

Wisconsin Walleye: Status, Trends, and Current Research and Management for Long-term Sustainability



Greg G. Sass, Ph.D.

Fisheries Research Team Leader
Office of Applied Science

Wisconsin Department of Natural Resources

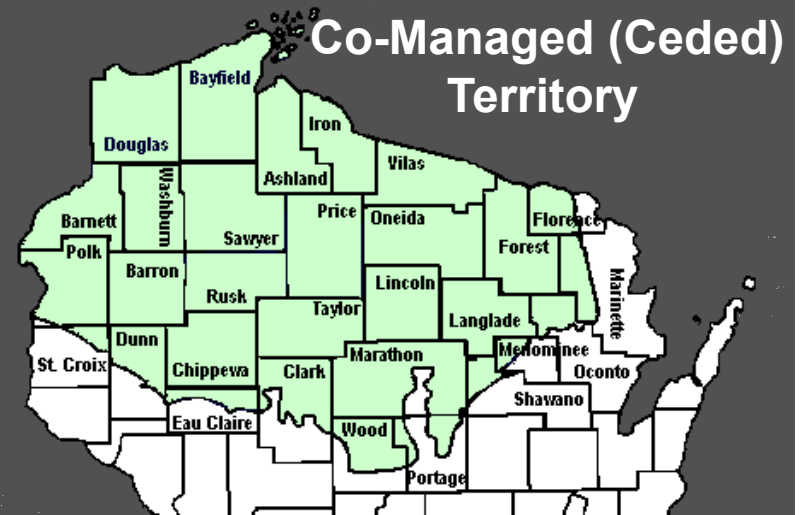


Collaborators

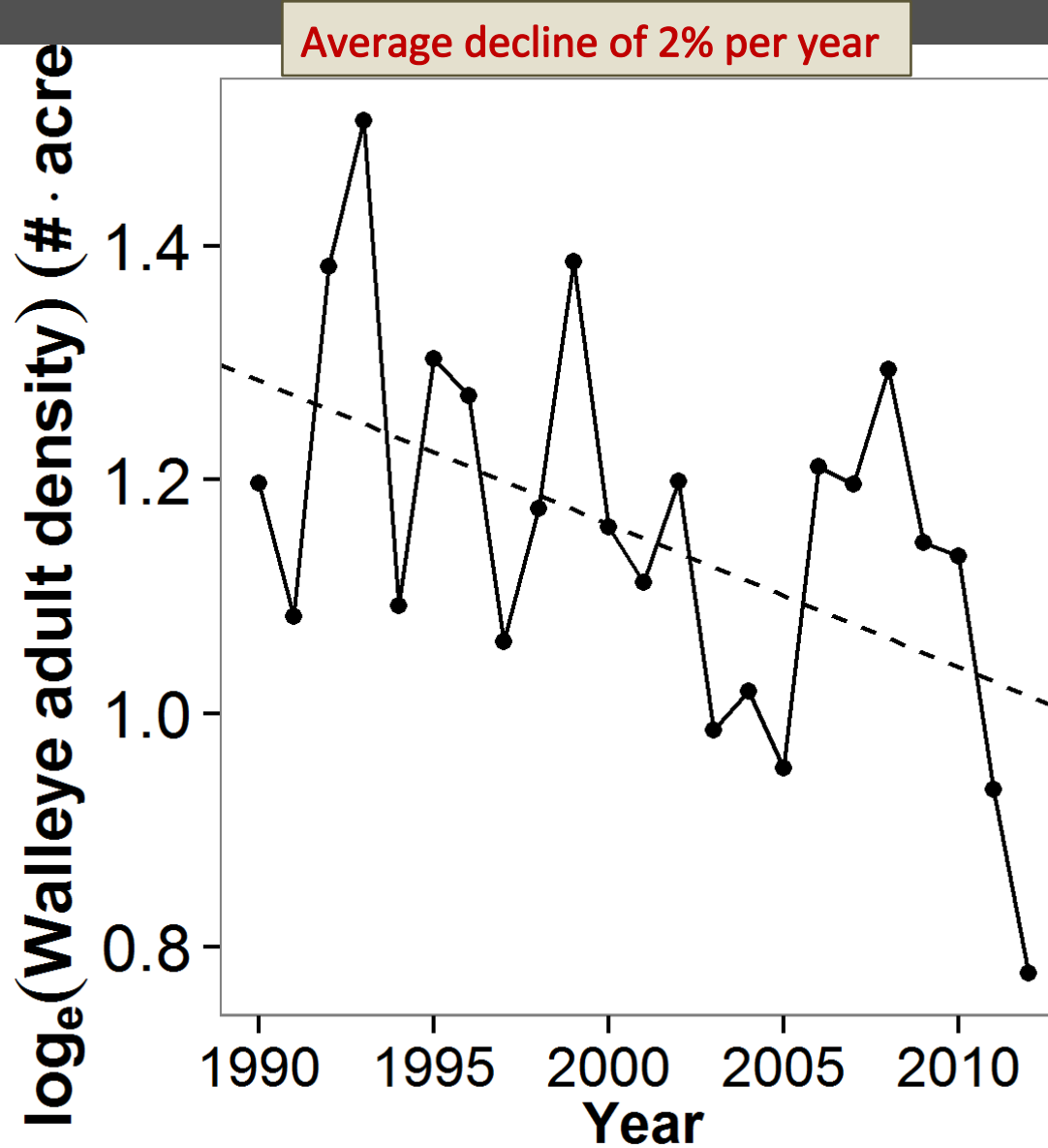
- Andrew L. Rypel, Ph.D.
- Joshua D. Stafford, Ph.D.
- Stephanie L. Shaw, Ph.D.
- Scott Toshner
- Pamela Toshner
- Joshua K. Raabe, Ph.D.
- Thomas R. Hrabik, Ph.D.
- Stephen R. Carpenter, Ph.D.
- Jake Vander Zanden, Ph.D.
- Jereme W. Gaeta, Ph.D.
- Dan Isermann, Ph.D.
- Gretchen J.A. Hansen, Ph.D.
- Holly Embke
- Daisuke Goto, Ph.D.
- Tyler D. Ahrenstorff, Ph.D.
- K. Martin Perales
- Tyler D. Tunney, Ph.D.
- Eric J. Pedersen, Ph.D.
- William A. Brock, Ph.D.
- Jonathan F. Hansen
- Joseph M. Hennessy
- Tom Cichosz
- Dan Dembkowski, Ph.D.
- Chris Sullivan
- John Lyons, Ph.D.
- GLIFWC



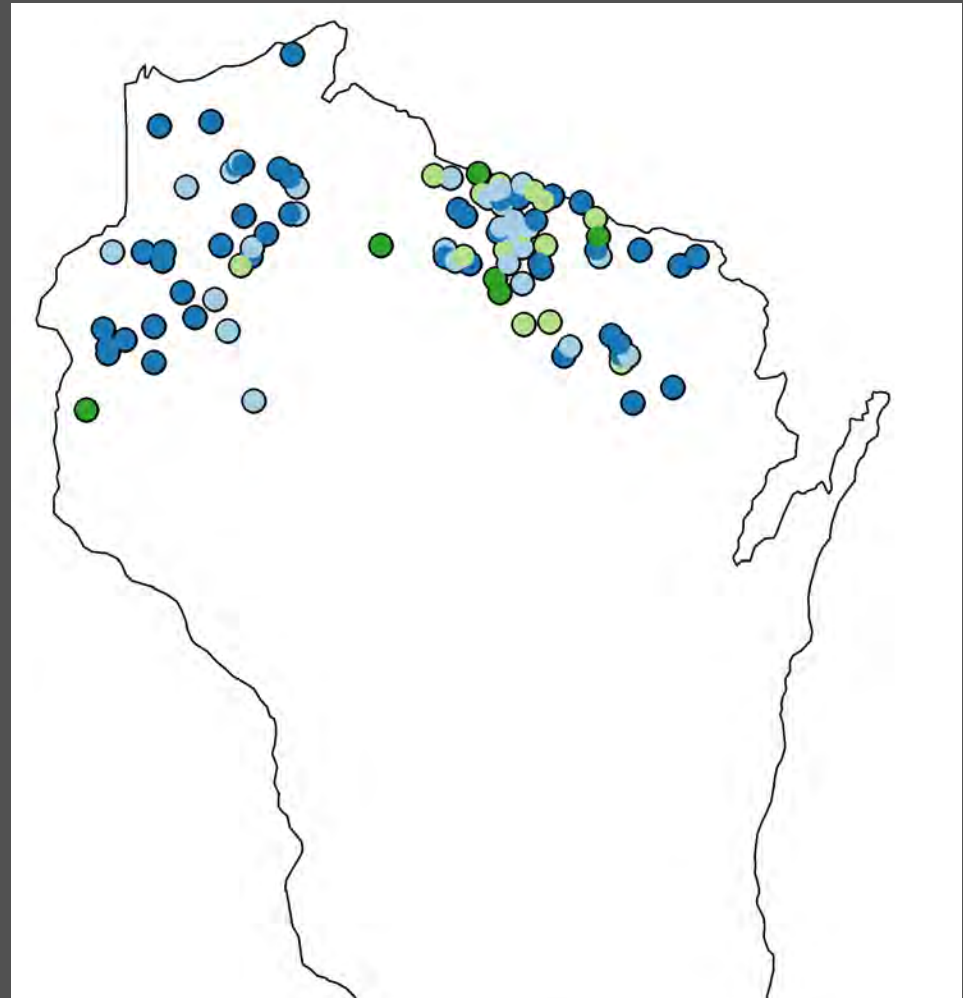
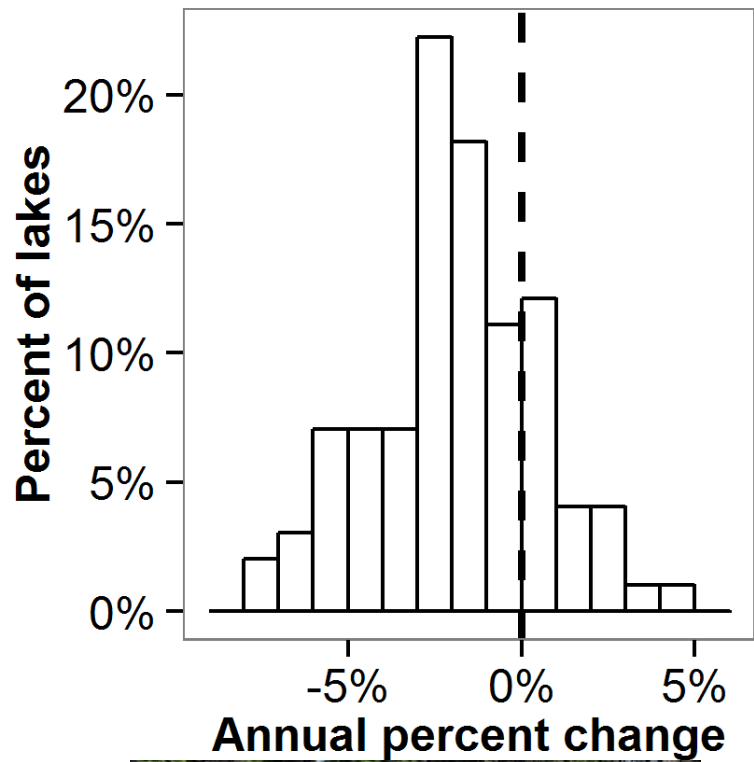
Walleye in Northern Wisconsin



