

Predicting water temperature and its effects on sport fish populations in Wisconsin Lakes



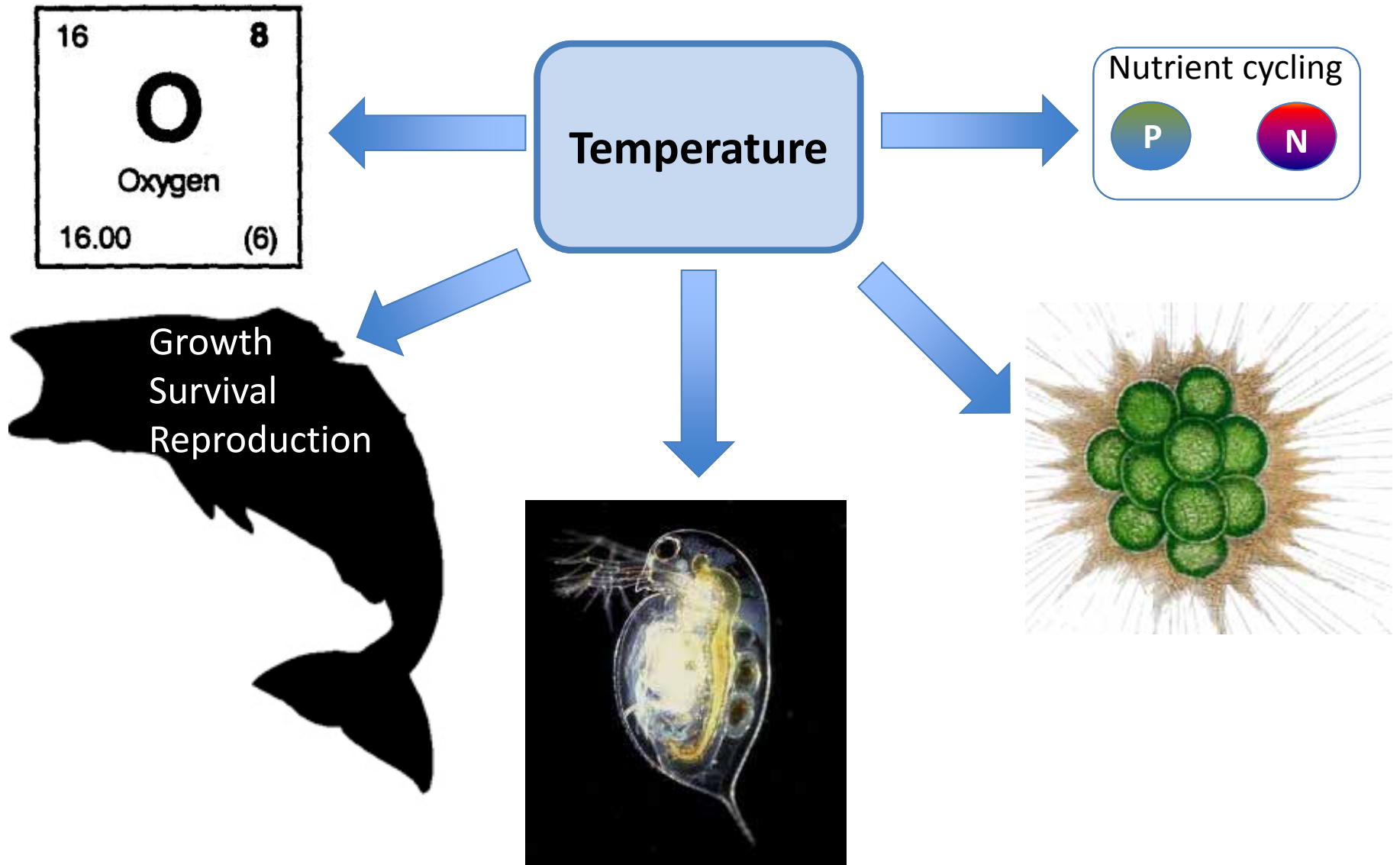
Gretchen JA Hansen, Jordan S Read, Luke Winslow



