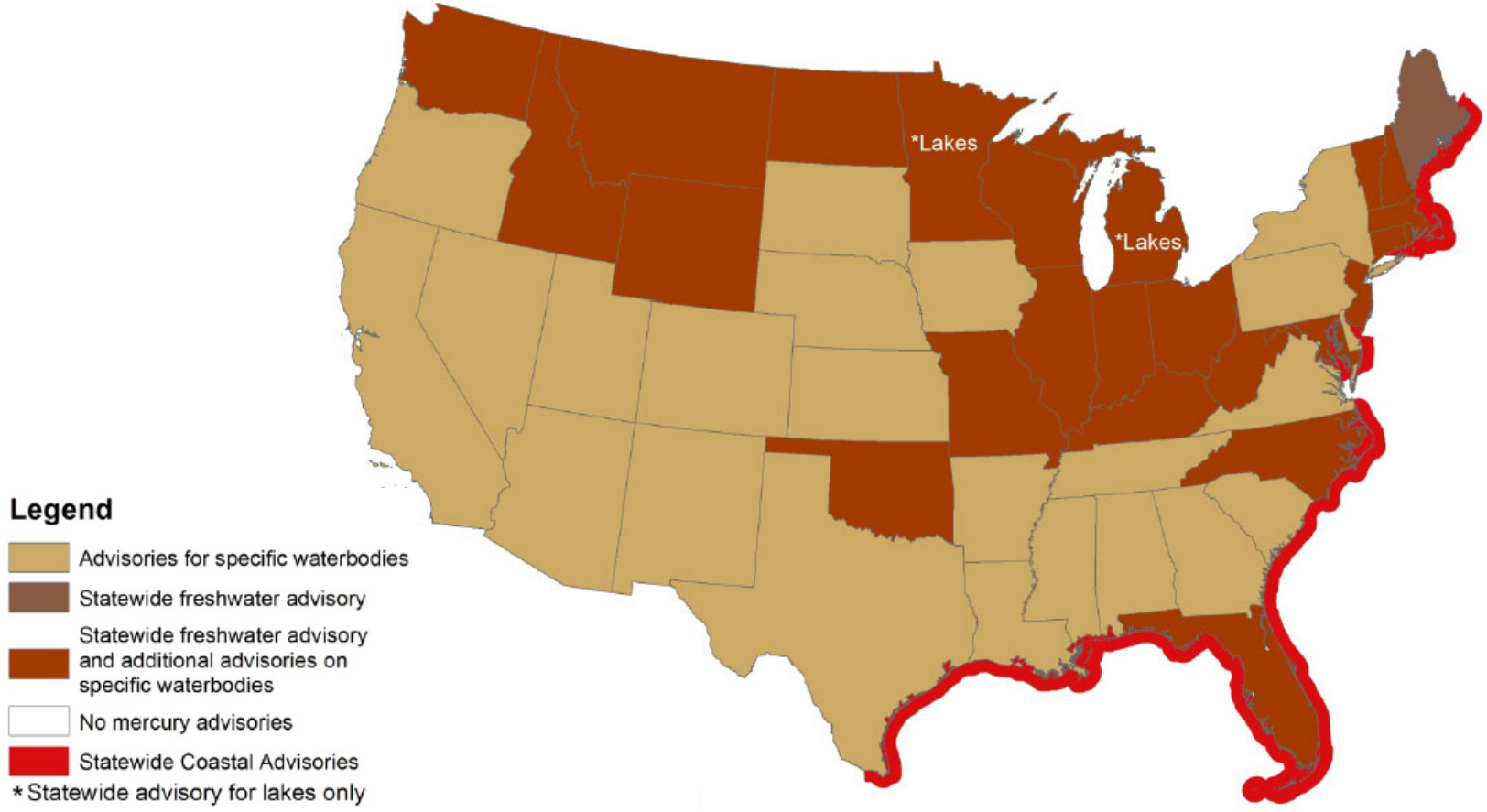
Particularly Apparent When Comparing Mercury and Total Fish Length



Evaluation of Remedy Effectiveness

- Sport fish expected to continue to decline, albeit at a slower rate than prey fish
  - Longer life cycles and higher position in the food chain result in slower response to system-wide reductions
- Lower concentrations observed in water and prey fish are positive early indicators for the trajectory of recovery in sport fish
- But…

