Bioaccumulation of Methylmercury in Aquatic Food Webs in Indiana Dunes National Lakeshore (INDU)

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Why are we concerned about Hg?

Thresholds of Mercury Toxicity

300 ppb (ng/g) wet weight:

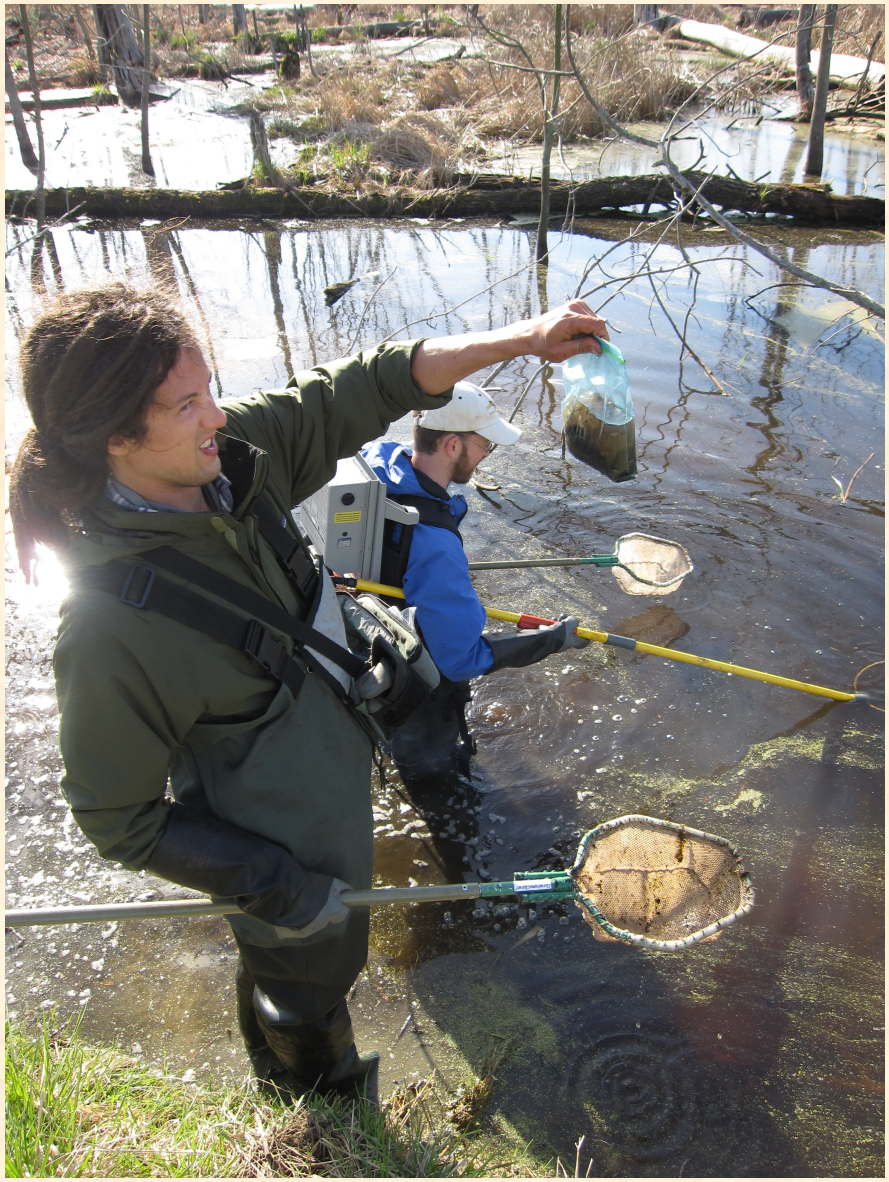
EPA tissue residue criterion for methylmercury, established to protect the health of humans who eat noncommercial fish.

500 ppb (ng/g) wet weight:

Associated with altered biochemical processes, damage to cells and tissues, and impaired reproduction in fish.