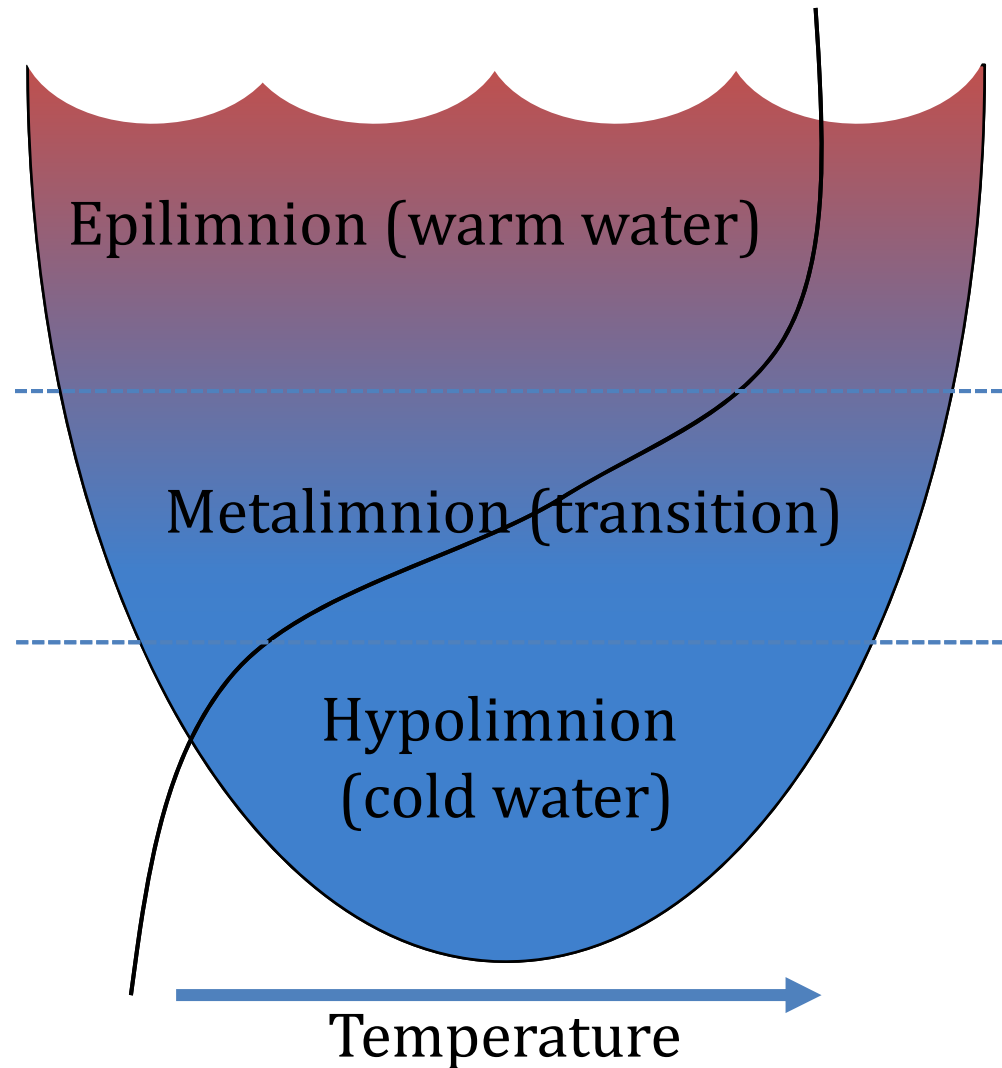
THE UNIVERSITY
of
WISCONSIN
MADISON



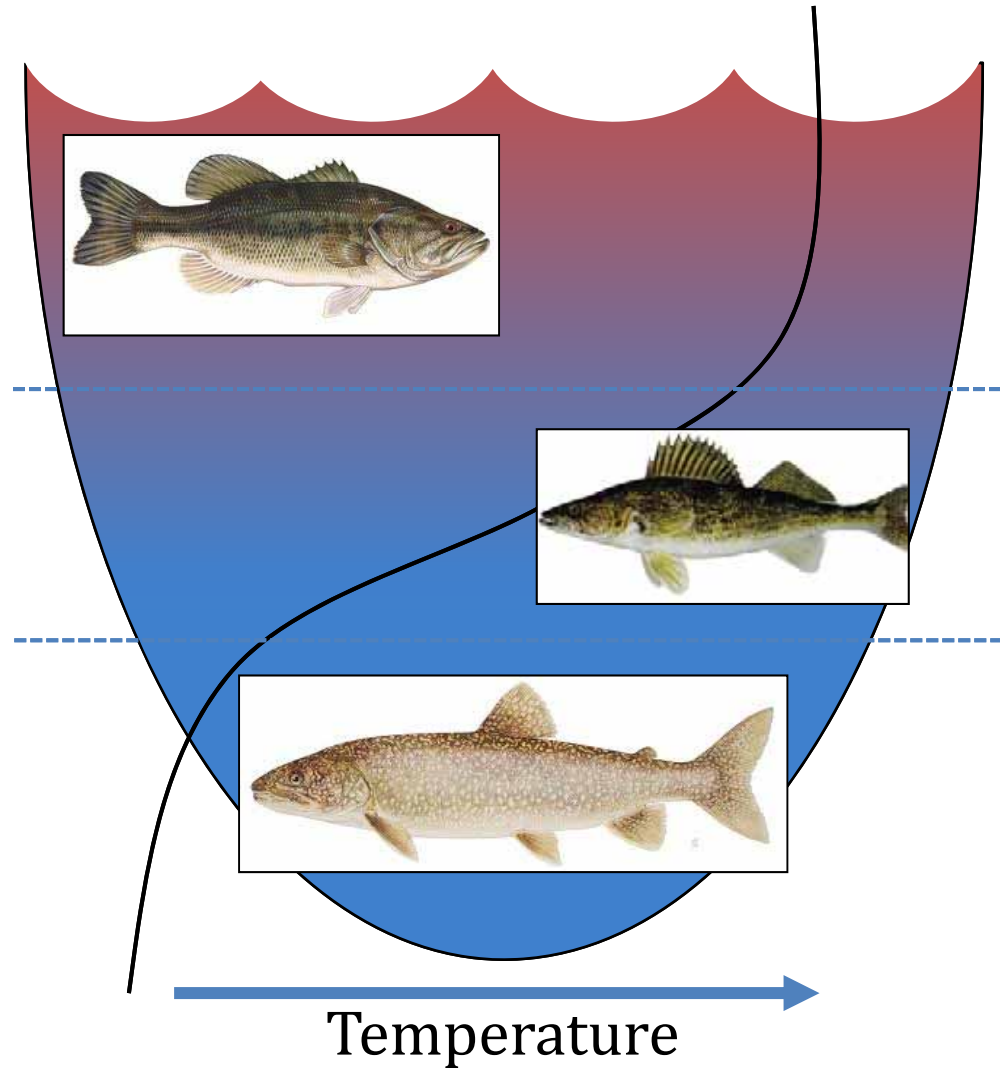
Temperature as ecological “master factor”