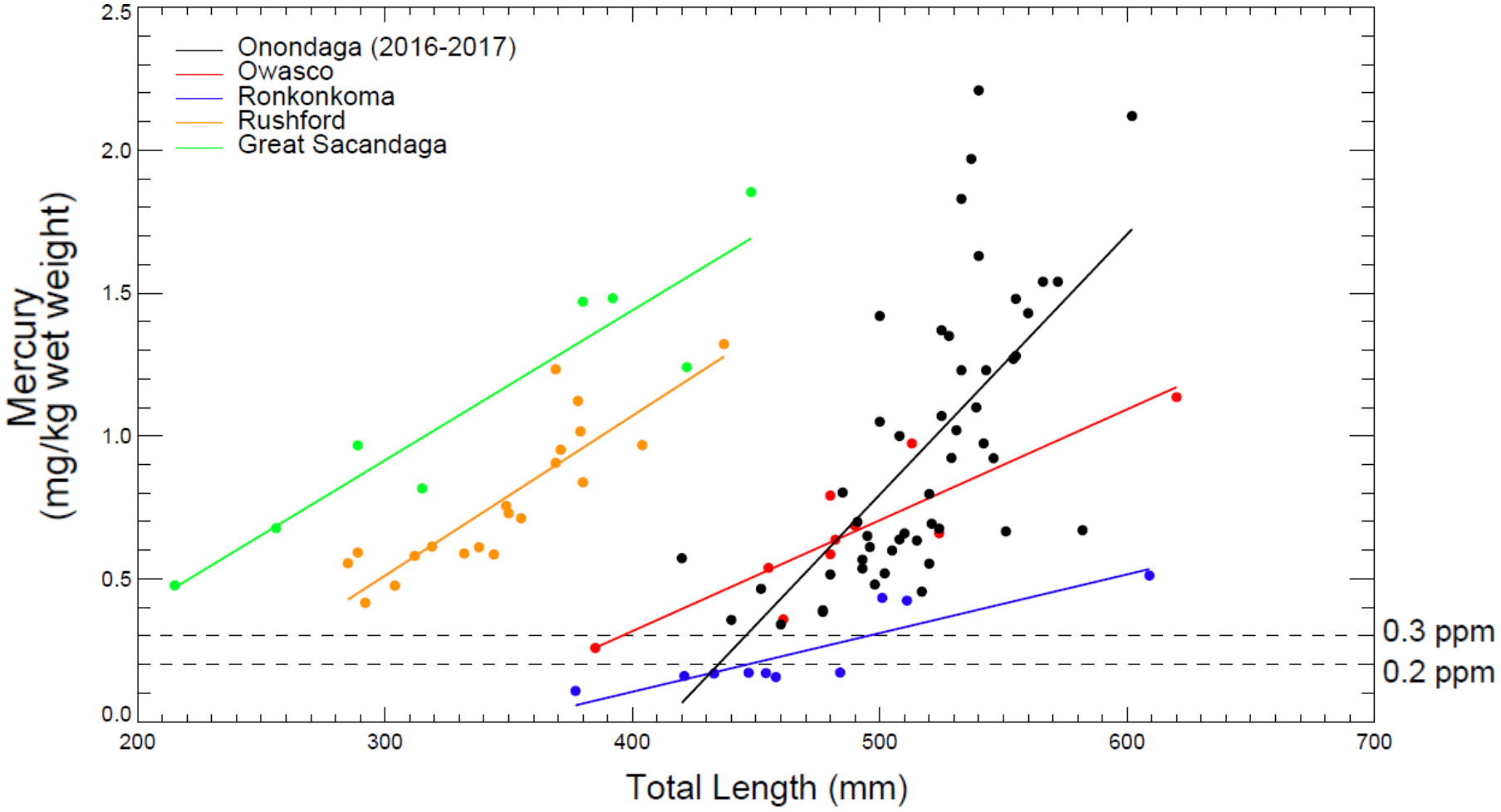
Fish Consumption Advisories for Mercury