(Dillon et al., 2010; Sandheinrich and Wiener, 2011)

Mercury in aquatic food webs in six parks of the Great Lakes Network: bioaccumulation and risks to fish



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Study Objectives

- To assess spatial and temporal patterns for methylmercury (MeHg) in food webs
- To identify parks and sites where MeHg exposure may adversely affect biota
- To identify factors and processes that control bioaccumulation of MeHg in aquatic food webs

National park units under study…

National parks

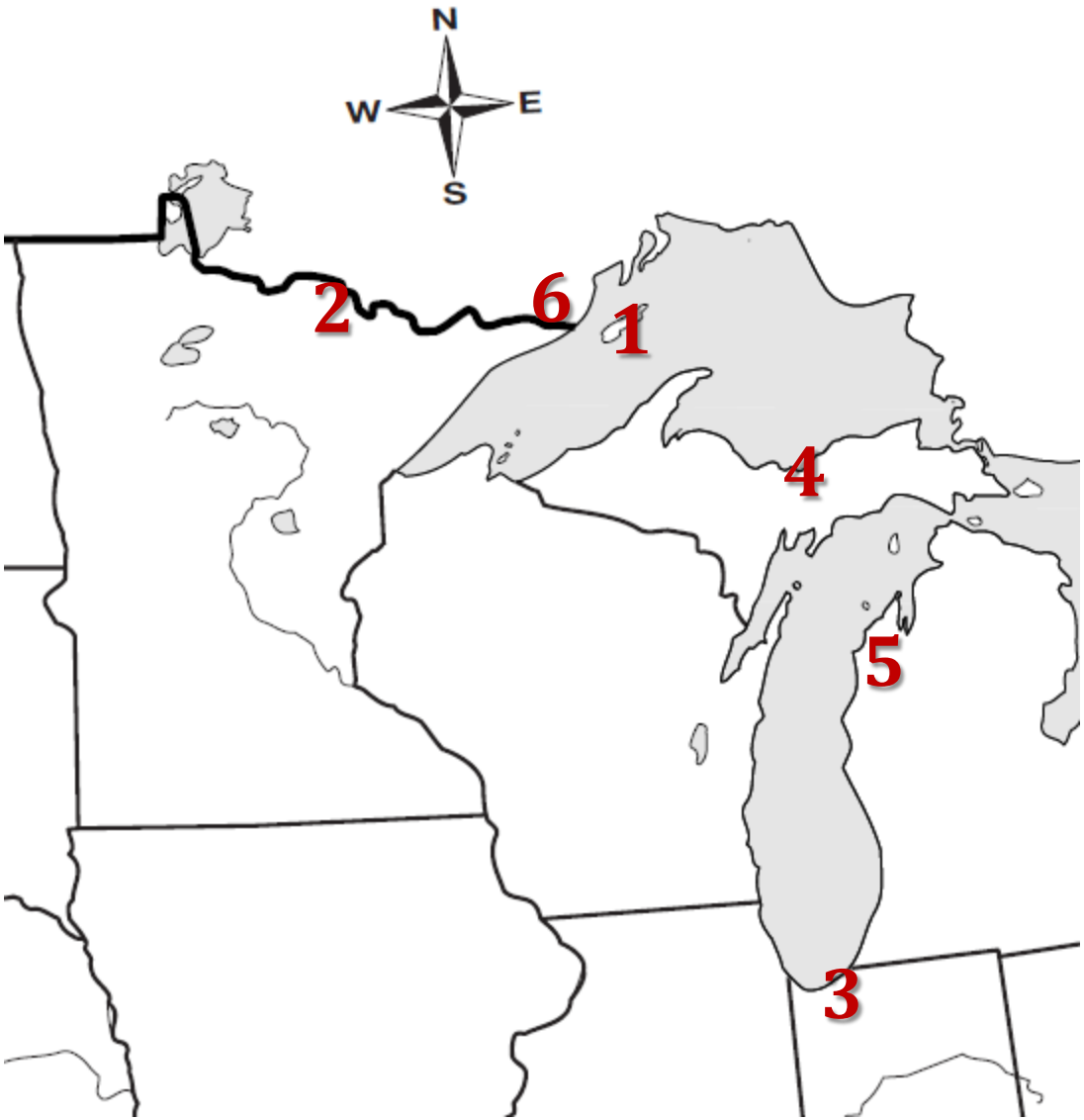
1. Isle Royale (ISRO)
2. Voyageurs (VOYA)