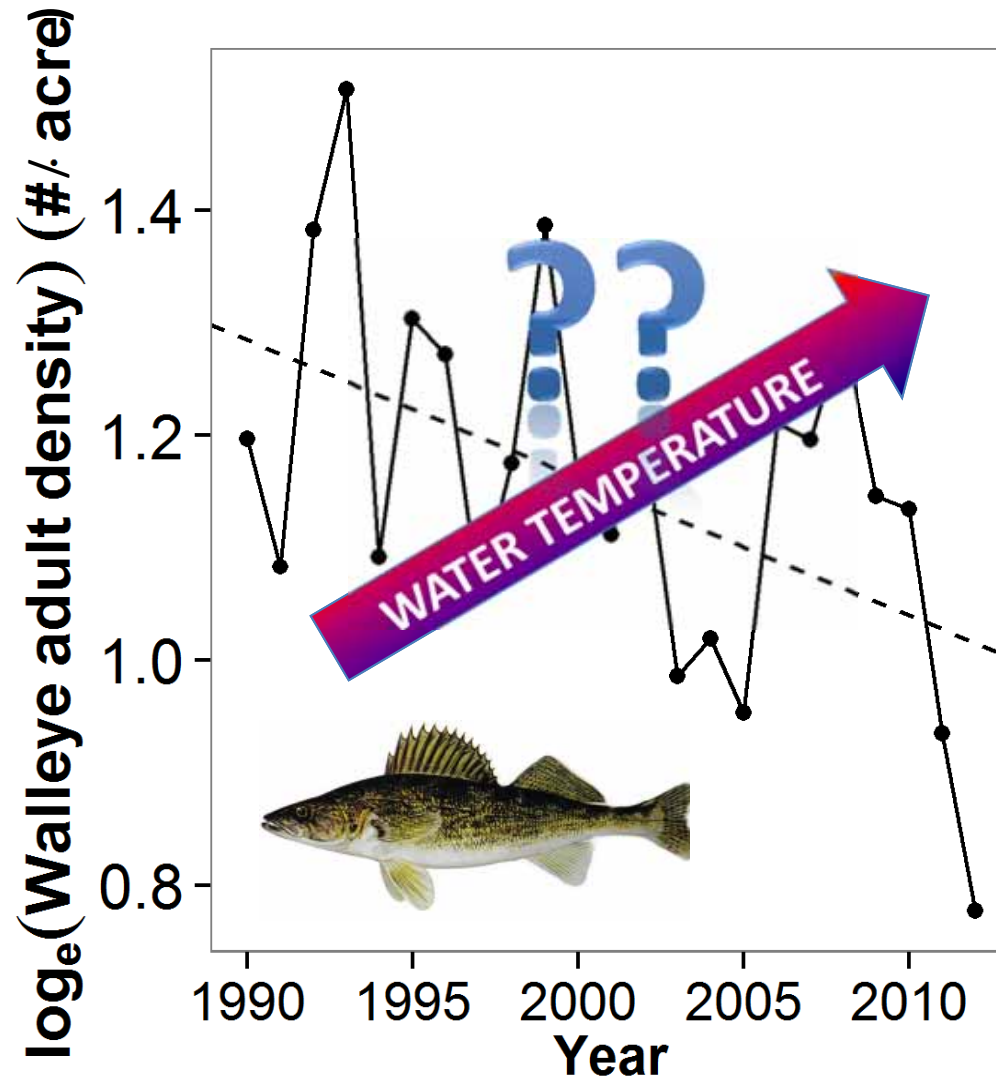
Water temperature in lakes



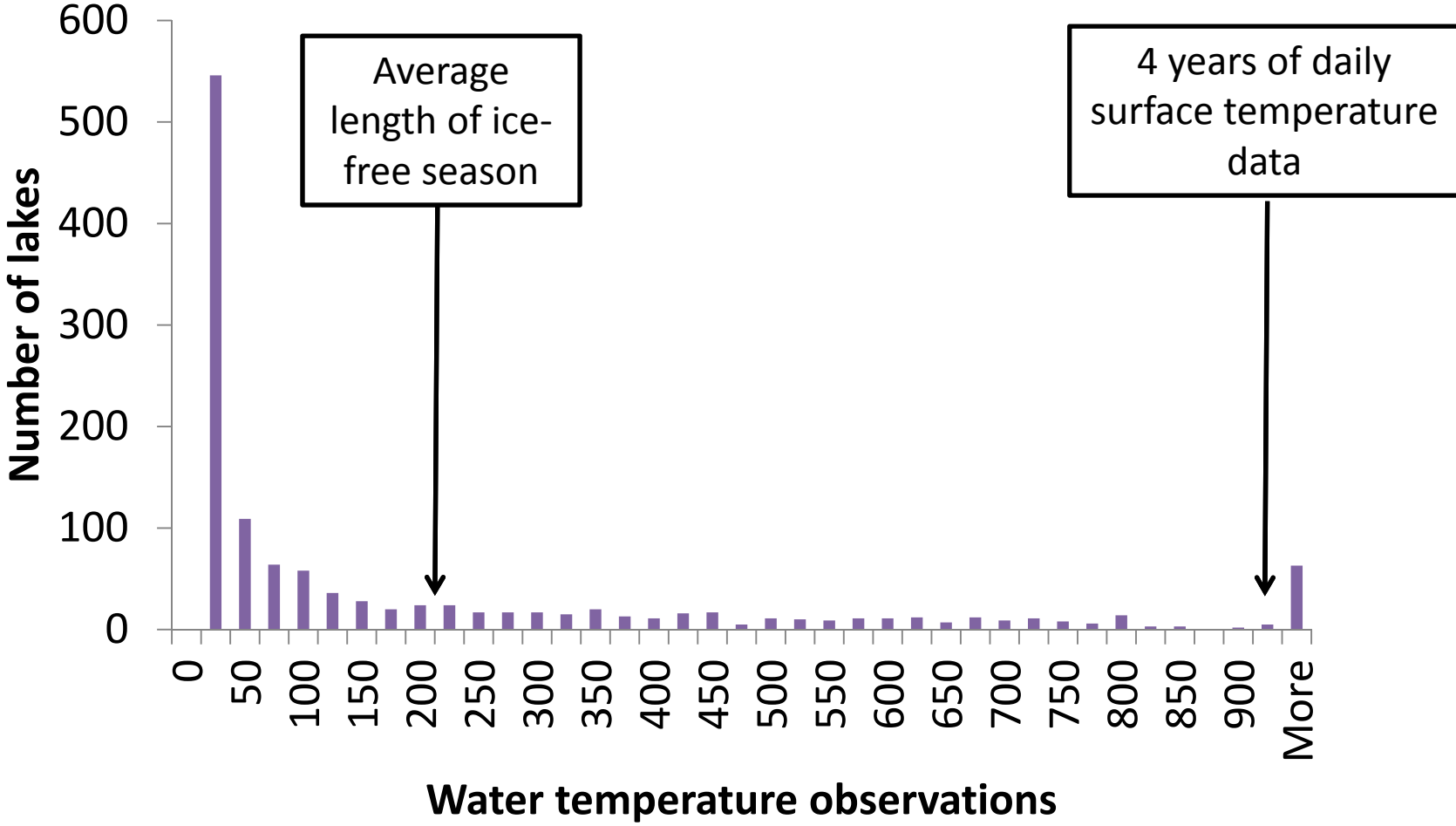
Water temperature in lakes



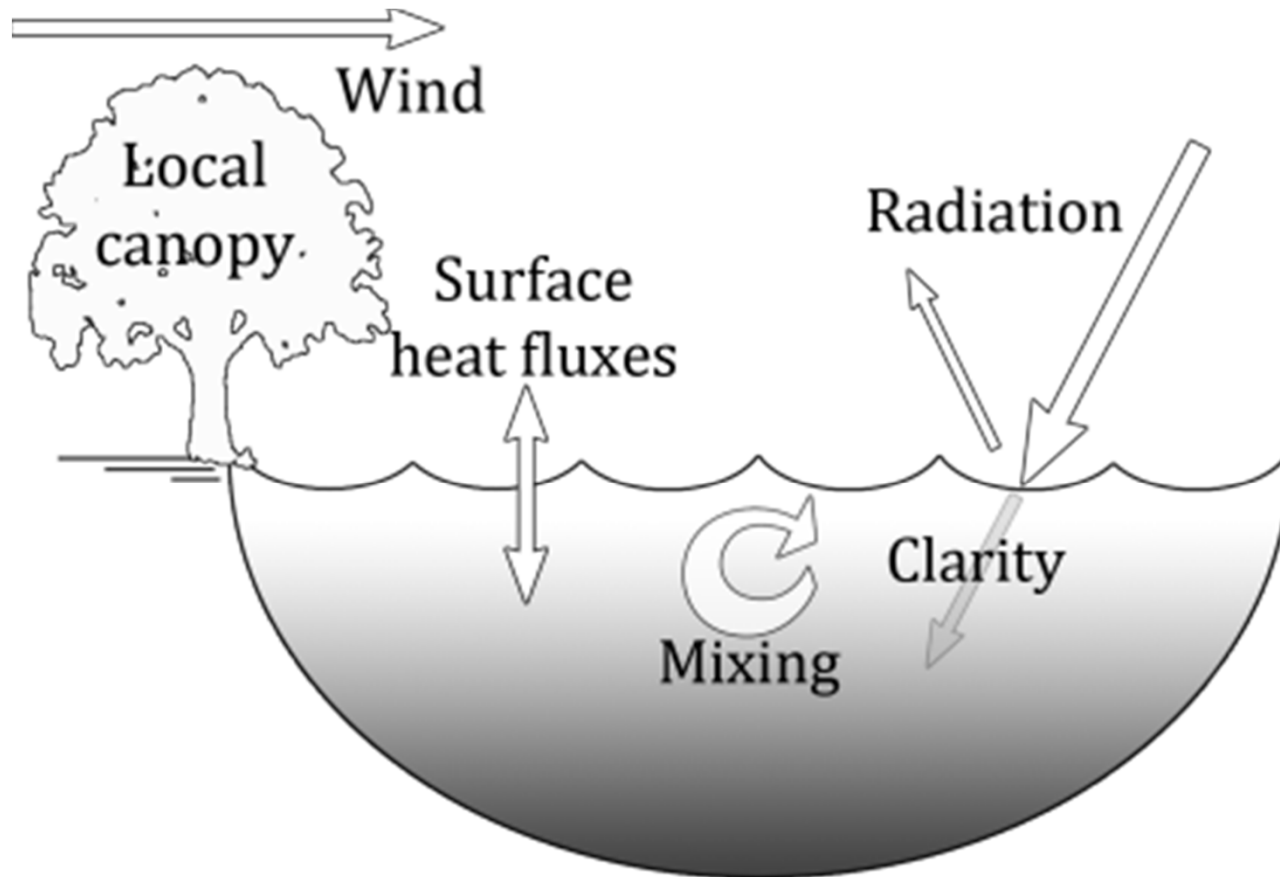
Can water temperature explain trends in Wisconsin's fish populations?



Historical temperature observations on 1,264 lakes

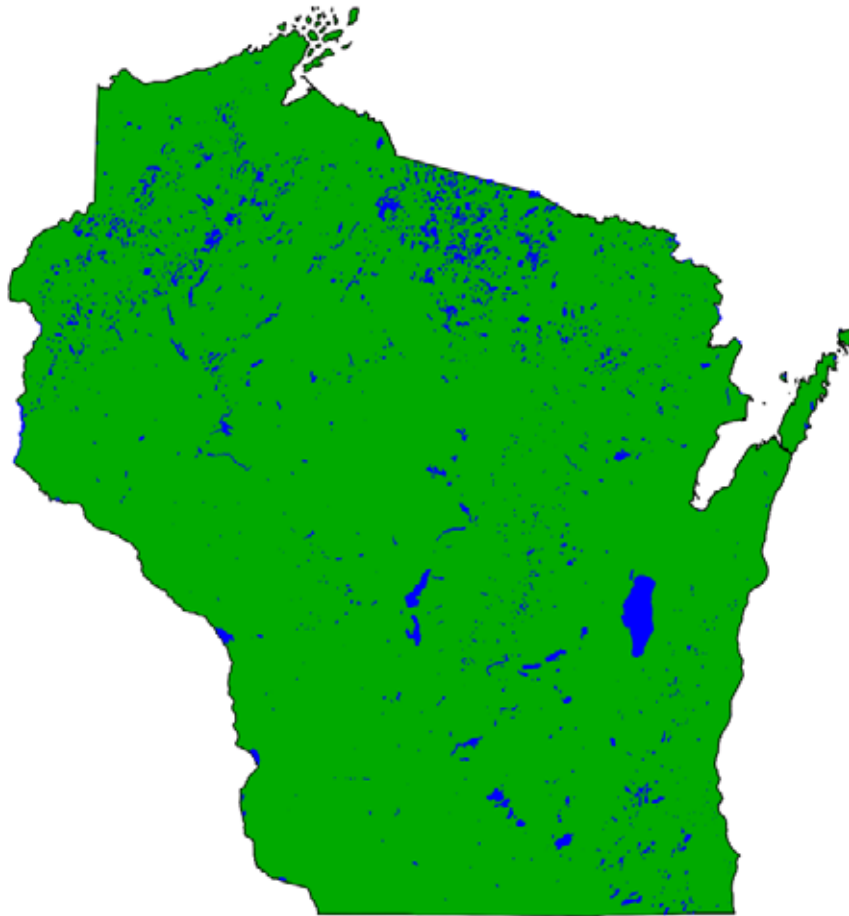


Approach: model temperature from known conditions



Depends on lake depth, location

Wisconsin's managed lakes



- 2,500 lakes with fisheries activity
- Ranging in size from <1 ha to > 500 km²
- Daily thermal profiles from 1979-2011

Slide 8

GAH2

Details about managed = all lakes for which there was any record of a fisheries management activity (fish survey, stocking, etc) in the DNR database.