Adult walleye density is declining in some lakes



Adult walleye density is declining in some lakes

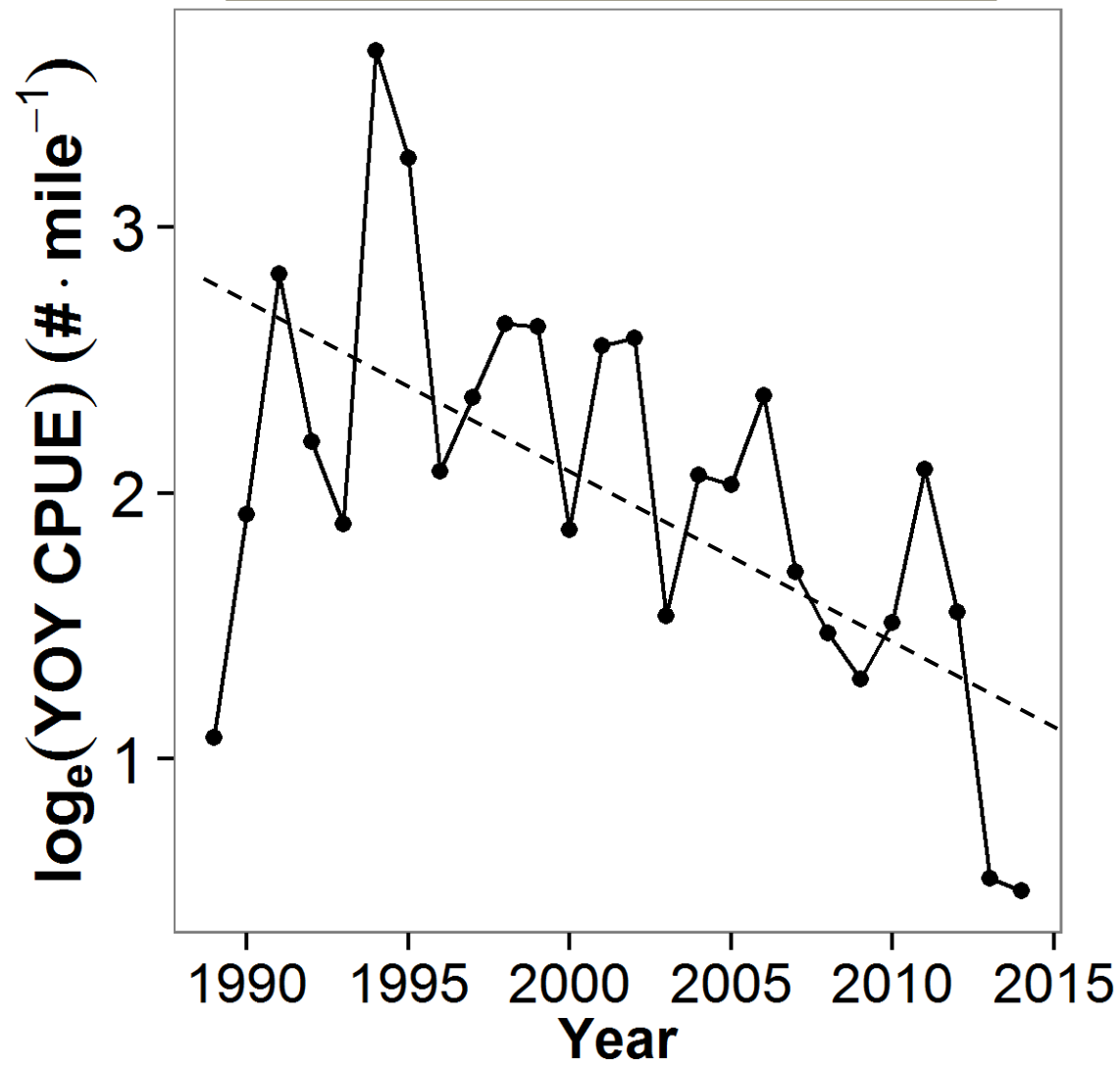


Annual change in adult walleye density (#/acre)

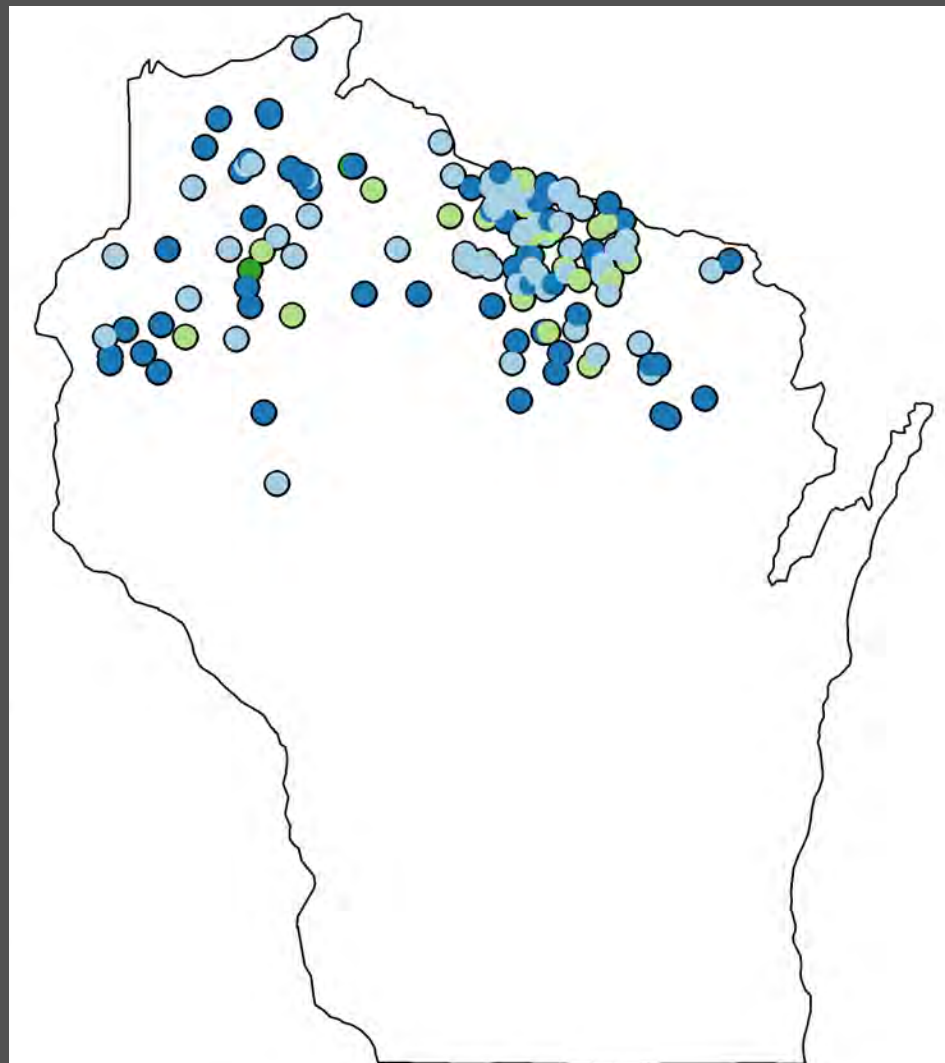
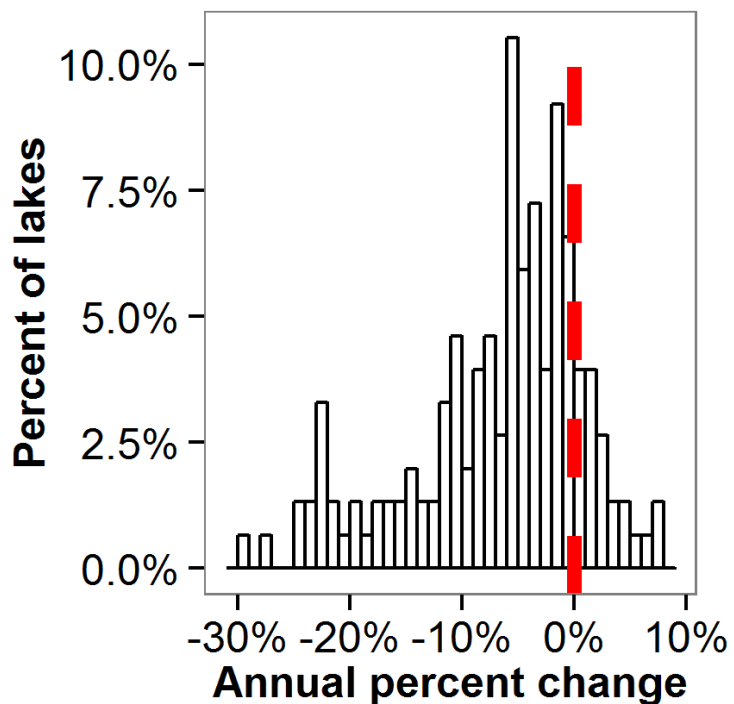
- Increase (0-2%)
- Strong increase (>2%)
- Strong decline (>2%)
- Decline (0-2%)