National lakeshores

3. Indiana Dunes (INDU)
4. Pictured Rocks (PIRO)
5. Sleeping Bear Dunes (SLBE)

National monument

6. Grand Portage (GRPO)

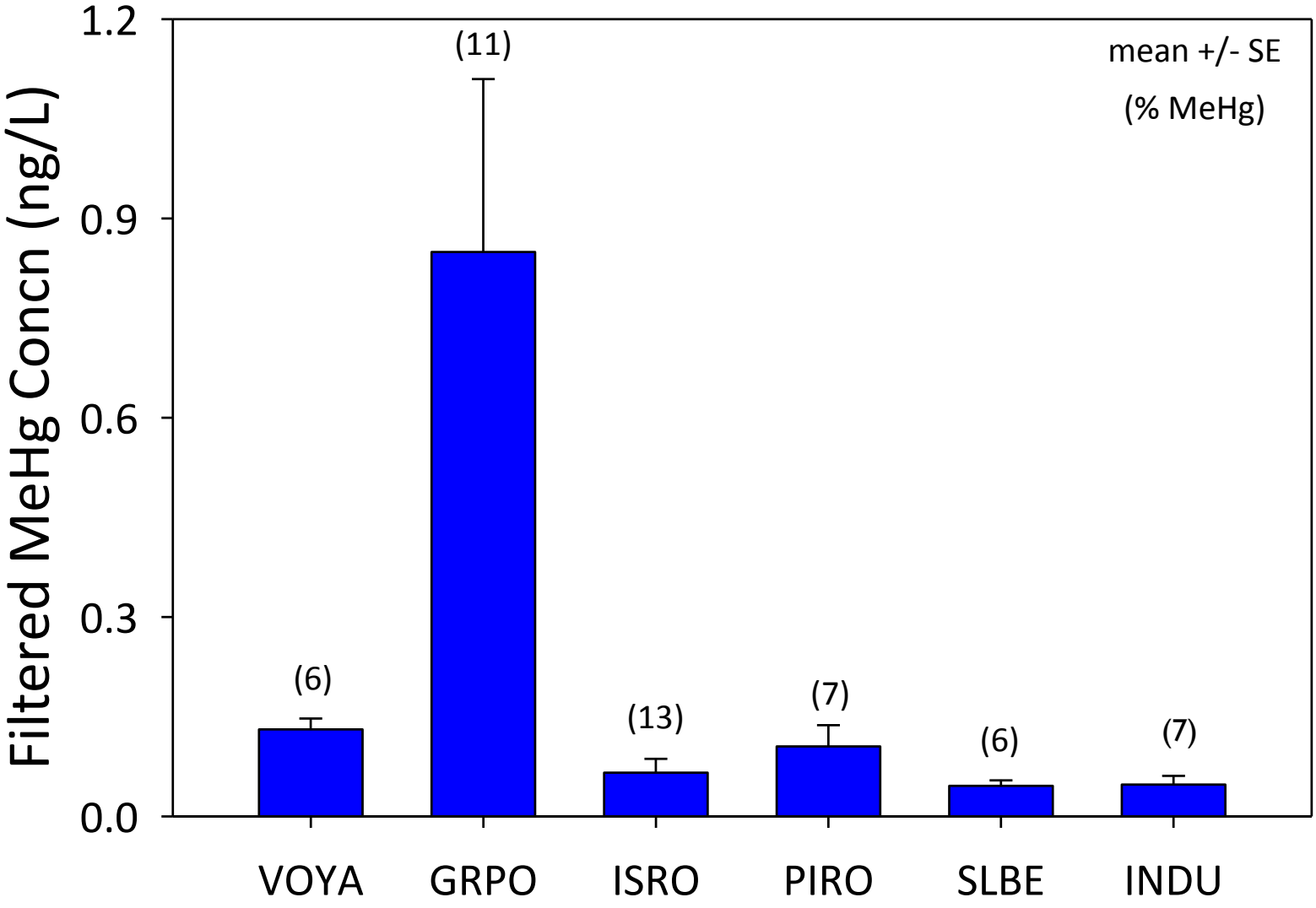


INDU Filtered Water Summary 2010-12

Parts per trillion (ng/L)

	MeHg	THg	%
Middle Lagoon	0.044	0.71	6.3
Long Lake	0.057	1.2	4.9
Great Marsh	0.19	2.1	9.2