Gretchen Hansen, 11/4/2013

WOWTemp

wowtemp bathybase.org

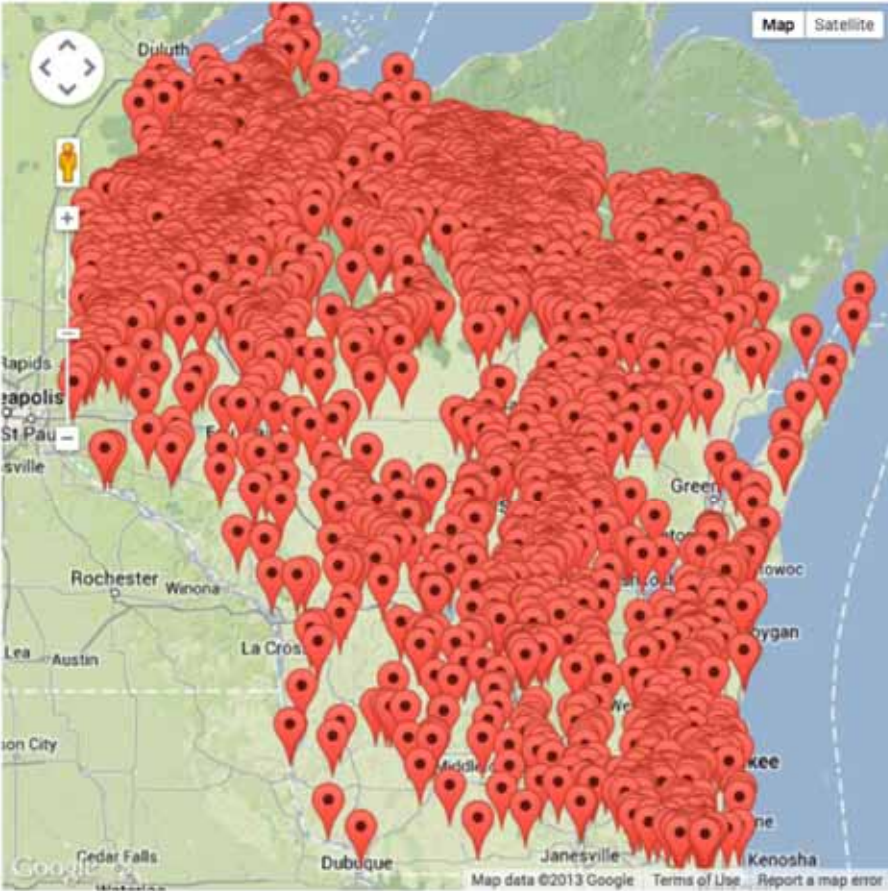
Home

Related: GLEON UW-Limnology USGS CIDA

wowtemp

Wisconsin Online Water TEMPERATURES project

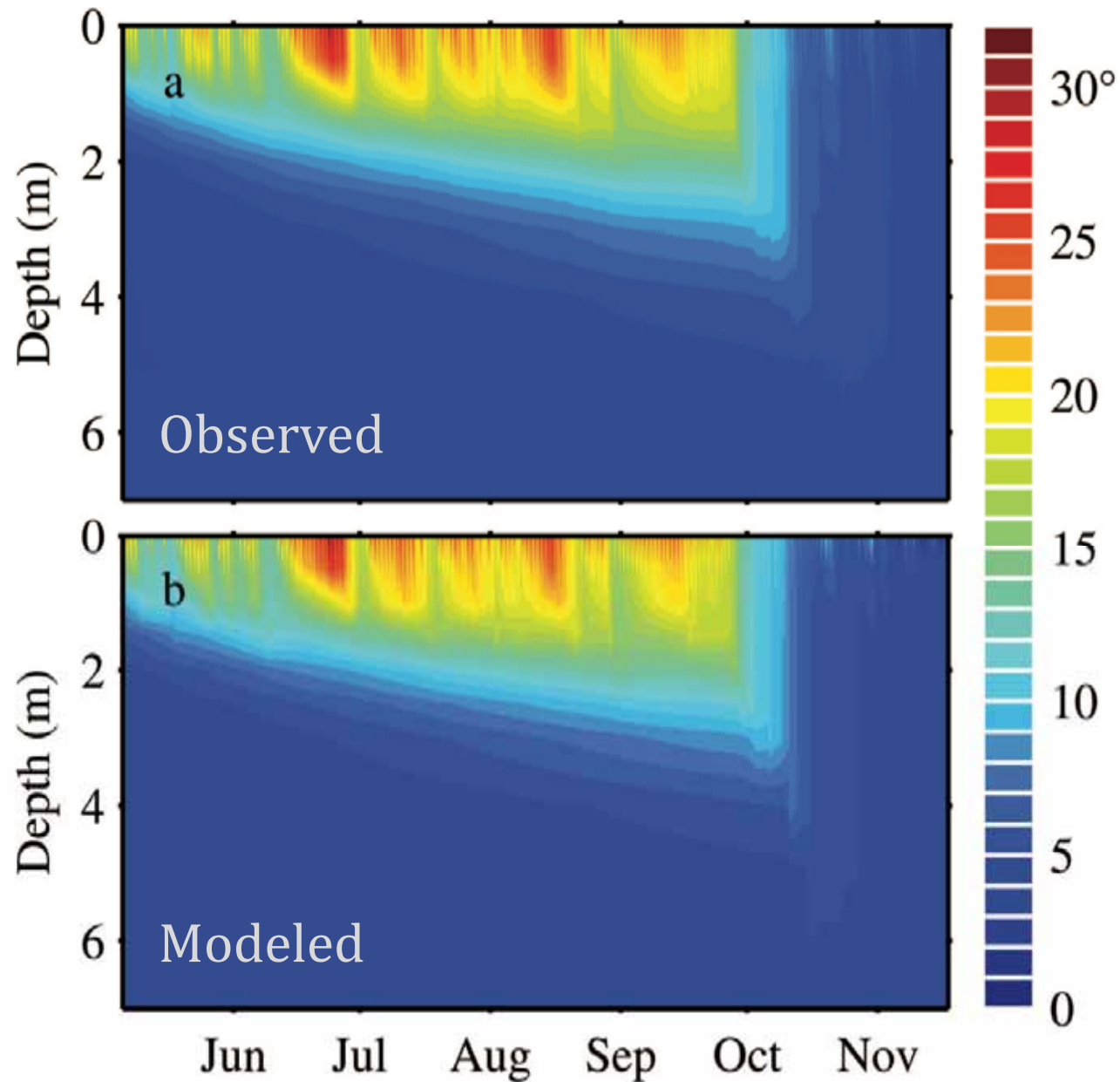
The collection of modeled water temperature for the managed lakes of Wisconsin.



The map displays the state of Wisconsin with a dense distribution of red location pins. The pins are most concentrated in the northern and central regions, particularly around the major lake basins. Labels for various cities and locations are visible on the map, including Duluth, St. Paul, Rochester, Winona, La Crosse, Dubuque, Janesville, and Kenosha. The map interface includes a compass, a person icon, and zoom controls. In the top right corner of the map area, there are buttons for 'Map' and 'Satellite'. At the bottom of the map, it says 'Map data ©2013 Google Terms of Use Report a map error'.