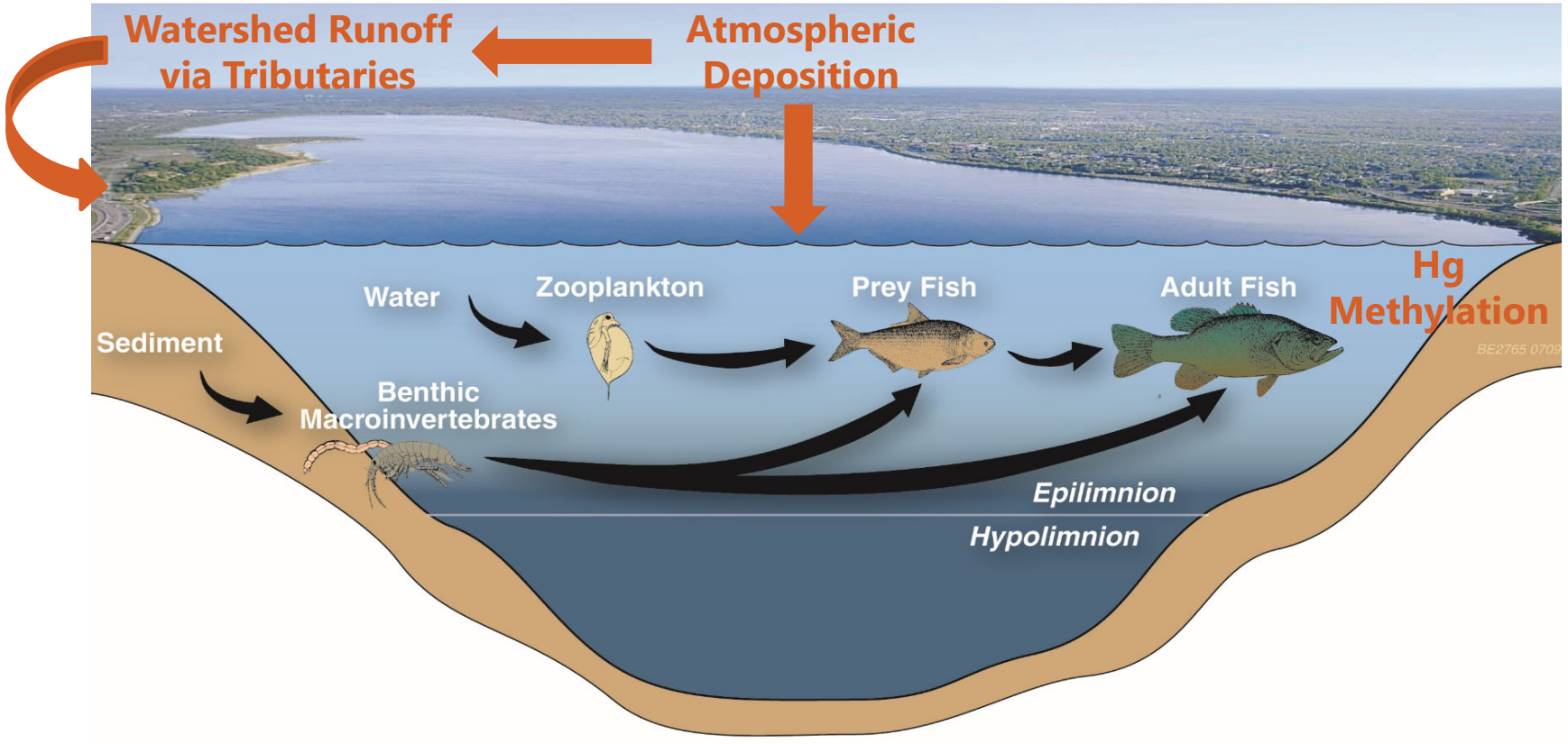
Source: 2011 National Listing of Fish Advisories

