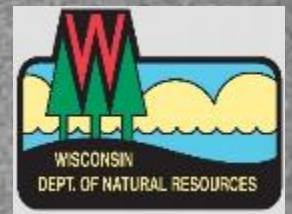


Trouble in paradise: long-term trends in the natural production of Wisconsin walleye

Andrew L. Rypel

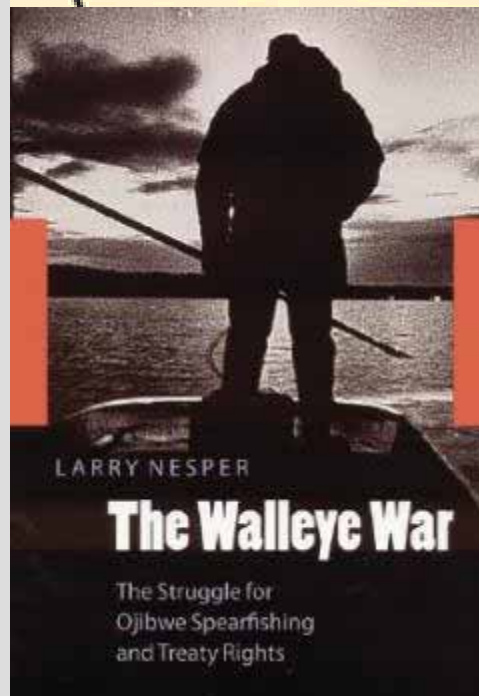
*Wisconsin Department of Natural Resources, Office of Applied Science
(Daisuke Goto, Jake Vander Zanden, Greg Sass)*



Wisconsin Walleye

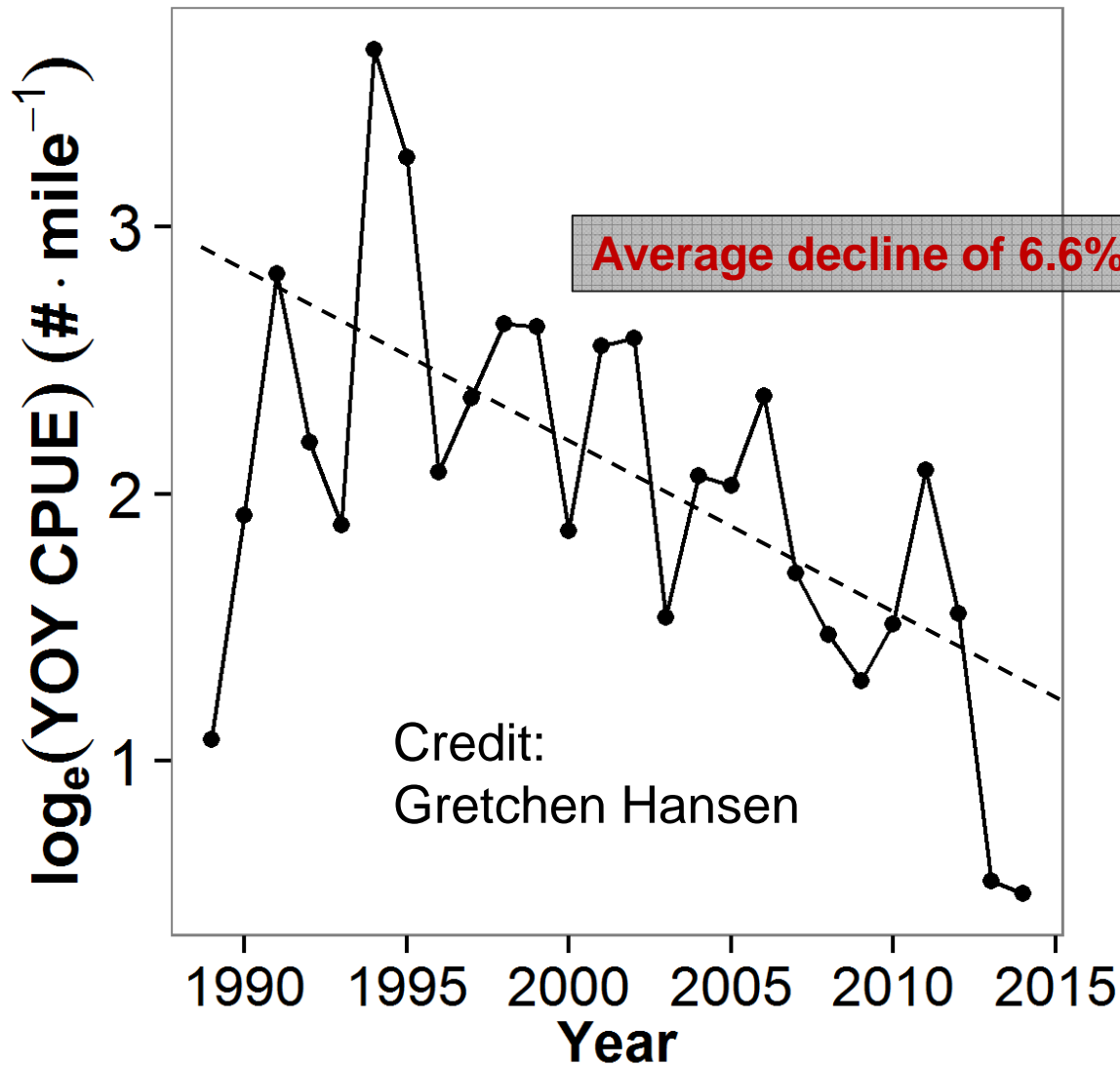


It's complicated...