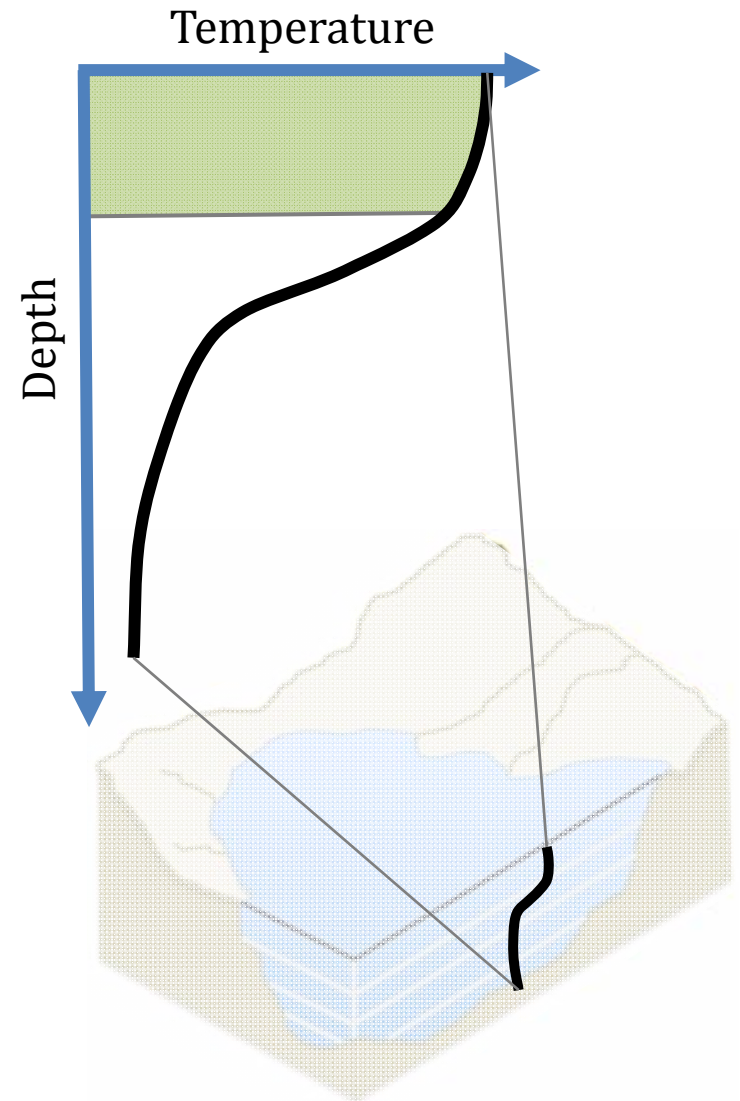
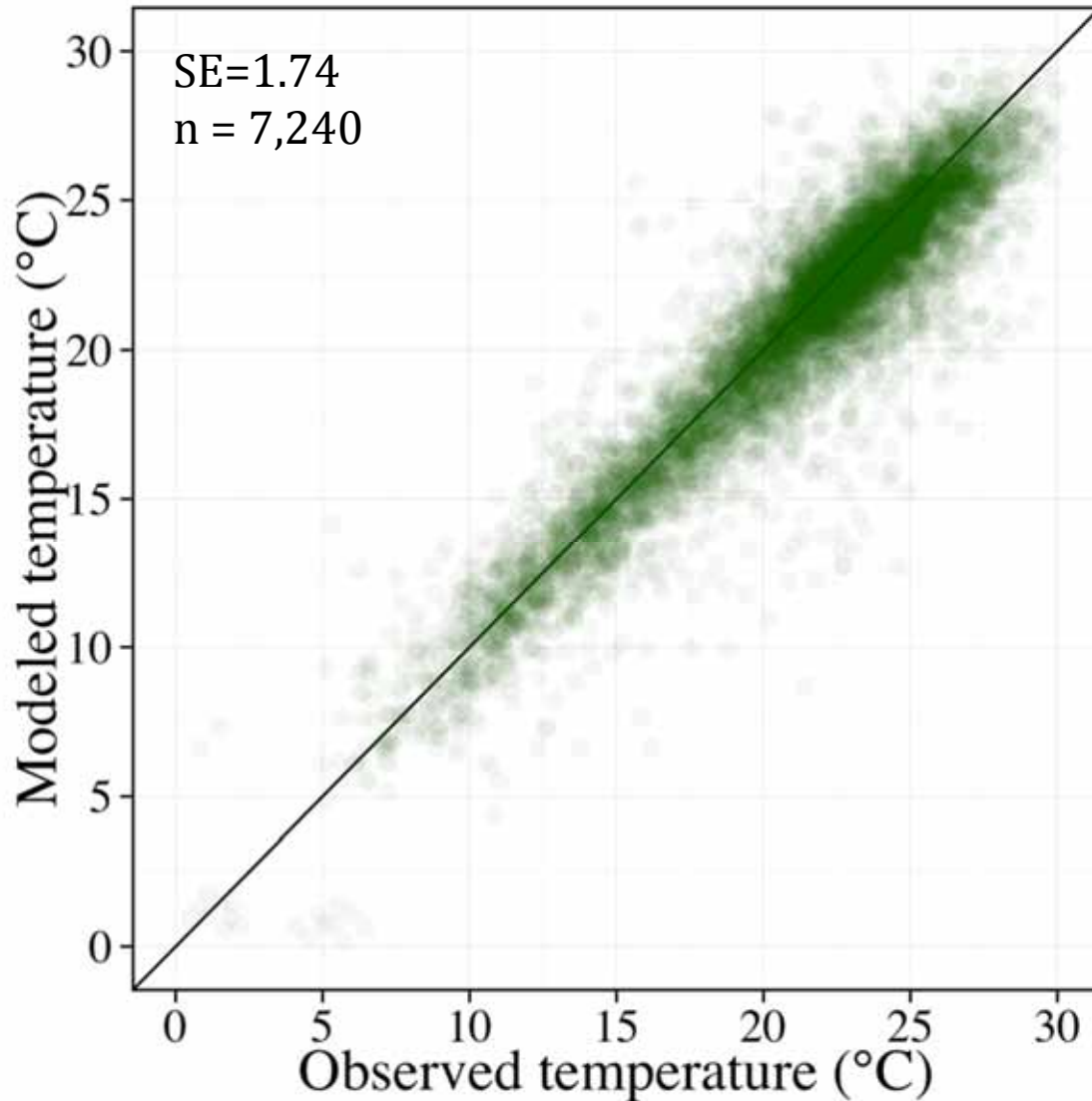
<http://wowtemp.bathybase.org/>

Model output: daily temperature profiles



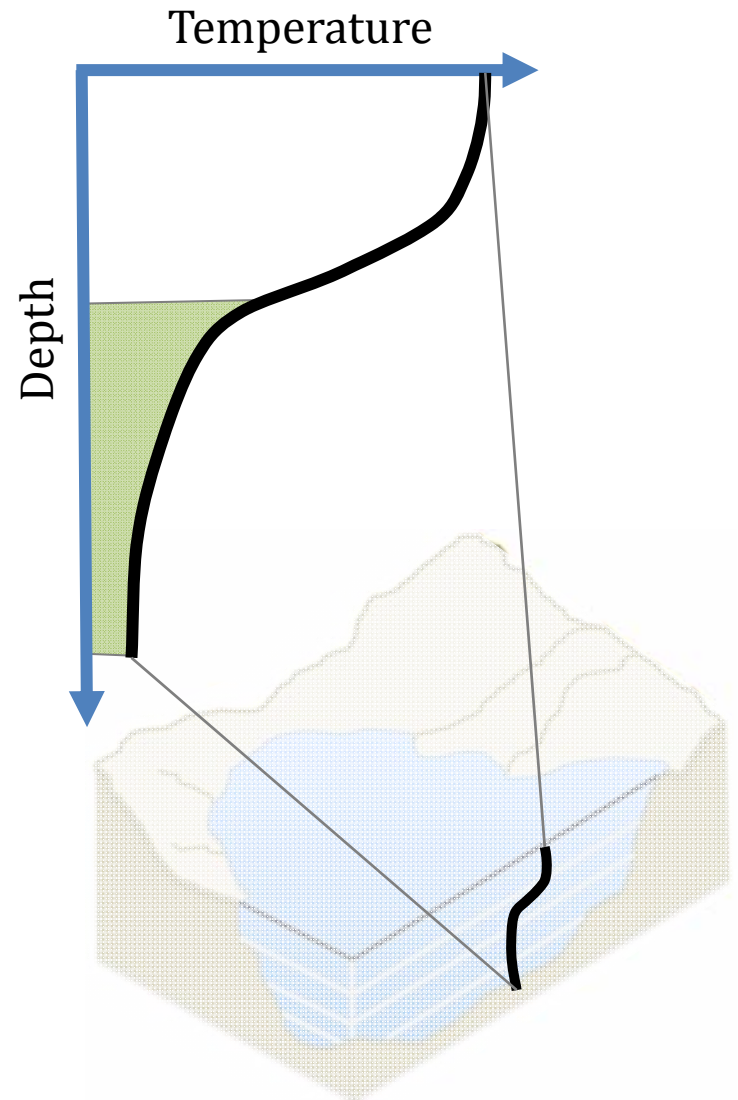
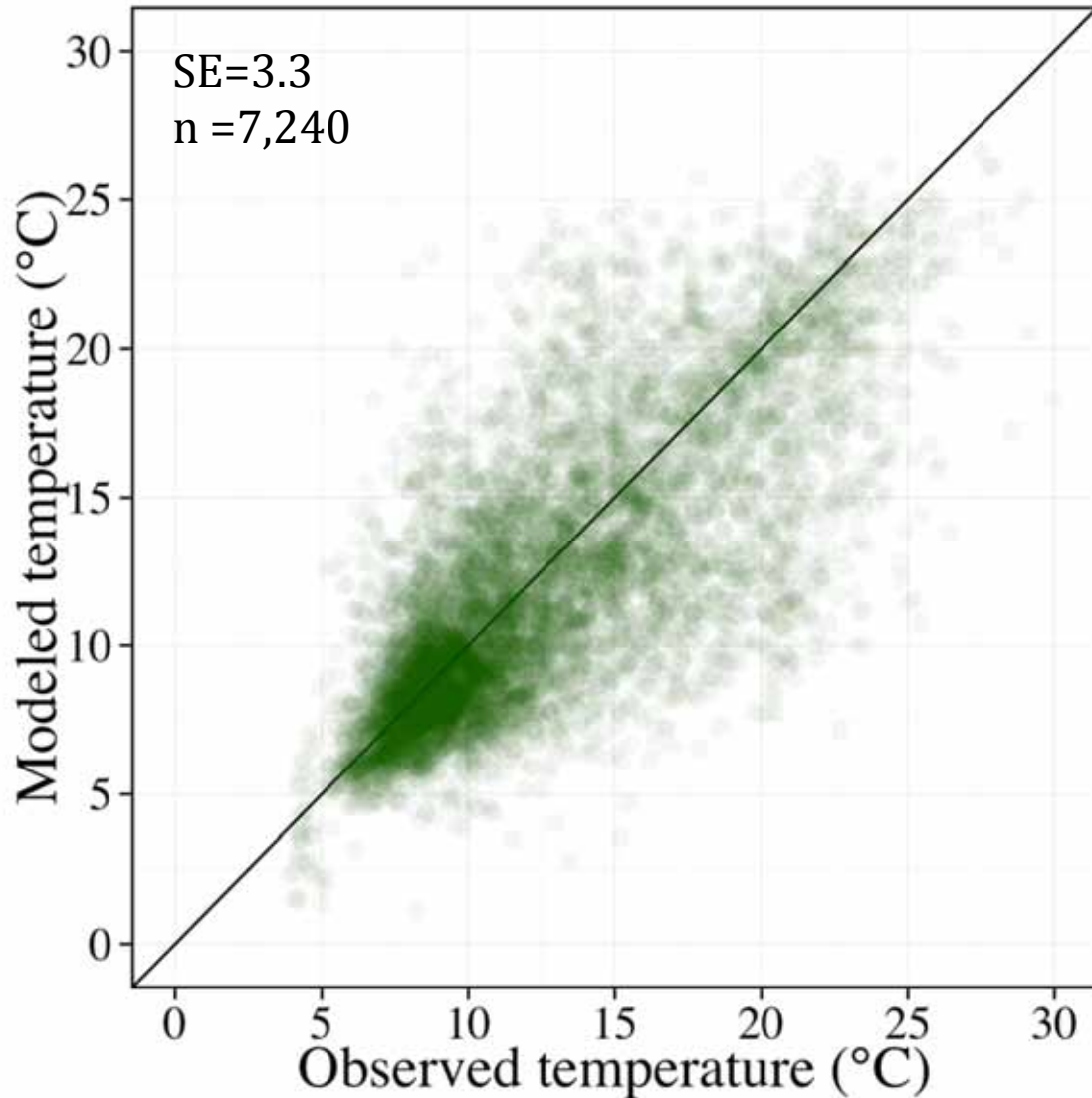
Model predicts surface and epilimnion temperatures well