Ultimately, reductions will be limited to what can be achieved regionally

Mercury in Walleye: Onondaga Lake vs. Regional Lakes



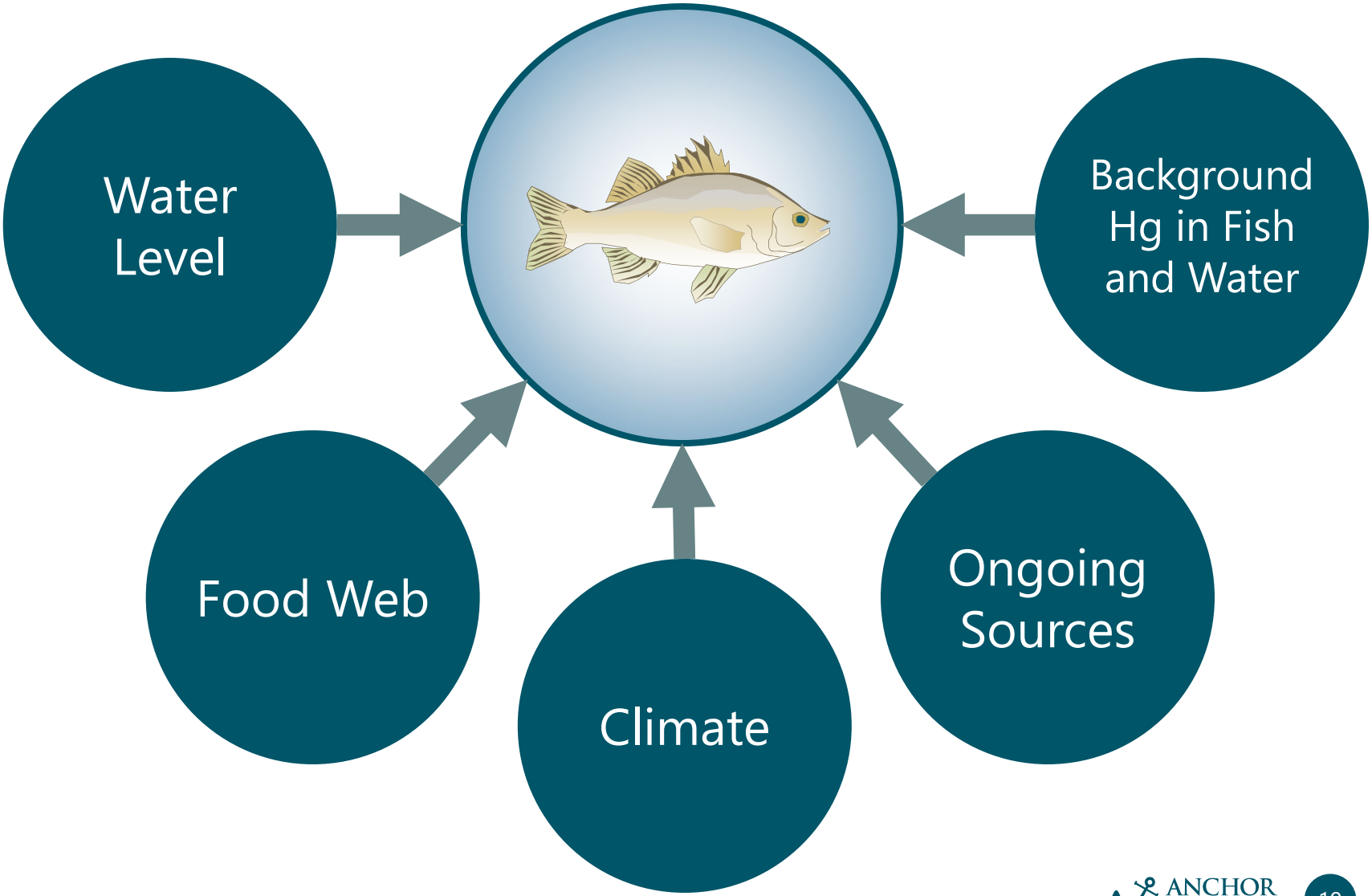
Ongoing Atmospheric Deposition of Hg and In-Lake Methylation (While Decreasing with Time) Will Continue to Contribute Methylmercury to Fish



“Mercury is ubiquitous in New York waters… wide-ranging health advisories limiting the consumption of fish are in place due to elevated levels of mercury in certain fish species…”

— NYSDEC, 2015

Large-Scale Factors Can Impact Remedy Success



Questions/Discussion

References

- USEPA, 2011. *National Listing of Fish Advisories 2011*. (Slide 15)
- NYSDEC, 2015. *Department of Water 1.3.10 Mercury – SPDES Permitting and Multiple Discharge Variance*. October 2015. (Slide 18)