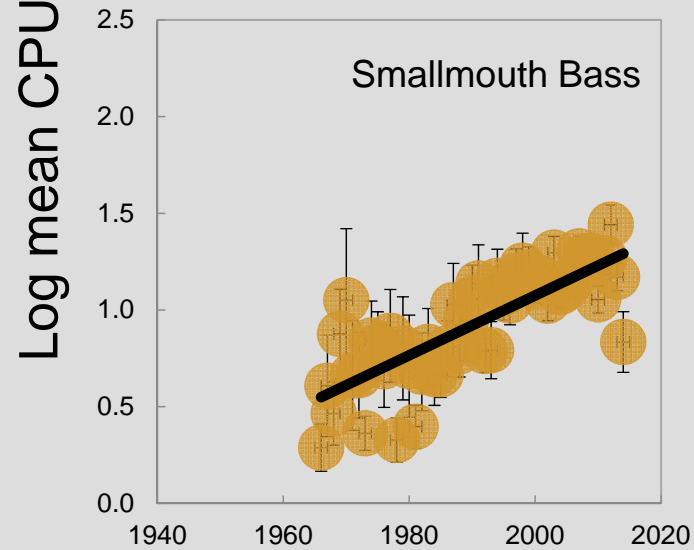
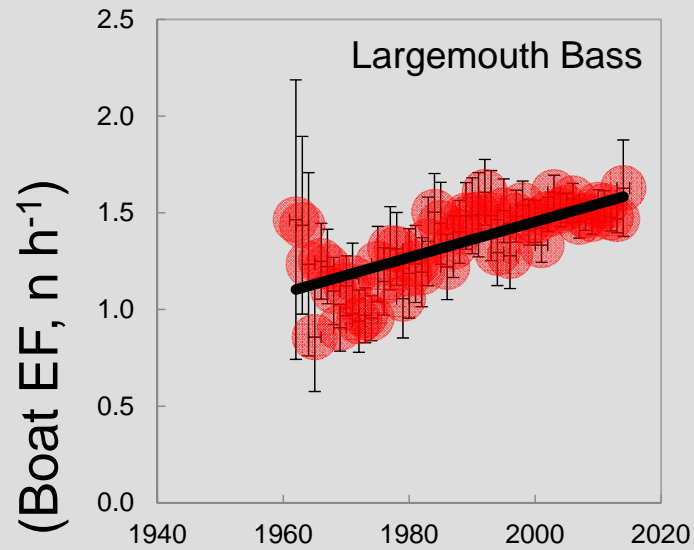