Epilimnion temperatures

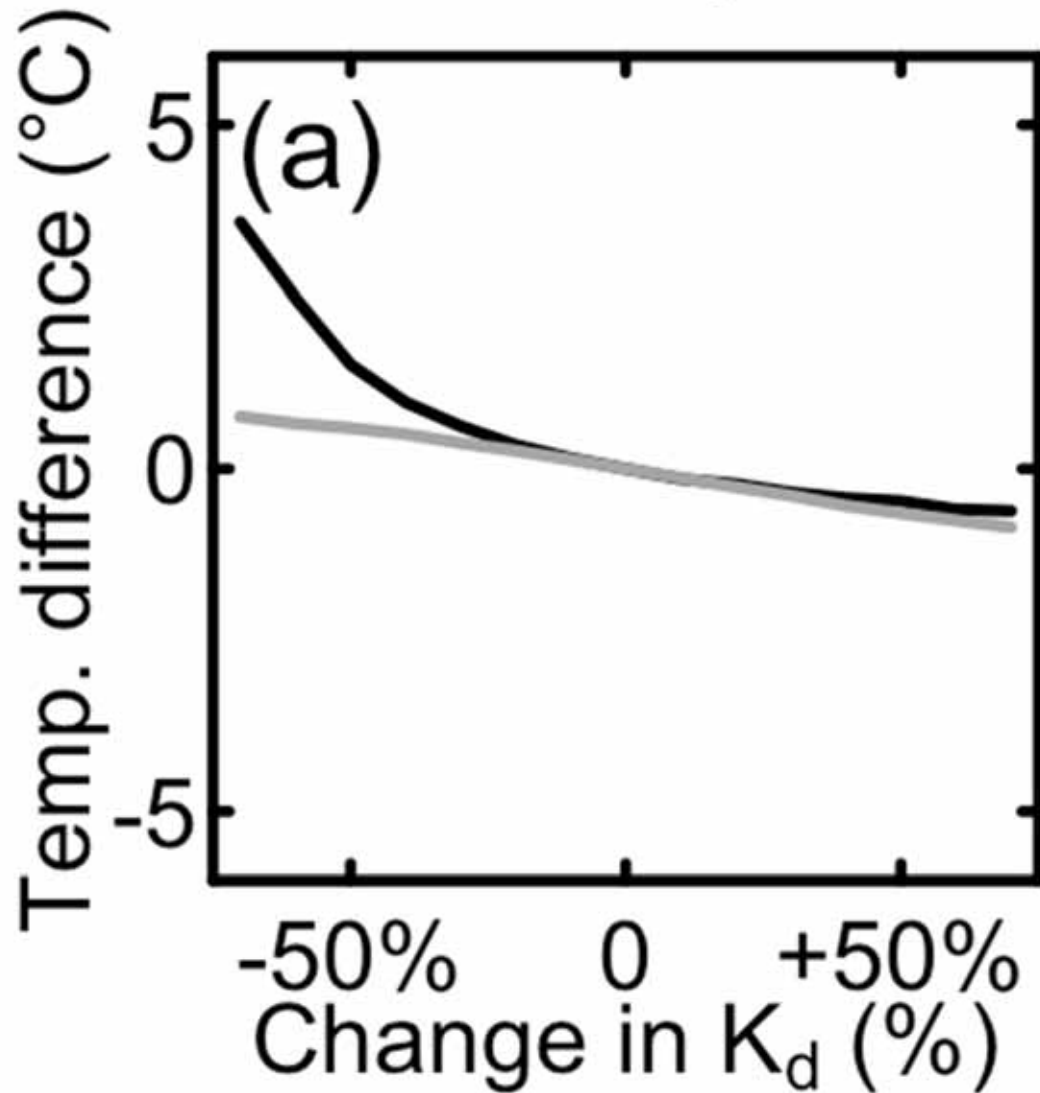


Model predicts hypolimnion temperatures less well

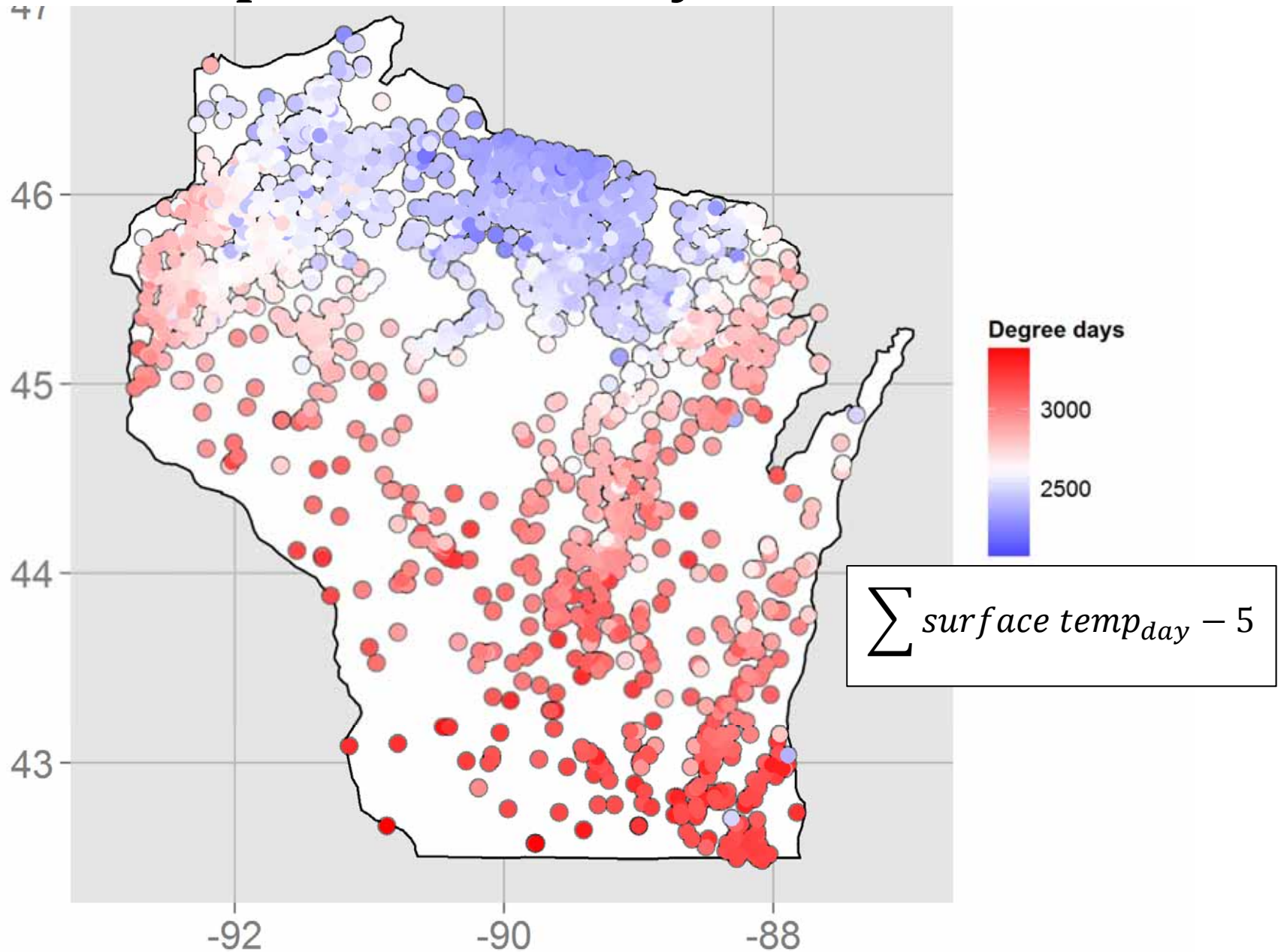
Hypolimnion temperatures