Walleye recruitment: declining in some lakes

Average decline of 6.6% per year



Walleye recruitment: declining in some lakes



Annual change in age-0 walleye catch per mile

- Increase (0-6.6%)
- Strong increase (>6.6%)
- Strong decline (>6.6%)
- Decline (0-6.6%)

Slide by G.J.A. Hansen

Habitat: lakes are warming, some more than others

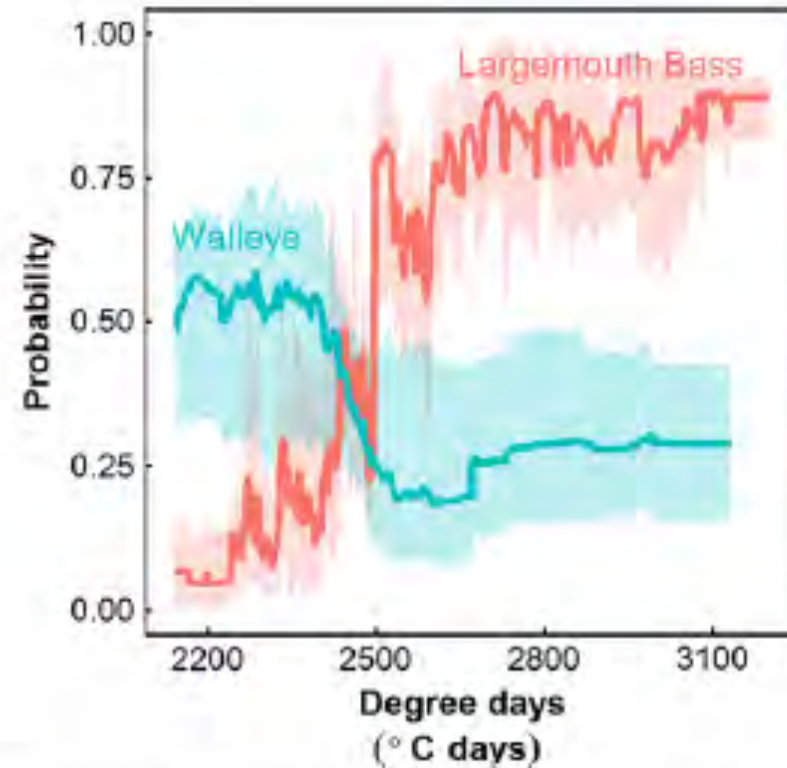
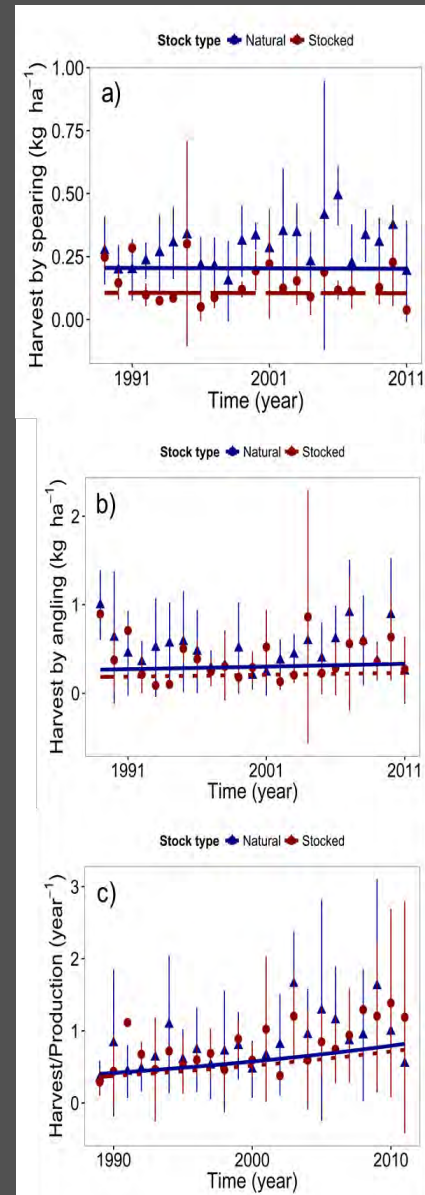
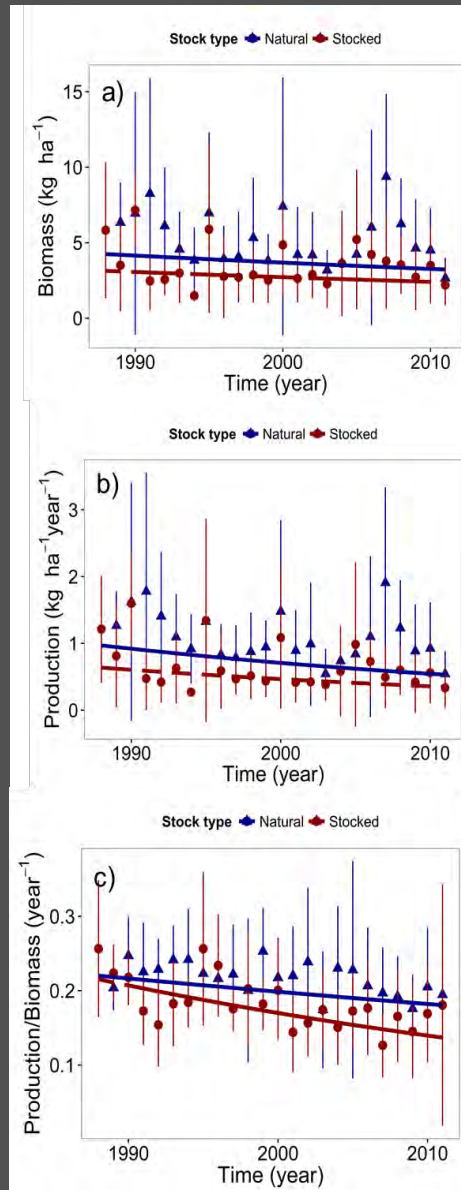
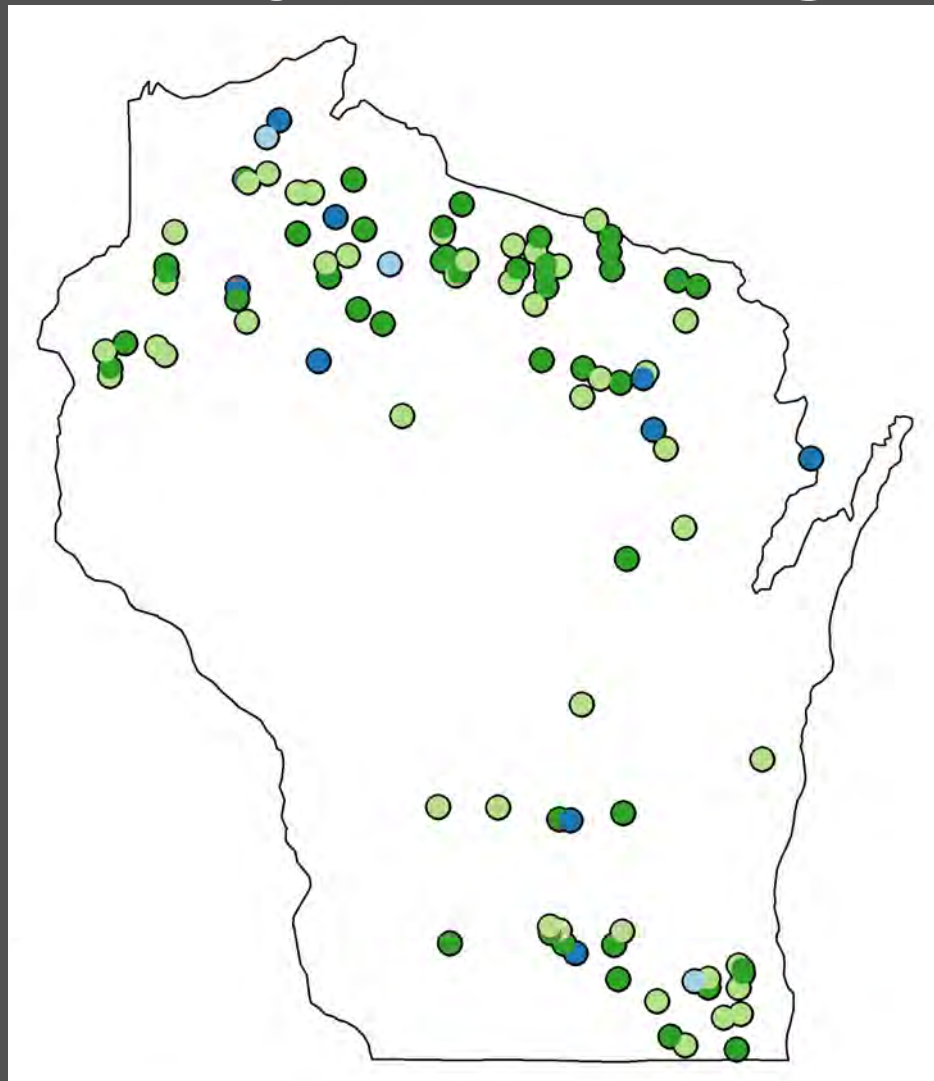
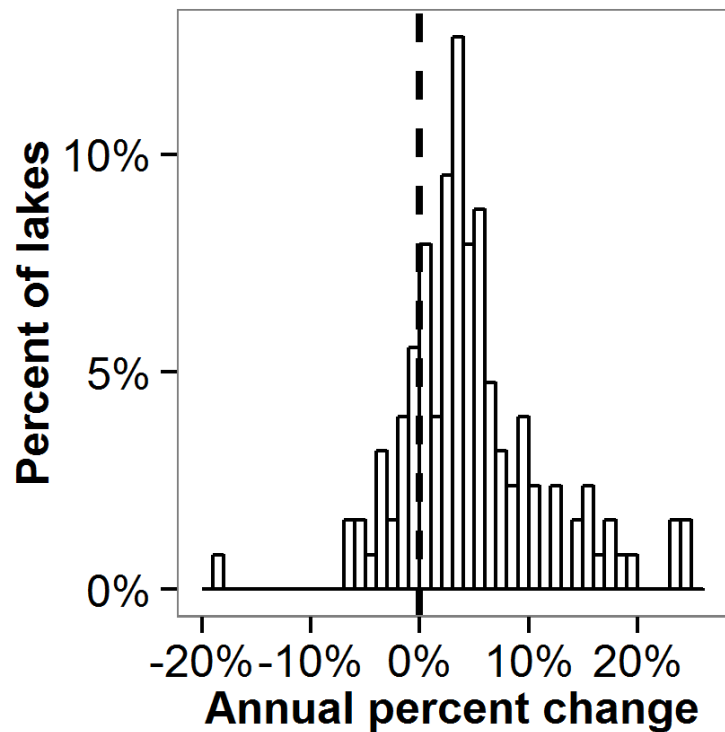