Walleye recruitment (to age-0) is declining in Wisconsin





Increasing black bass abundances

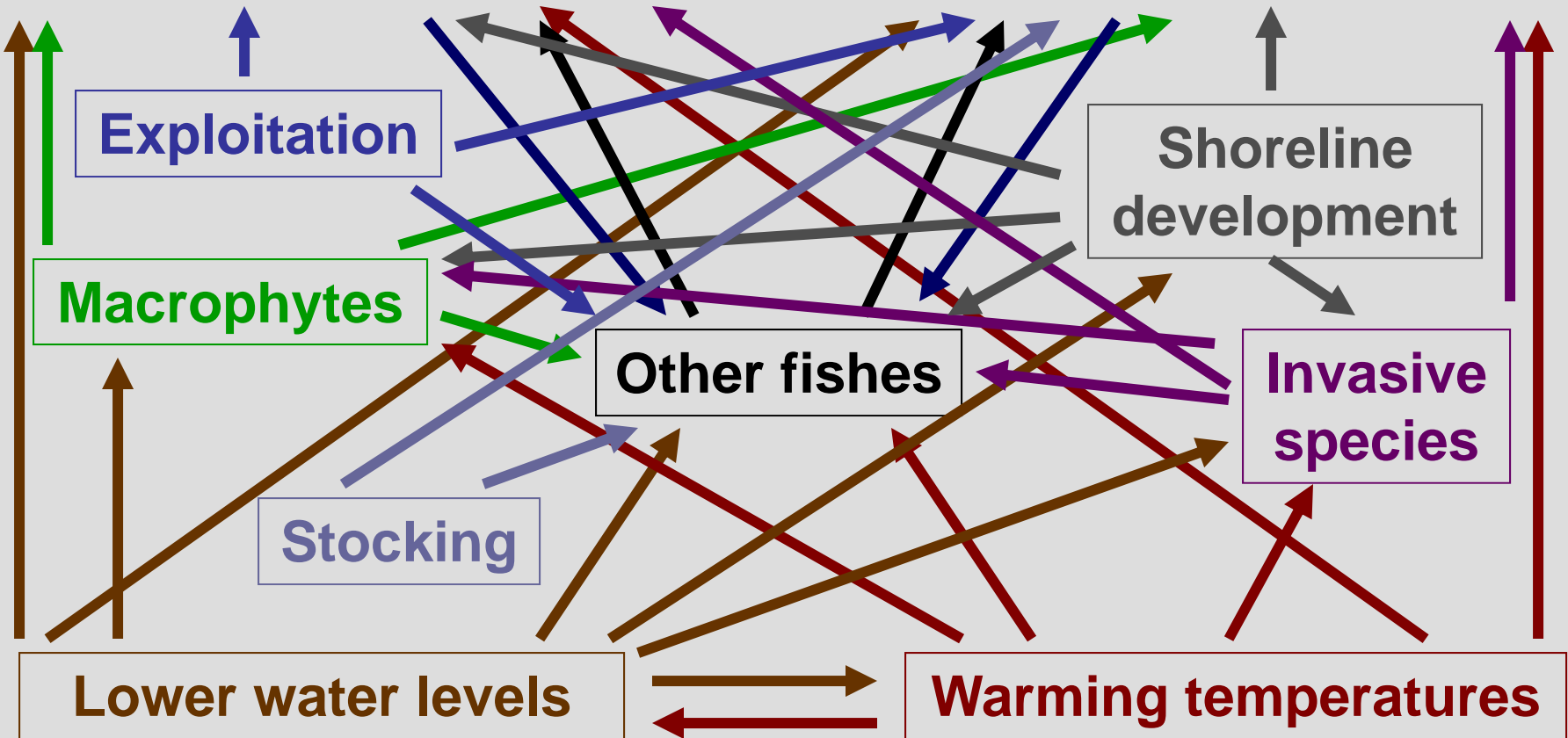


The Bass-Walleye Problem...



Bass-Walleye Team = Gretchen Hansen, Steve Carpenter, Dan Isermann, Hadley Boehm, Jereme Gaeta, Daisuke Goto, Jonathan Hansen, Joseph Hennessy, Craig Kelling, John Lyons, Eric Pedersen, Jordan Read, Stephanie Shaw, Andrew Rypel, Greg Sass, Kaitlin Schnell, Tyler Tunney, Jake Vander Zanden