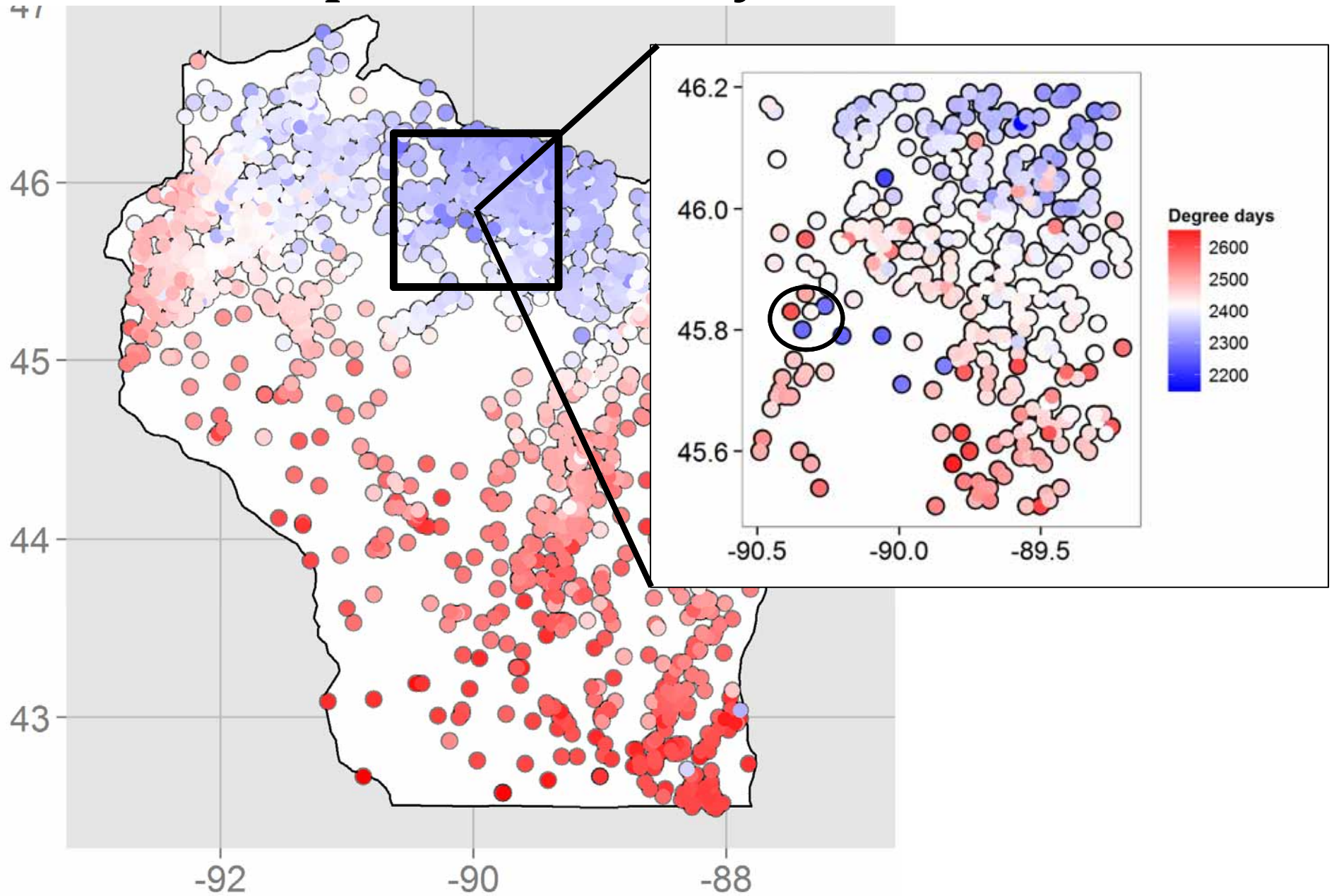
Water temperature is sensitive to clarity



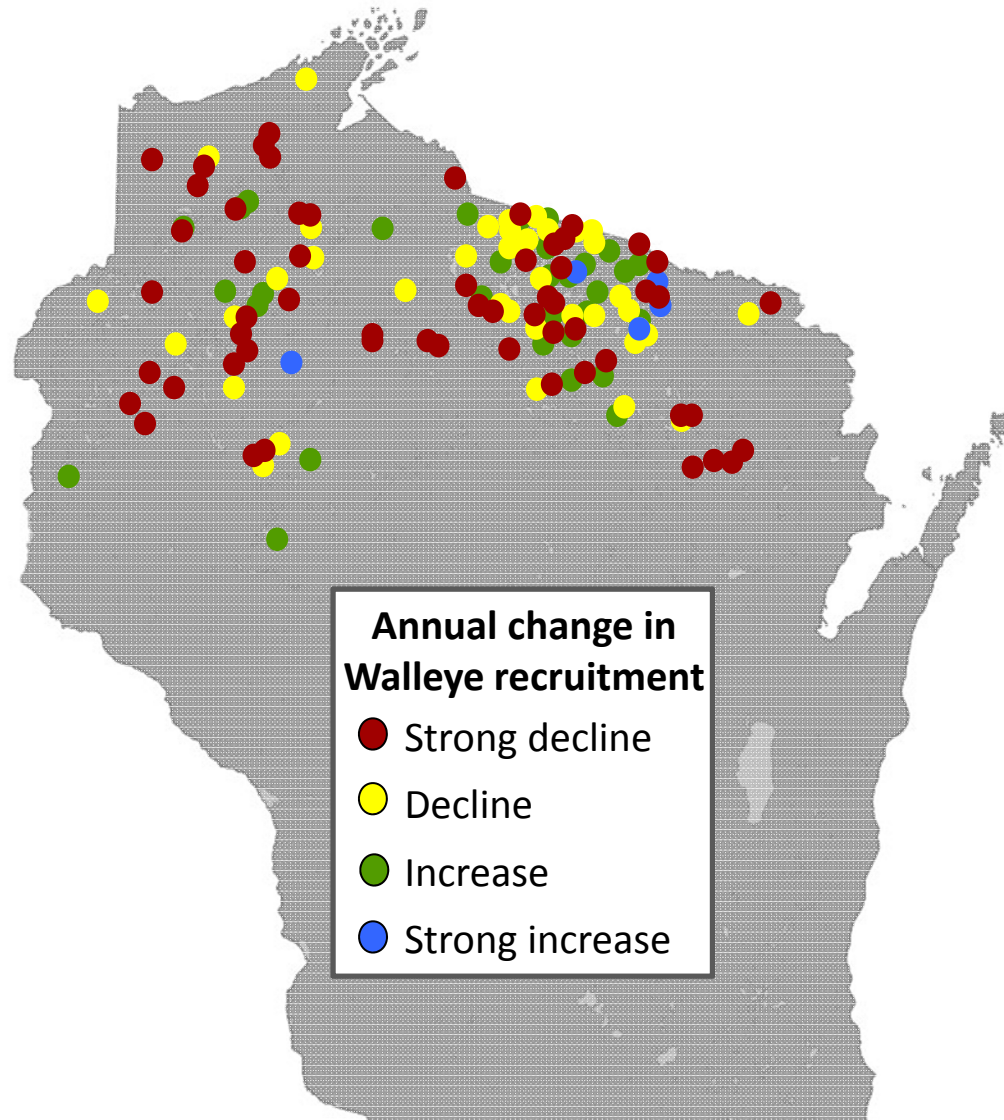
Water temperatures vary across Wisconsin