Fig. 1 Predicted probability of successful walleye recruitment (electrofishing catch rates ≥ 10 age-0 fish per mile; blue line) and high largemouth bass relative abundance (electrofishing catch rates \geq season-specific median catch rates; orange line) as a function of mean water temperature degree days (base temperature 5 °C) in contemporary period (1989–2014). Predicted proba-

Walleye Production and Harvest



Largemouth bass density is increasing



Annual change in LMB >8in spring catch per mile

- Increase (0-4%)
- Strong increase (>4%)
- Strong decline (>4%)
- Decline (0-4%)



Catch-Release Trends for Largemouth Bass and Walleye in Wisconsin

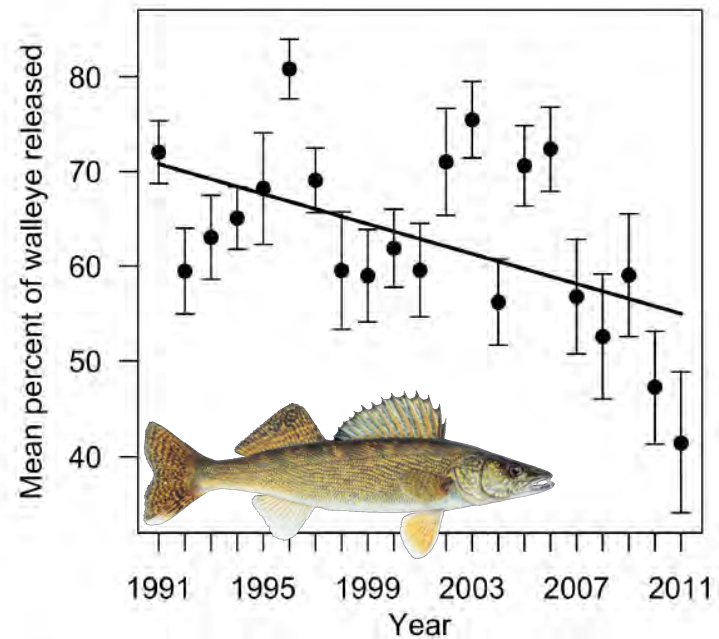
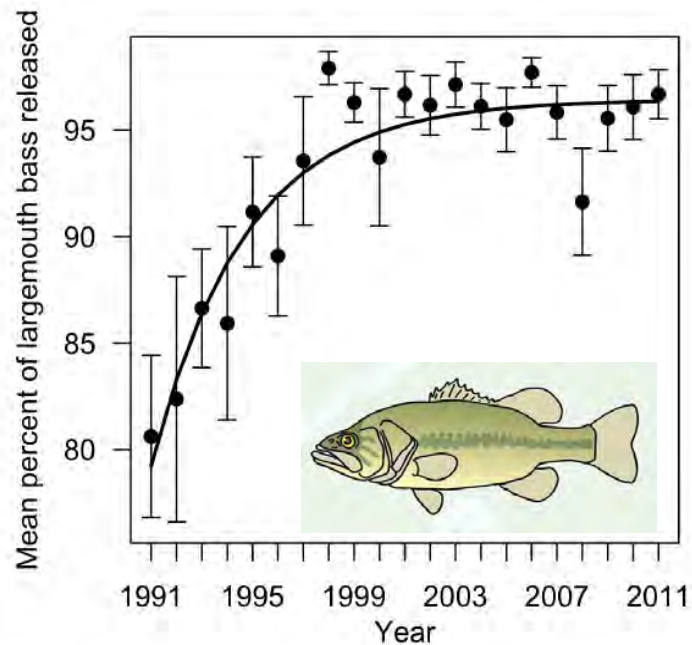


Figure 5. Ceded Territory of Wisconsin nonlinear trend in recreational angler release rates of Largemouth Bass during 1991–2011. Figure 6. Ceded Territory of Wisconsin trend in recreational angler release rates of Walleye during 1991–2011.