Credit: John Lyons

The idea of quantifying fish production



Homer Swingle



William Ricker



Amy Rosemond



Arthur Benke



Ray Hilborn



Mary Freeman

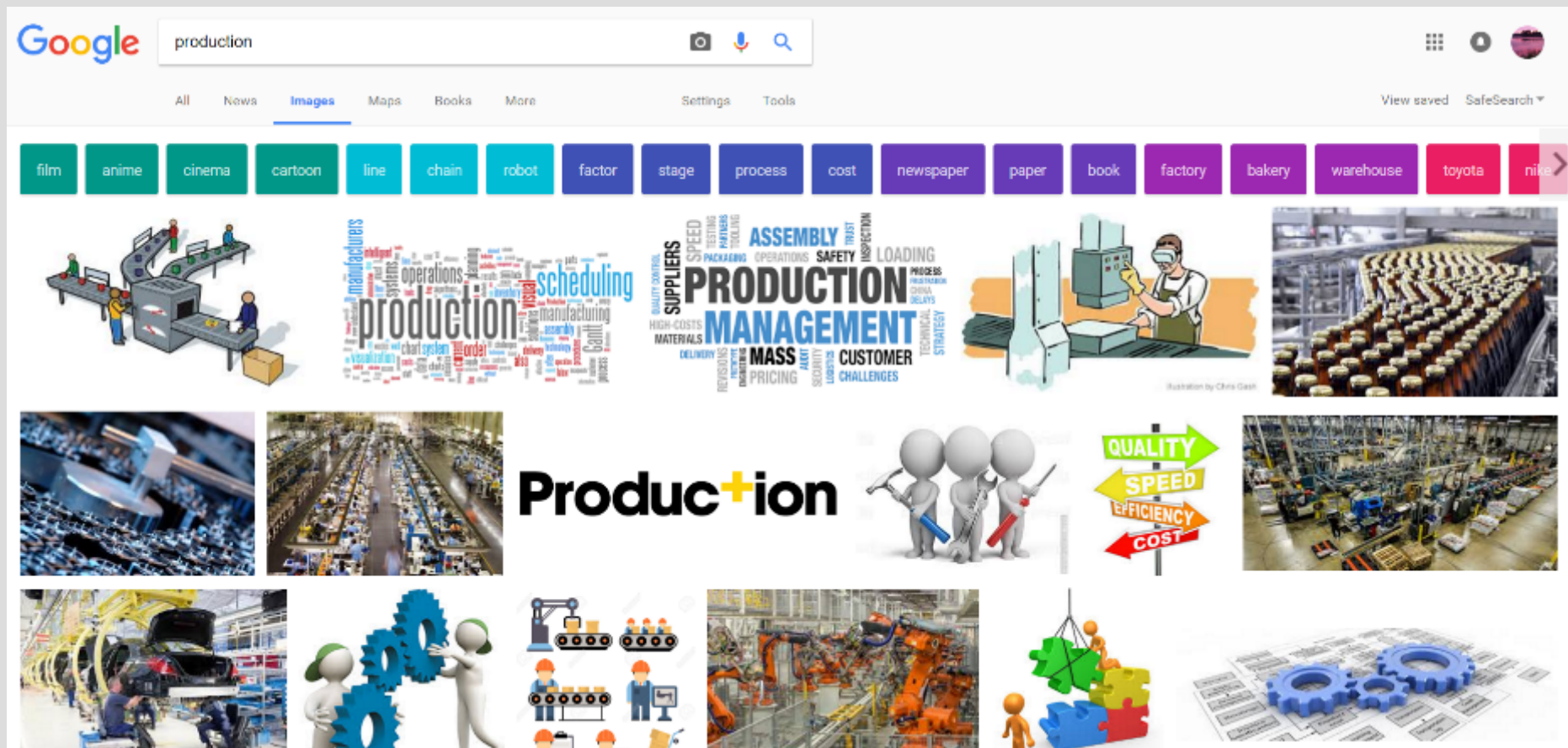


Tom Waters

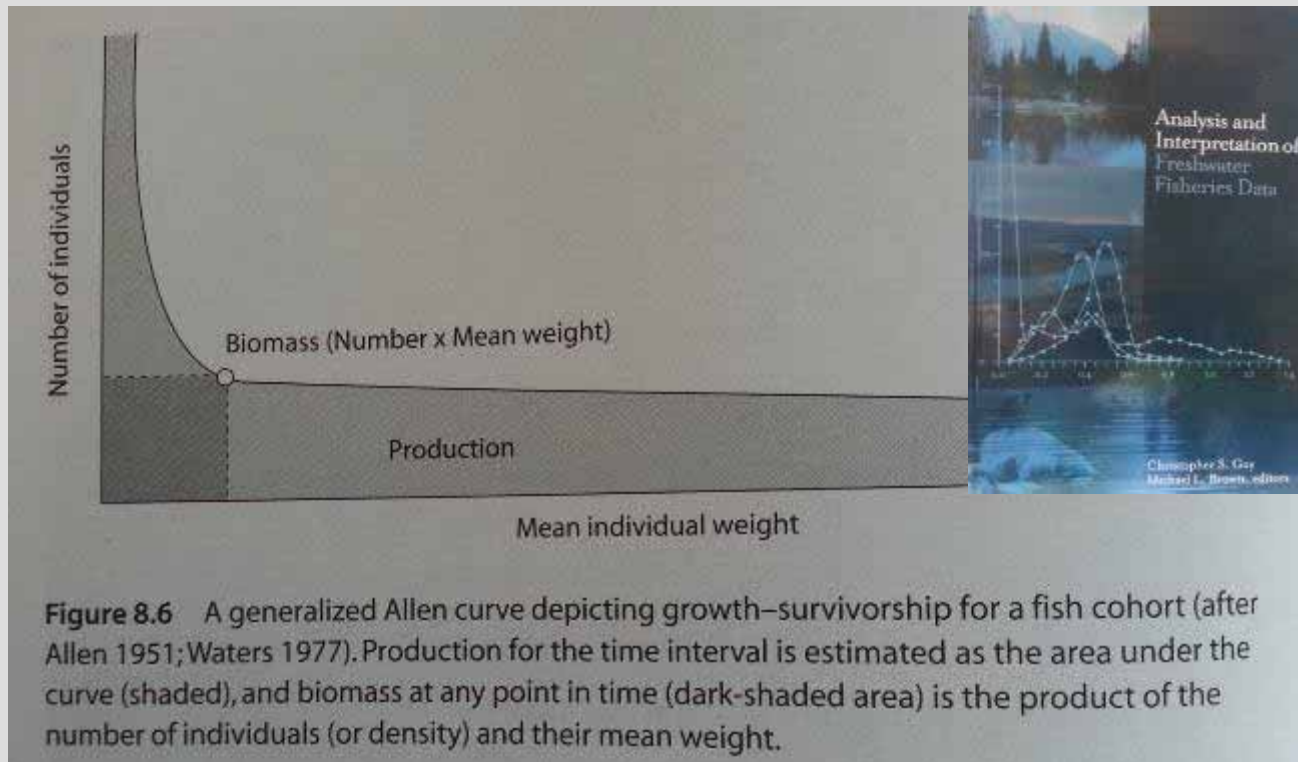


Photo: corporate.ford.com

Google: **Production** is a process of combining various material inputs and immaterial inputs in order to make something for consumption



What is production???



Fish production - the amount of biomass produced by a fish population during an interval of time.