GLKN MeHg in Filtered Water

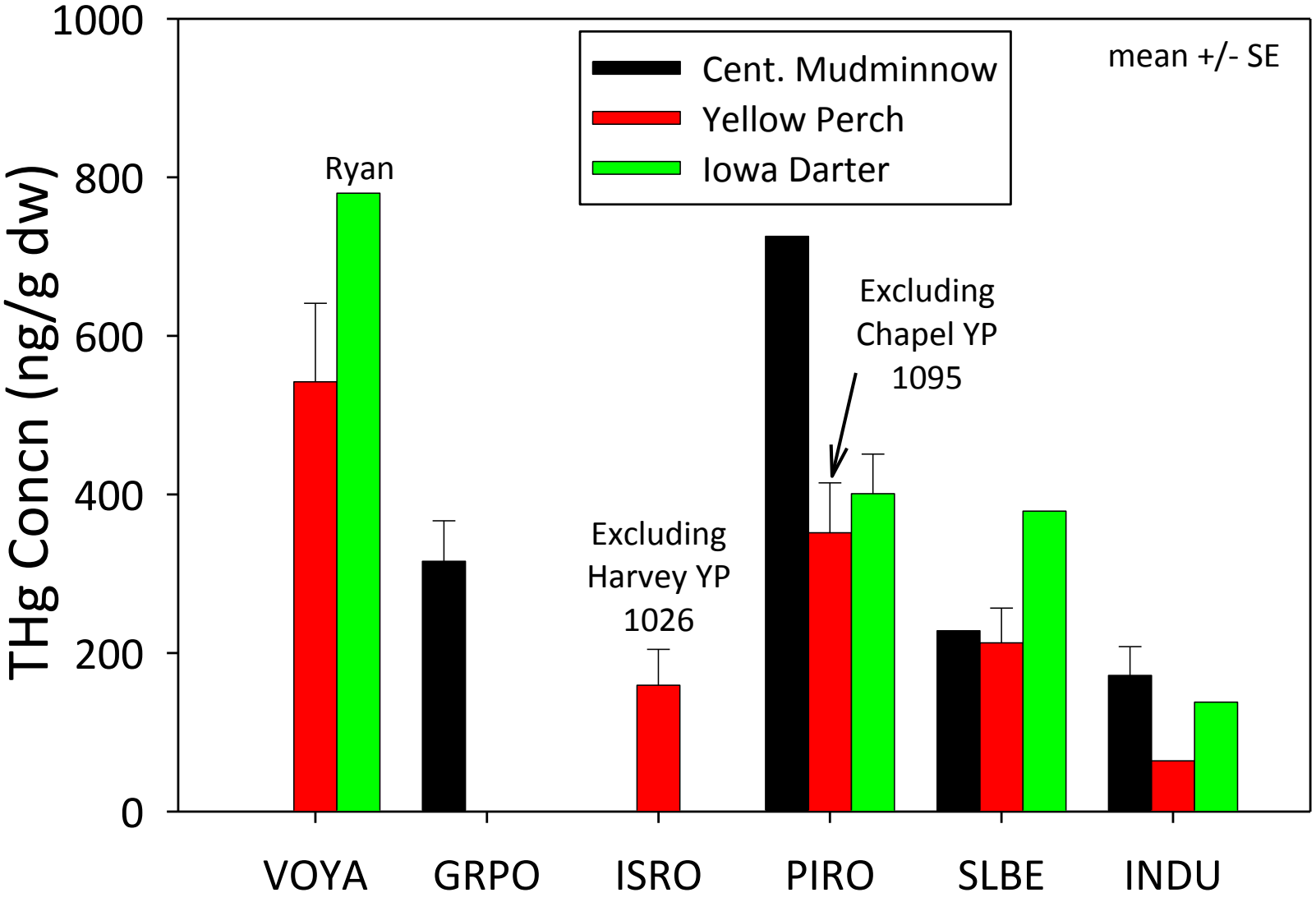


INDU Preyfish Summary 2008-11

Whole body mean ± SE, ppb or ng/g wet weight

	Central Mudminnow	Iowa Darter	Grn. Sunfish/ Bluegill
Middle Lagoon	39 ± 4.7	24 ± 1.7	26 ± 1.8
Long Lake	20 ± 1.1	--	22 ± 1.3
Great Marsh	36 ± 1.2	--	--