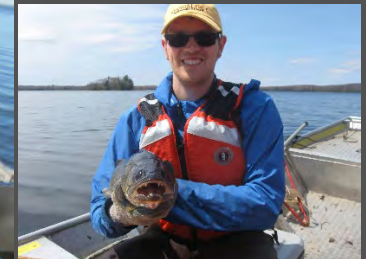
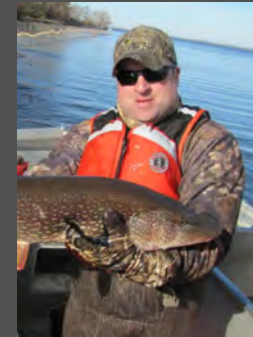
Finding a Safe Operating Space for Recreational Fisheries

**World Recreational Fishing Conference 8
Victoria, British Columbia**

Presented by

Steve Carpenter

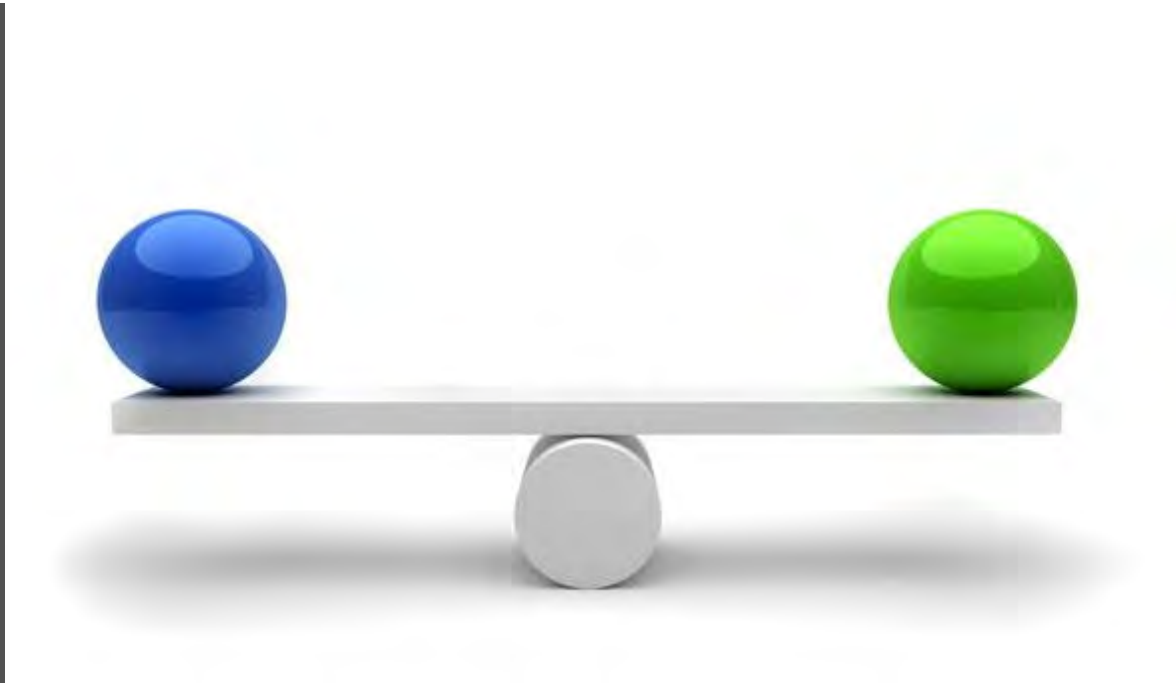
Center for Limnology, University of Wisconsin-Madison U.S.A.



On behalf of coauthors

**Buz Brock, Gretchen Hansen, Jon Hansen, Joe Hennessey,
Dan Isermann, Eric Pederson, Martin Perales, Andrew Rypel,
Greg Sass, Tyler Tunney, Jake Vander Zanden**





What is Driving Change?

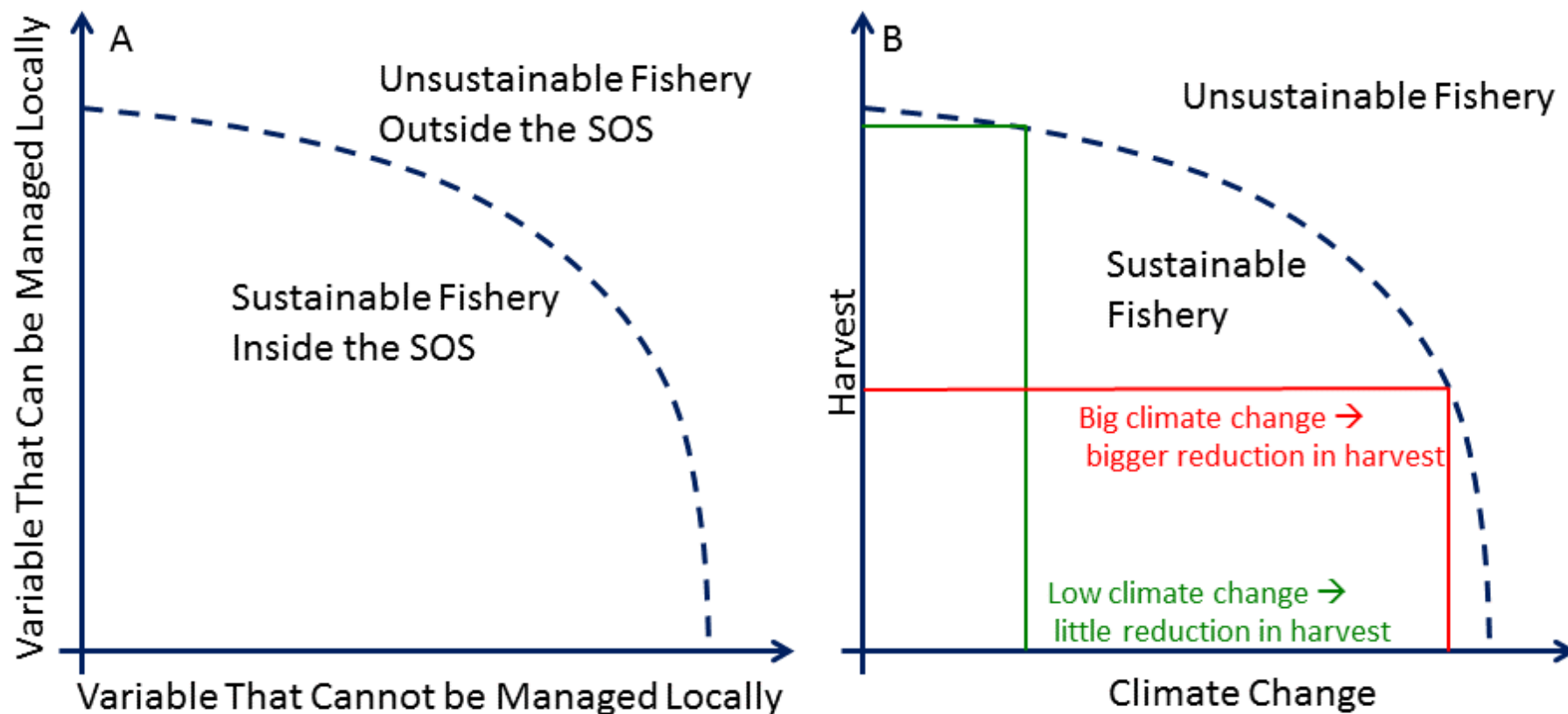
- Climate
- Habitat:
 - Littoral, Optical, Thermal
- Angler preferences, behavior
- Harvest
- And others . . .

What Can be Managed?

- Harvest
- Effort
- Some aspects of angler behavior
- Sometimes habitat

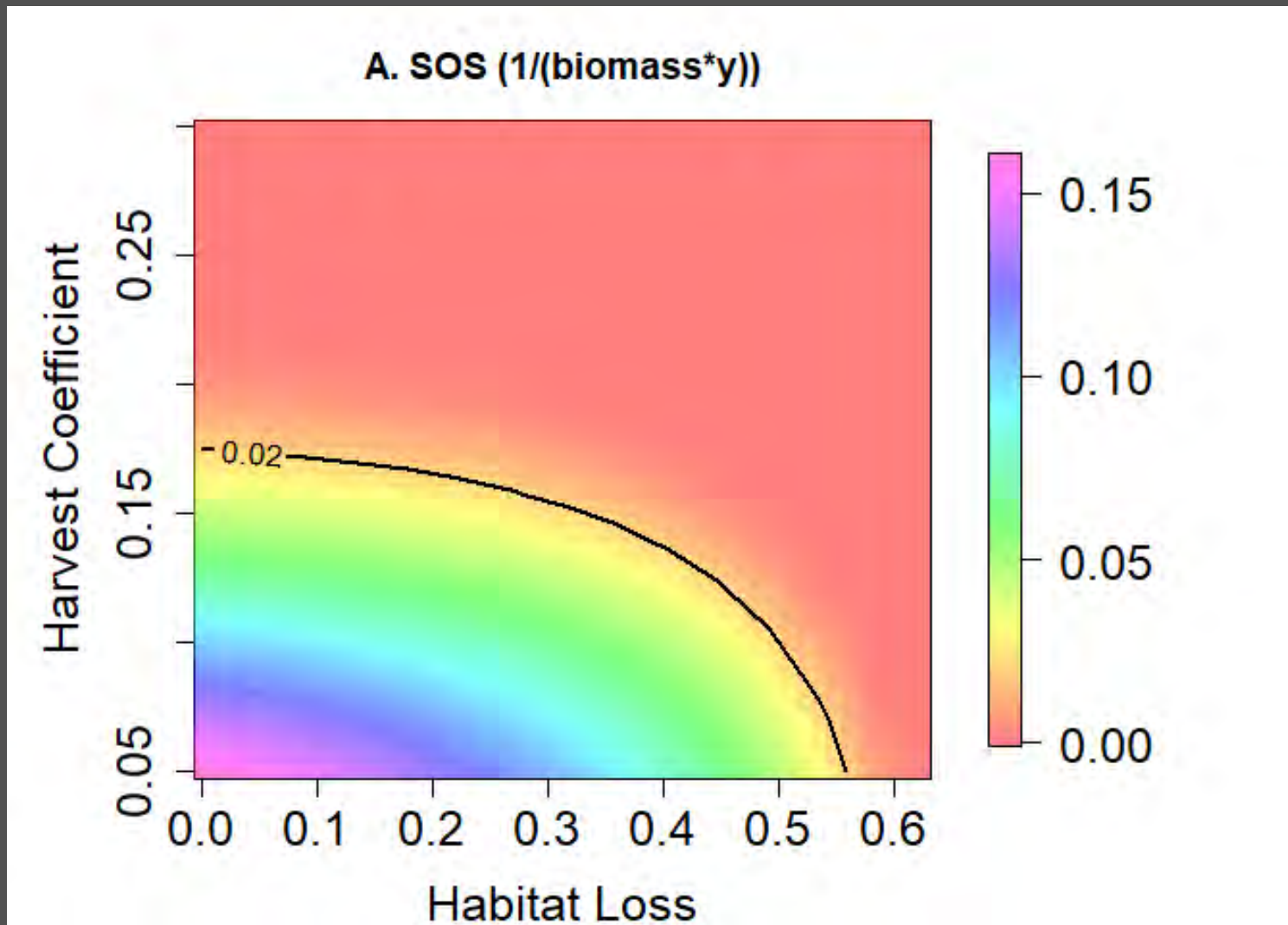
SAFE OPERATING SPACE:

“Manage what you can to offset trends you can’t manage”



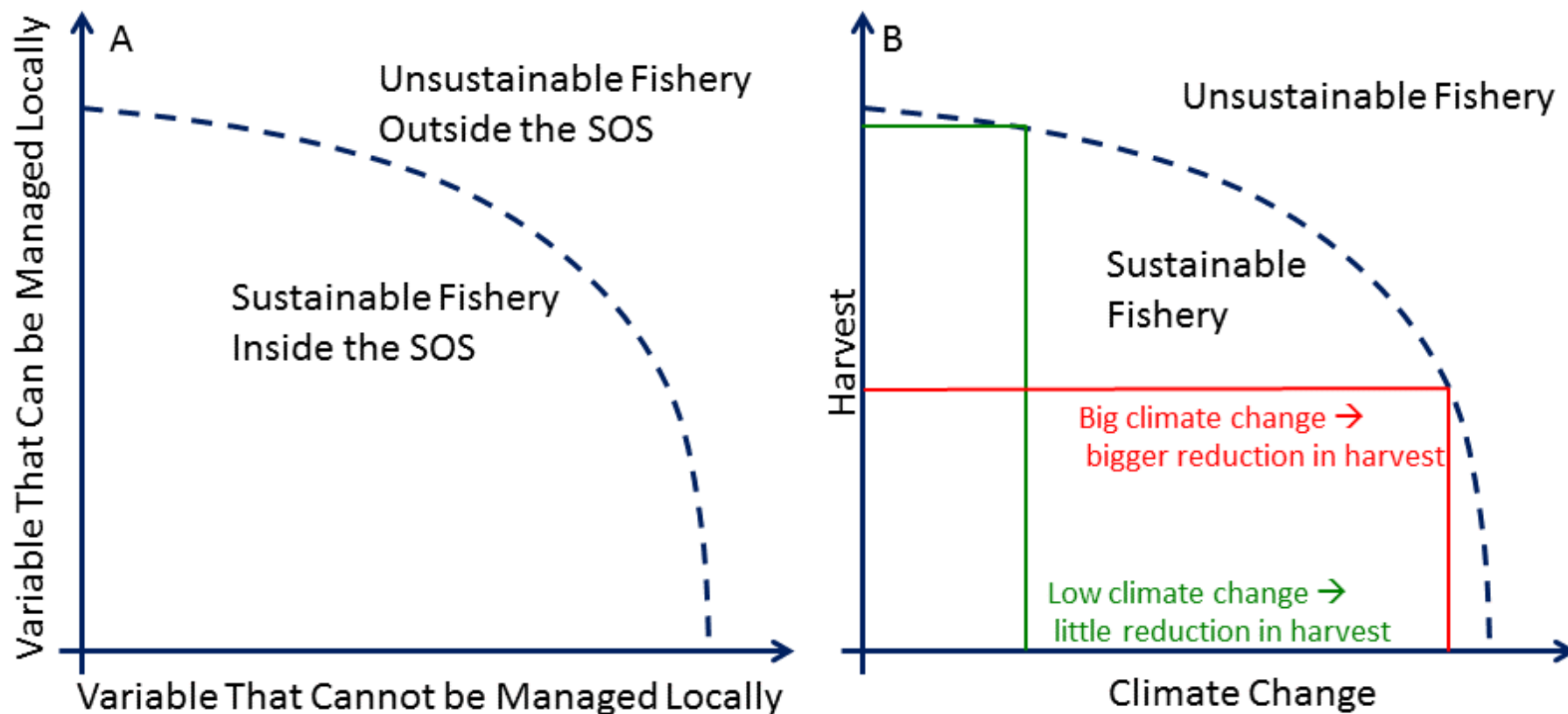
Scheffer et al., 2015, Science
Carpenter et al., 2017, Fish & Fisheries

SOS Edge =
Curve where a hairline increase in harvest coef. or habitat loss triggers loss of the high-biomass equilibrium.



SAFE OPERATING SPACE:

“Manage what you can to offset trends you can’t manage”



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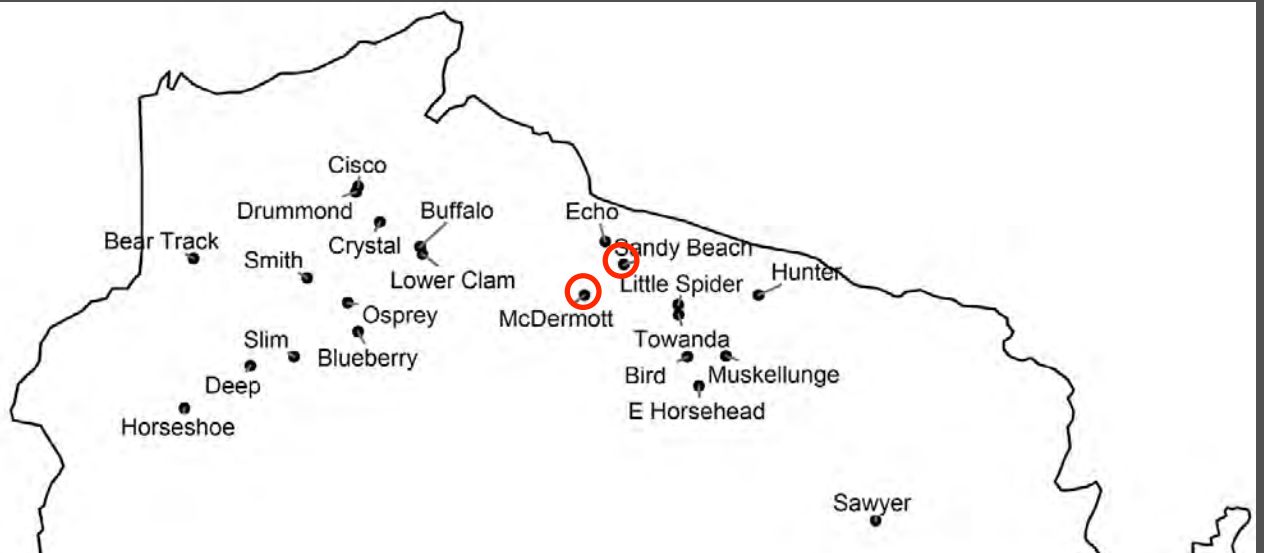
Whole-lake Centrarchid Removal to Improve Walleye Recruitment

Can fewer mouths to feed mean better walleye fishing?

Wisconsin biologists and researchers are proposing a strategy to find out.