$$Production = Growth \times Biomass$$

What do you need to calculate fish production?

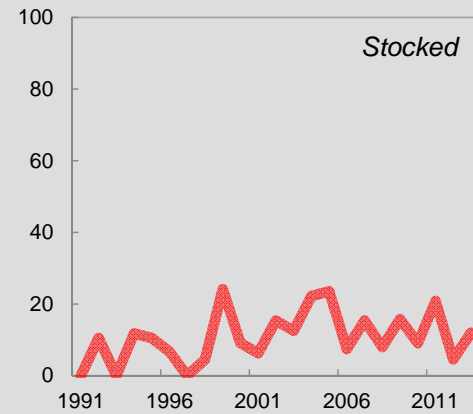
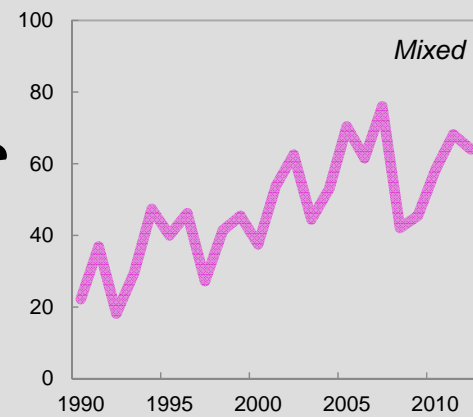
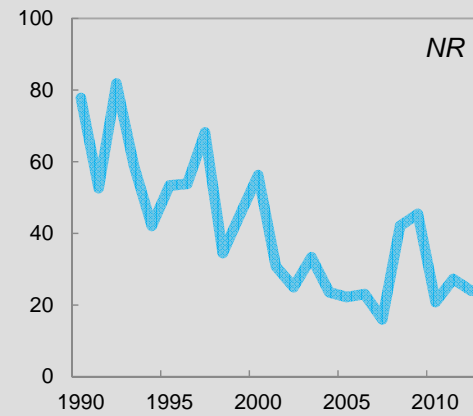
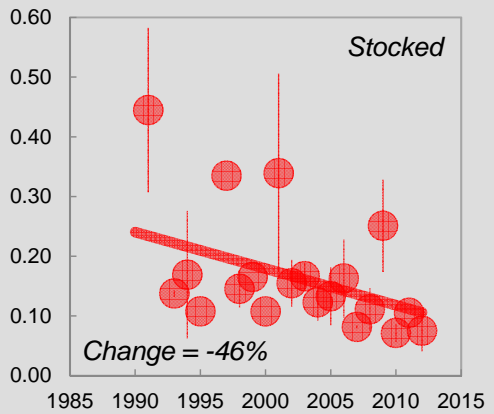
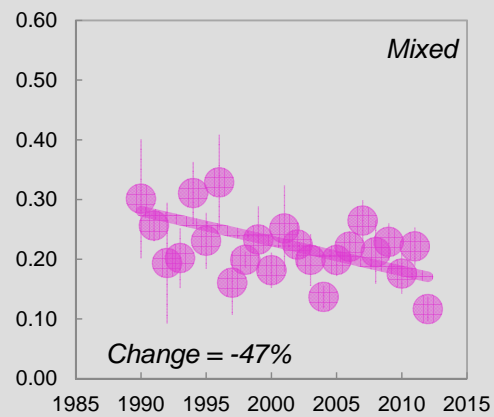
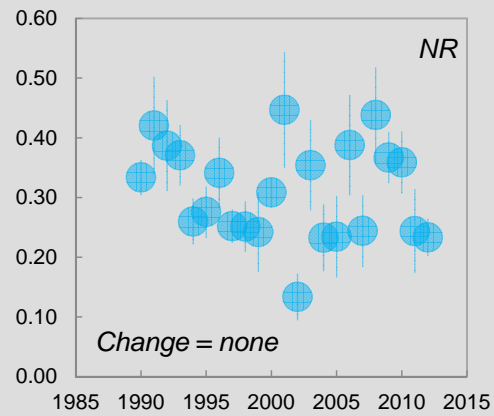
1. Sampling area
2. Population estimate
3. Size-structure data
4. Fish growth information (length-at-age)
5. Weight data, or a length-weight relationship