GLKN Preyfish

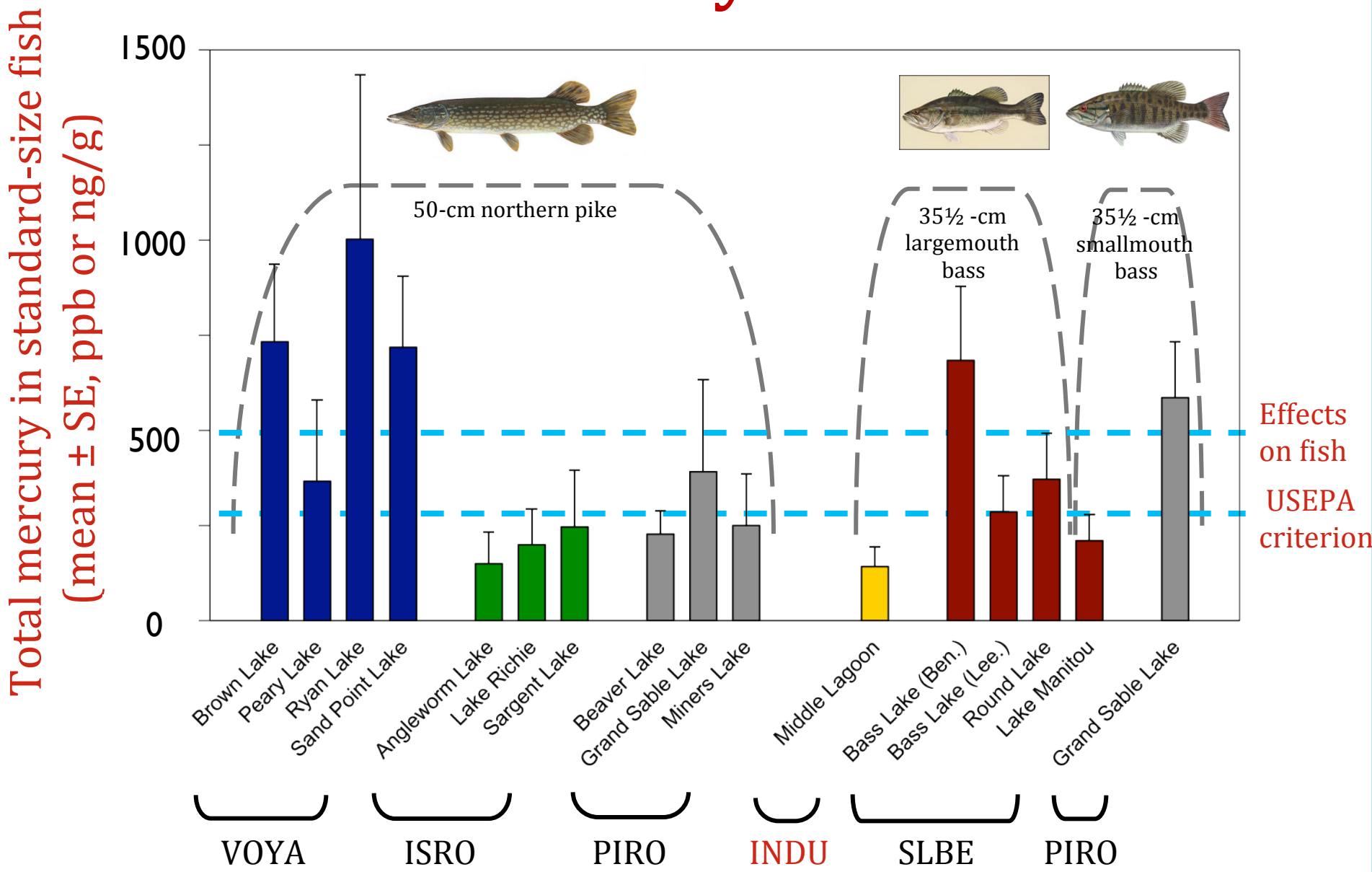


INDU Predator Summary 2008-11

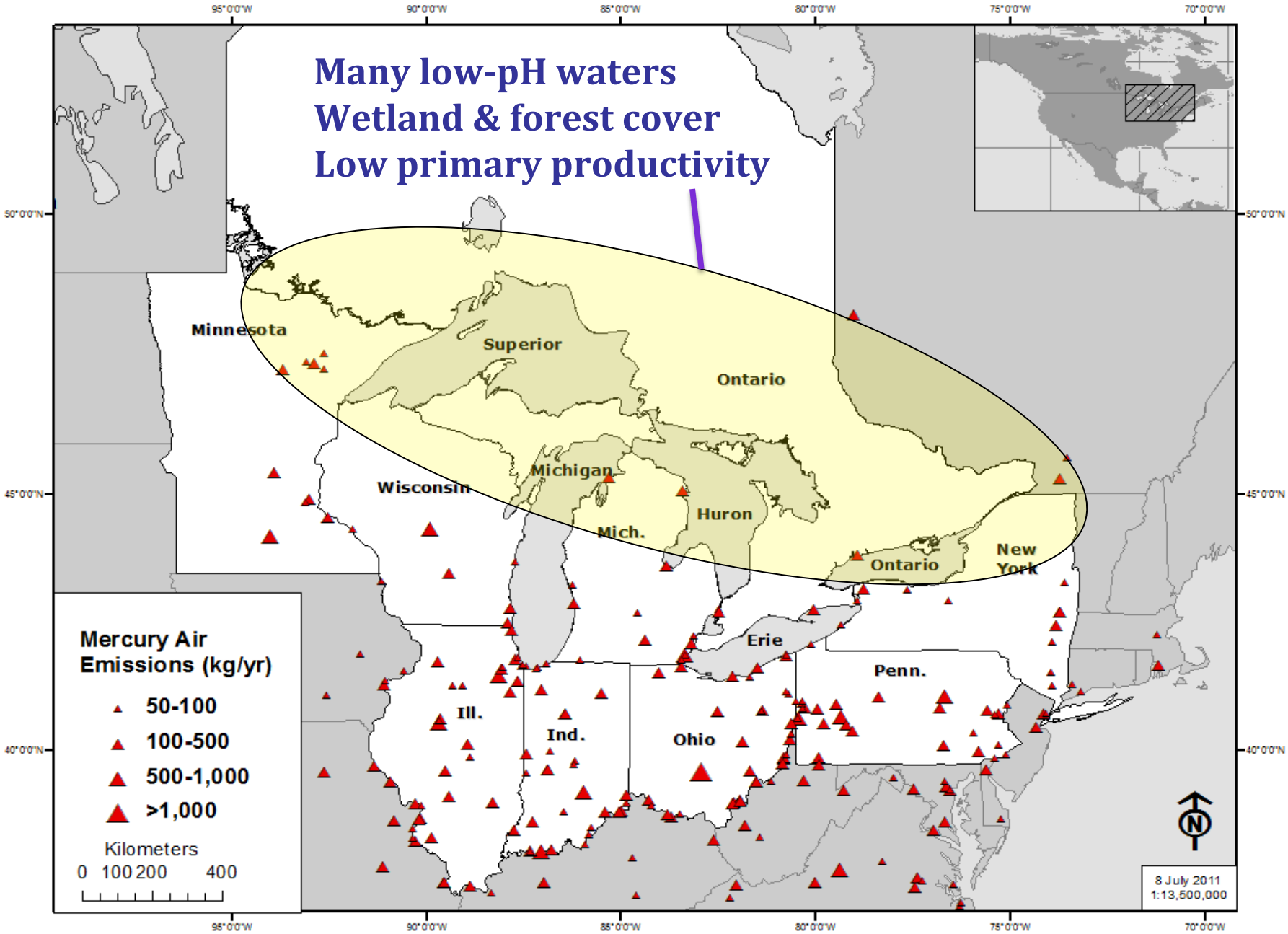
Fillet mean ± SE, ppb or ng/g wet weight

	Largemouth Bass	Grass Pickerel
Middle Lagoon	165 ± 14	158 ± 26
Great Marsh	--	136 ± 23

GLKN Predatory Fish 2008-10



Mercury-Sensitive Watersheds and Water Bodies



Take Home Points

- Despite proximity to Hg sources, INDU is less sensitive to Hg than other GLKN parks

- Geologic, biological conditions limit MeHg production in water
  - High pH
  - Poorly-developed food webs
  - High rates of biological productivity

- Predator fish Hg is a function of MeHg exposure at the base of the food web (i.e., MeHg levels in water)

- Future effects of climate change: water level fluctuation

Acknowledgments:

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