Engbretson Underwater Photo

-Whole-lake removal of largemouth bass, bluegill, black crappie, and pumpkinseed beginning this spring



Walleye Comparative Recruitment

- What intra-lake and watershed characteristics enable a walleye population to maintain natural recruitment?*



Whole-Lake Manipulations to Restore Natural Recruitment of Walleye

Organization	Lakes	Approach	SOS Dimension
Wisconsin DNR, Tribal gov't., fishing clubs	21 manipulated, 13 reference lakes	Stock extended growth fingerlings, change regulations	Predation, Harvest, Angler expectations
Wisconsin DNR, Tribal gov't., fishing clubs	5 manipulated (Minocqua chain)	Close harvest of walleye for 5 years	Harvest
Tribal gov't, Wisconsin DNR, lakeshore owners	Jungle Lake	Remove adult LMB, stock extended growth fingerlings	Predation
Mole Lake Chippewa Community	Metonga, Patten	Remove bullheads, stock walleye	Predation
UW-Madison, WDNR, lakeshore owners	McDermott Lake, reference lakes	Remove small centrarchids	Predation

Whole-Lake Manipulations to Restore Natural Recruitment of Walleye

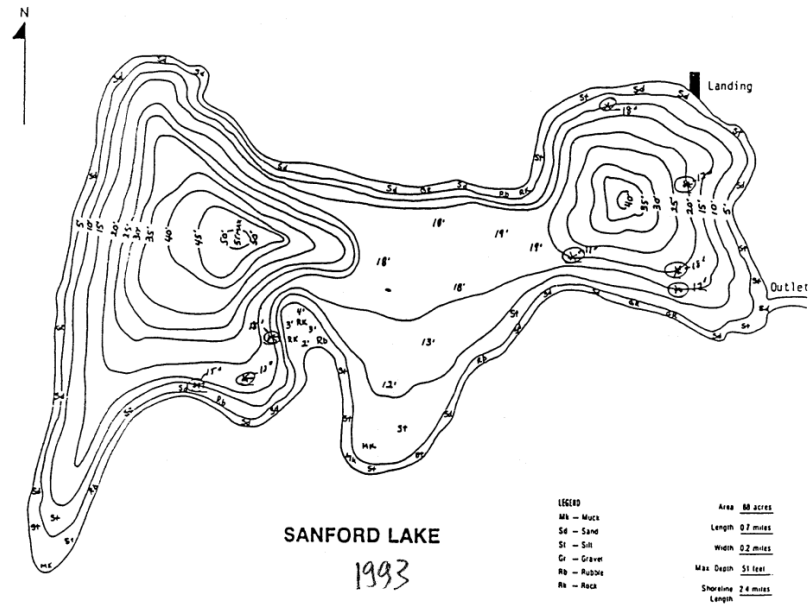
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Note the lack of habitat manipulations!

Sanford Lake - Dairymen's, Inc.



- 88 acres
- Maximum depth of 51 feet
- Undeveloped shoreline

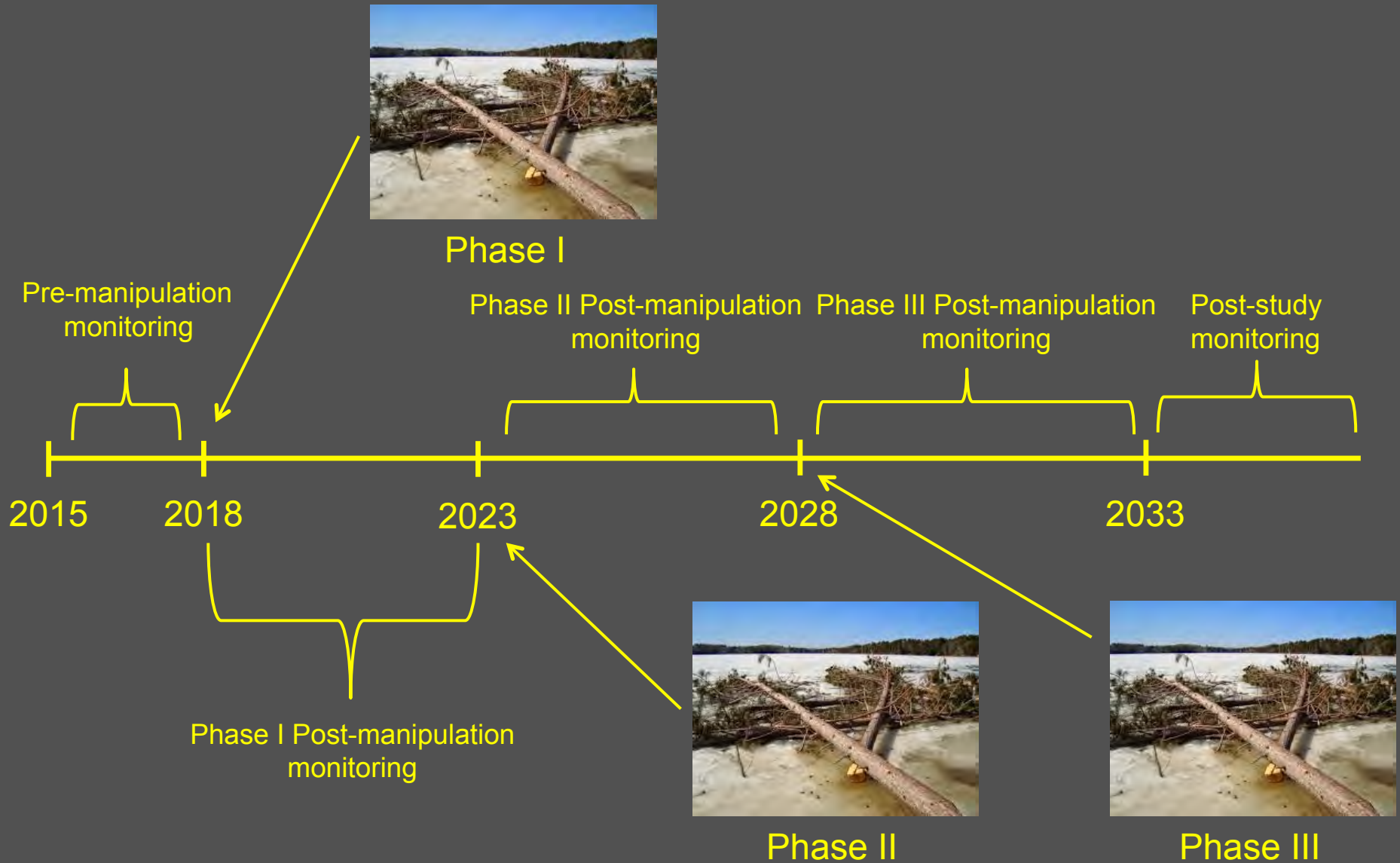


Reference System = Escanaba Lake

Sanford Lake Fish Community



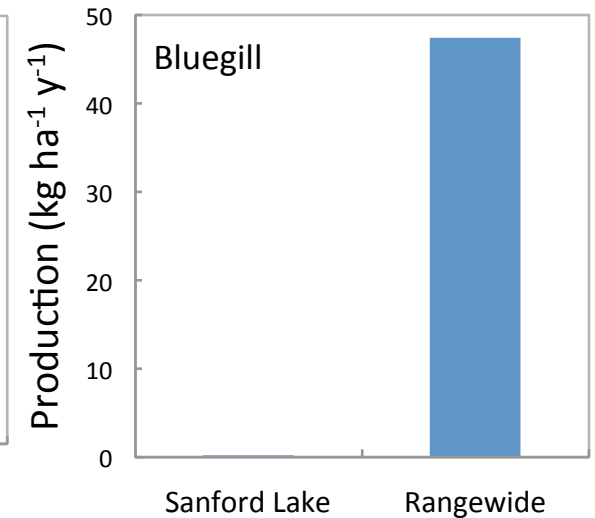
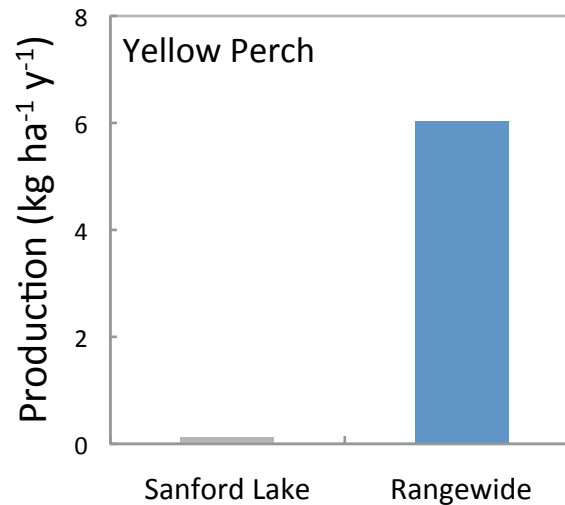
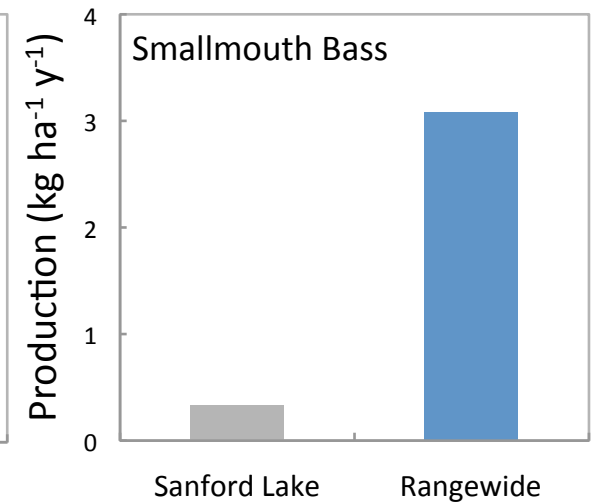
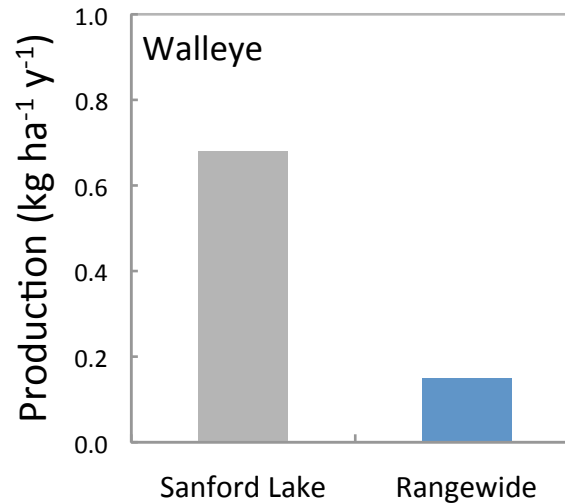
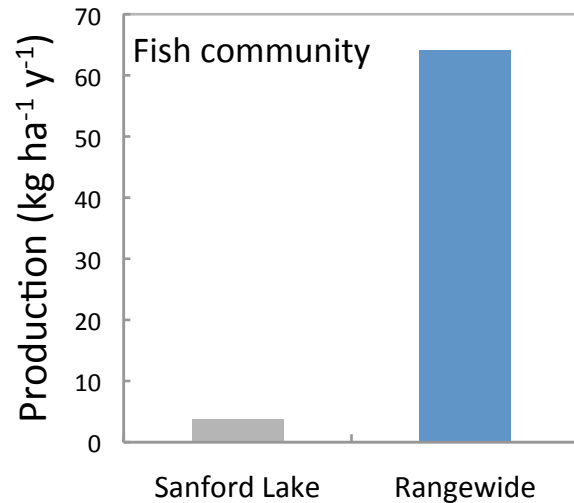
Sanford Lake Study Timeline