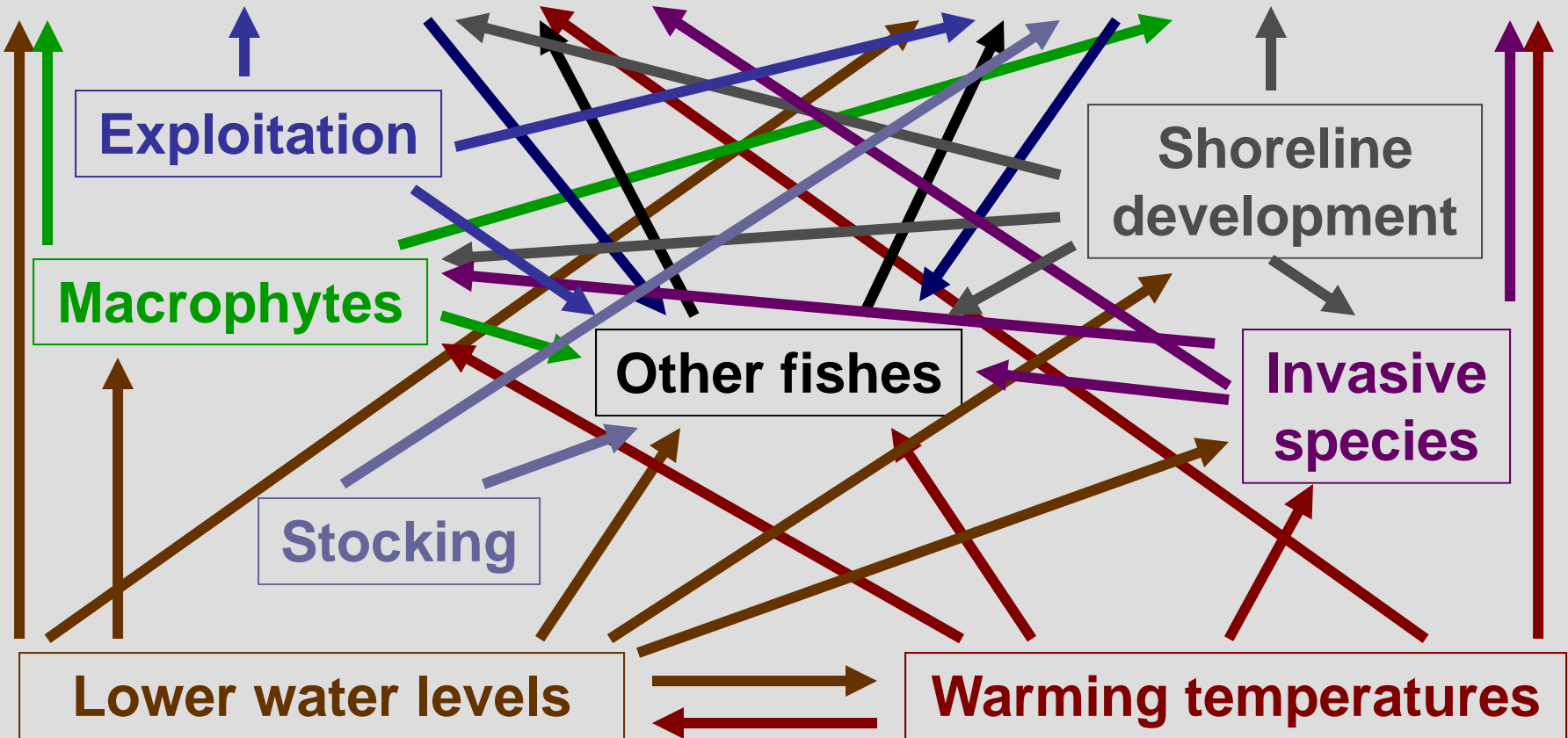


Walleye production depends on recruitment



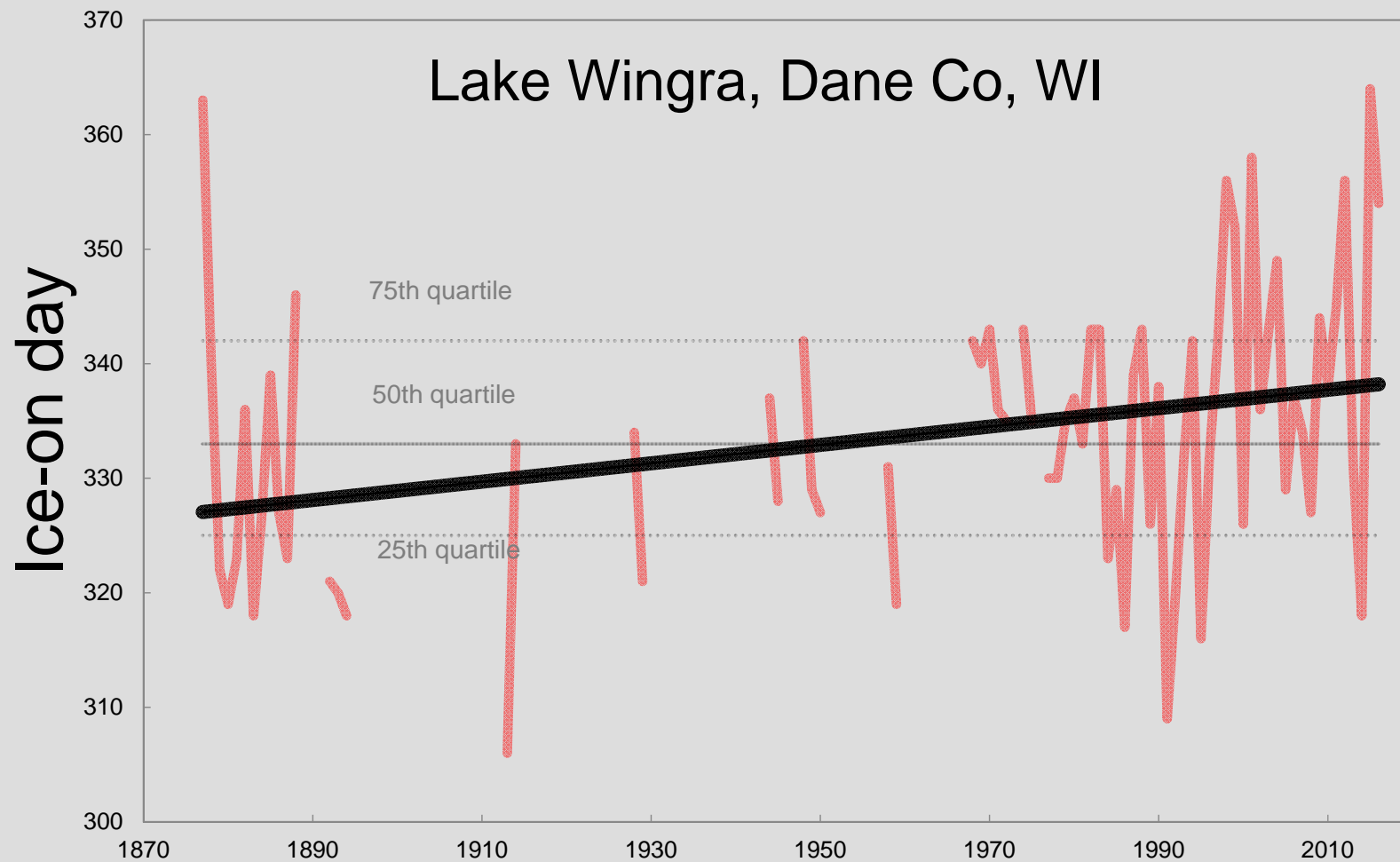
Walleye production (\log_{10} kg ha⁻¹ y⁻¹)



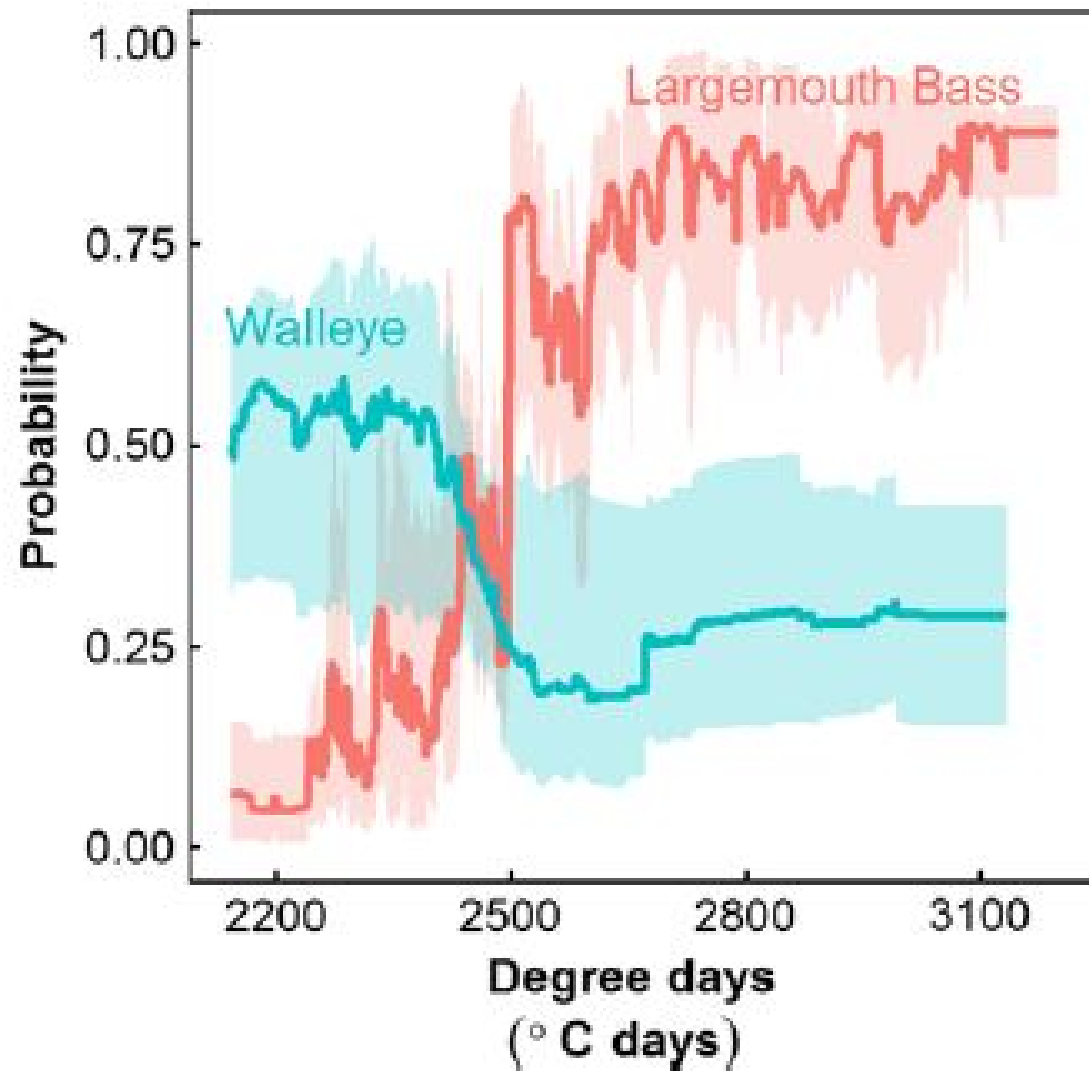


Credit: John Lyons

Wisconsin lakes are getting warmer



Data Credit: *North Temperate Lakes LTER*

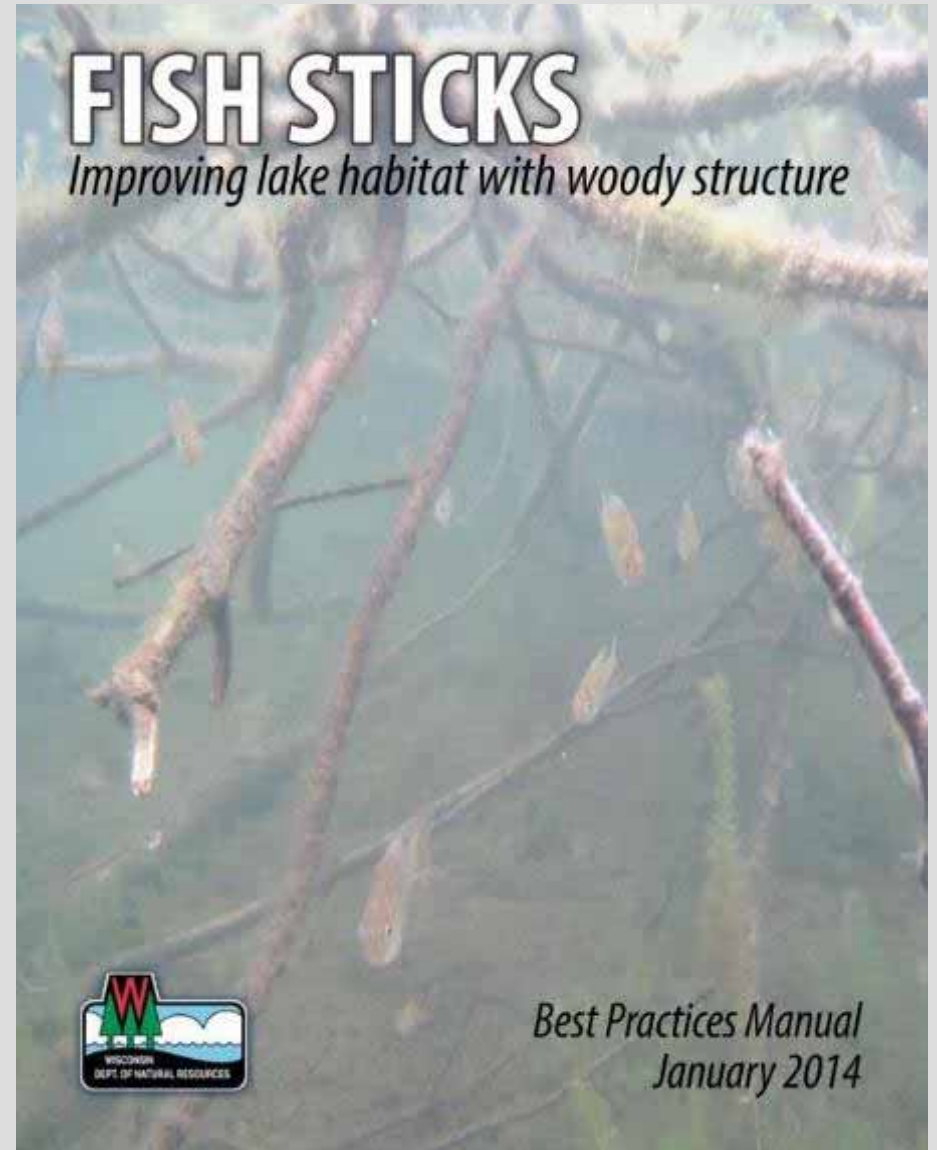


Hansen et al. (2016) *Global Change Biology*

What if we remove warmwater bass and sunfish species?



What if we rehabilitate lake habitats?



What if we stopped harvesting walleye?

Fishing opener means no walleye dinners from the Minocqua Chain of Lakes

BARRY ADAMS badams@madison.com, 608-252-6148 · Apr 26, 2015 · 0