Response Variables

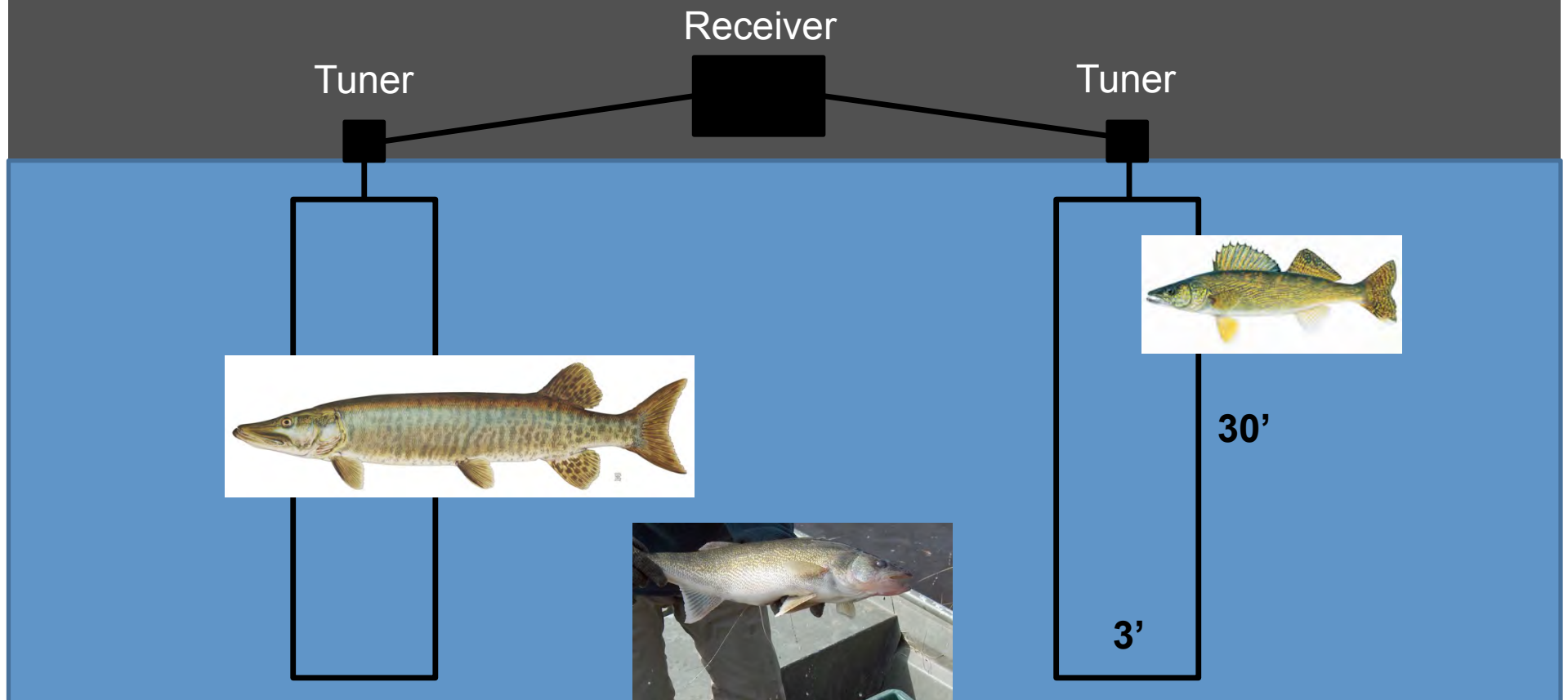
- Fish PE's, growth, condition, diet
- **Production**
 - production, biomass*
 - P/B (biomass turnover rate, trophic basis of production (energy flow))*
- Food web structure (stable isotopes)
- CWH habitat use
- Benthic macroinvertebrates
- Zooplankton
- **Fish behavior**
- Temperature/dissolved oxygen profiles
- CWH abundances
- Riparian forest characteristics
- Chlorophyll *a*, nutrients
- Submersed aquatic vegetation
- Angler harvest/catch rates
- Ecotone responses

Sanford Lake Fish Production - 2016



PIT Tag Receivers, Radio Telemetry, and Fish Behavior

- Muskellunge, walleye, smallmouth bass = 32 mm PIT tag (3 foot detection)
- Yellow perch, bluegill, rock bass = 12 mm PIT tag (1 foot detection)
- Radio transmitters in muskellunge, walleye, smallmouth bass

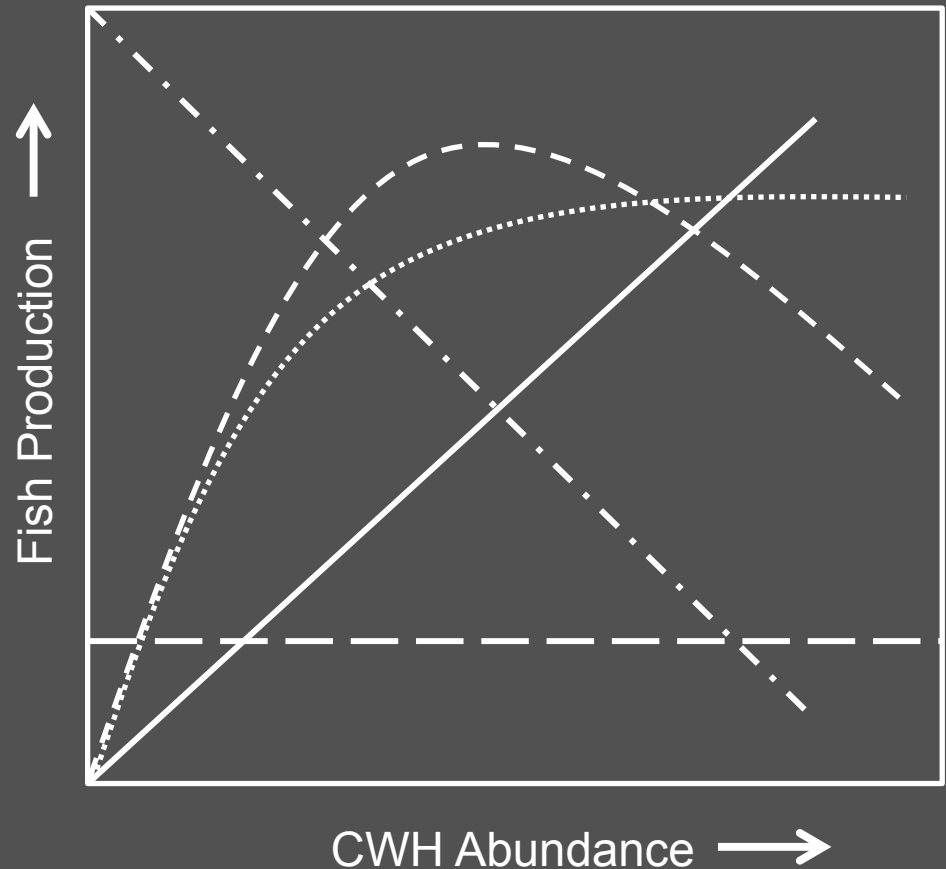


Hypotheses

- Tree drops will increase fish production and energy transferred to the adjacent riparian ecosystem



Surprises?



Wisconsin Walleye Initiative



Questions?