POPULAR

1 DN scie

2 Donald Trump a over his head'

3 Cottage Grove m identified

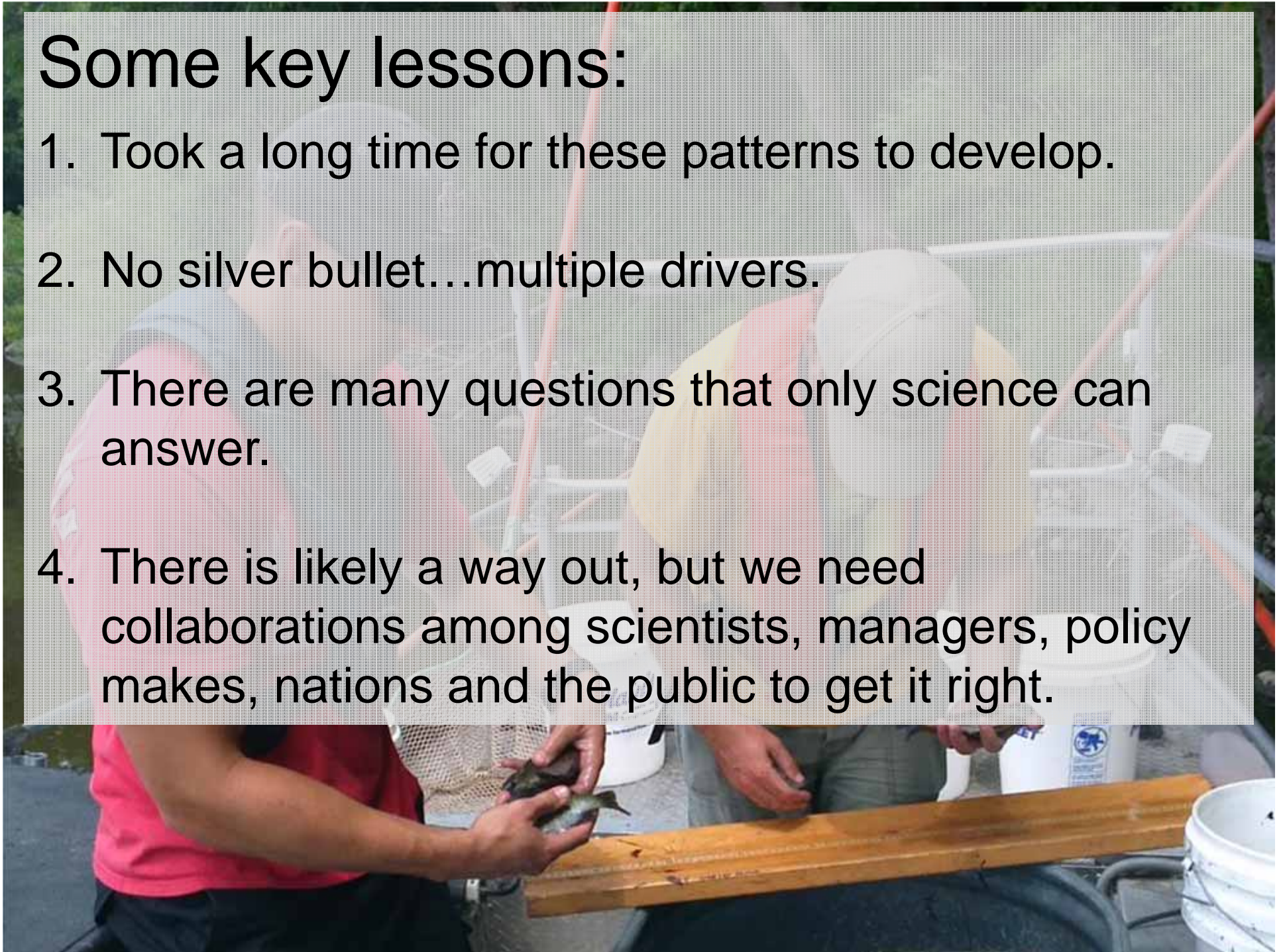
4 Monroe mourns

5 City of Madison federal lawsuit r

NEXT UP

Some key lessons:

1. Took a long time for these patterns to develop.
2. No silver bullet...multiple drivers.
3. There are many questions that only science can answer.
4. There is likely a way out, but we need collaborations among scientists, managers, policy makes, nations and the public to get it right.





Thanks!