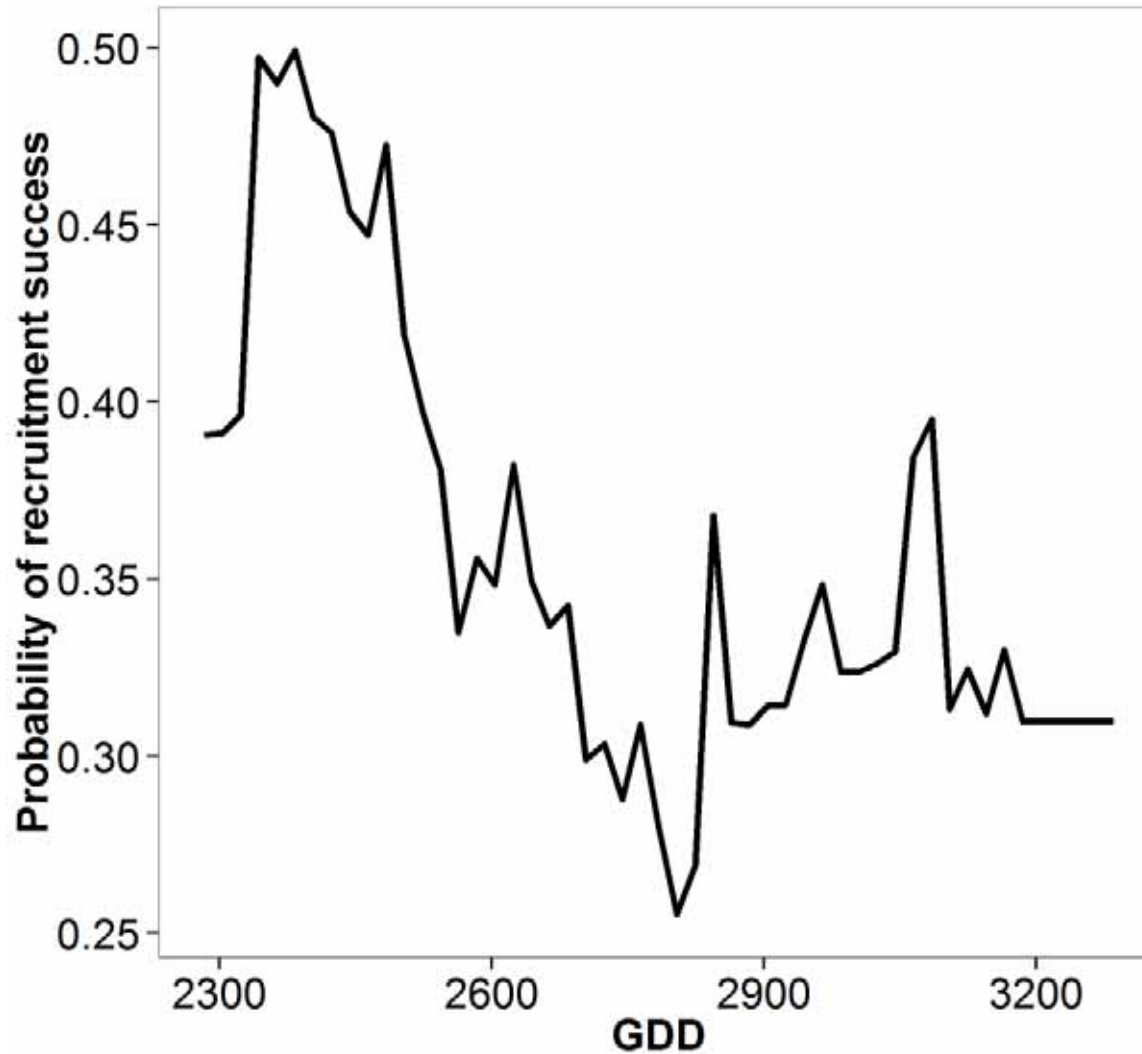
Water temperatures vary across Wisconsin



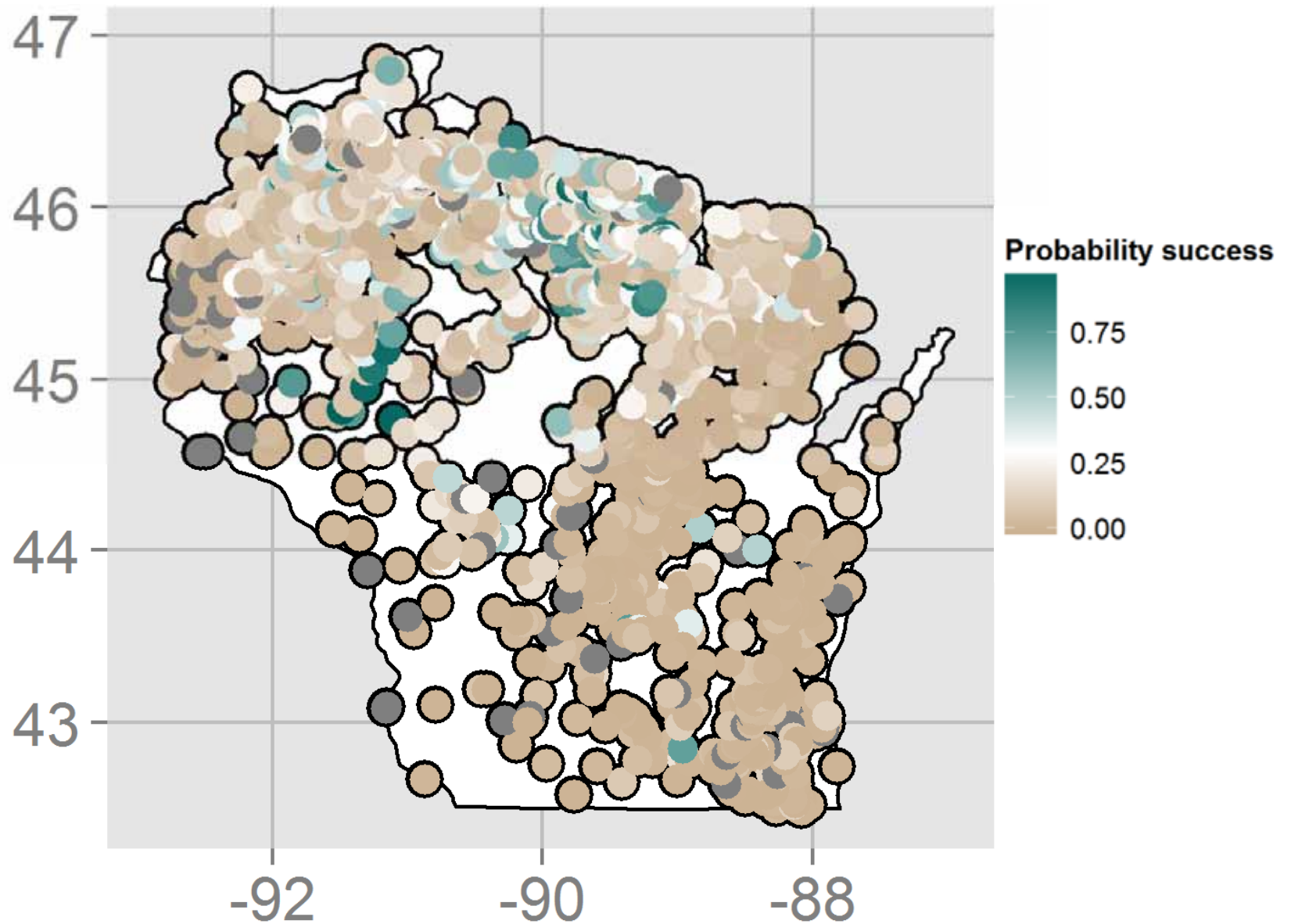
Walleye recruitment declining in Wisconsin's Ceded Territory



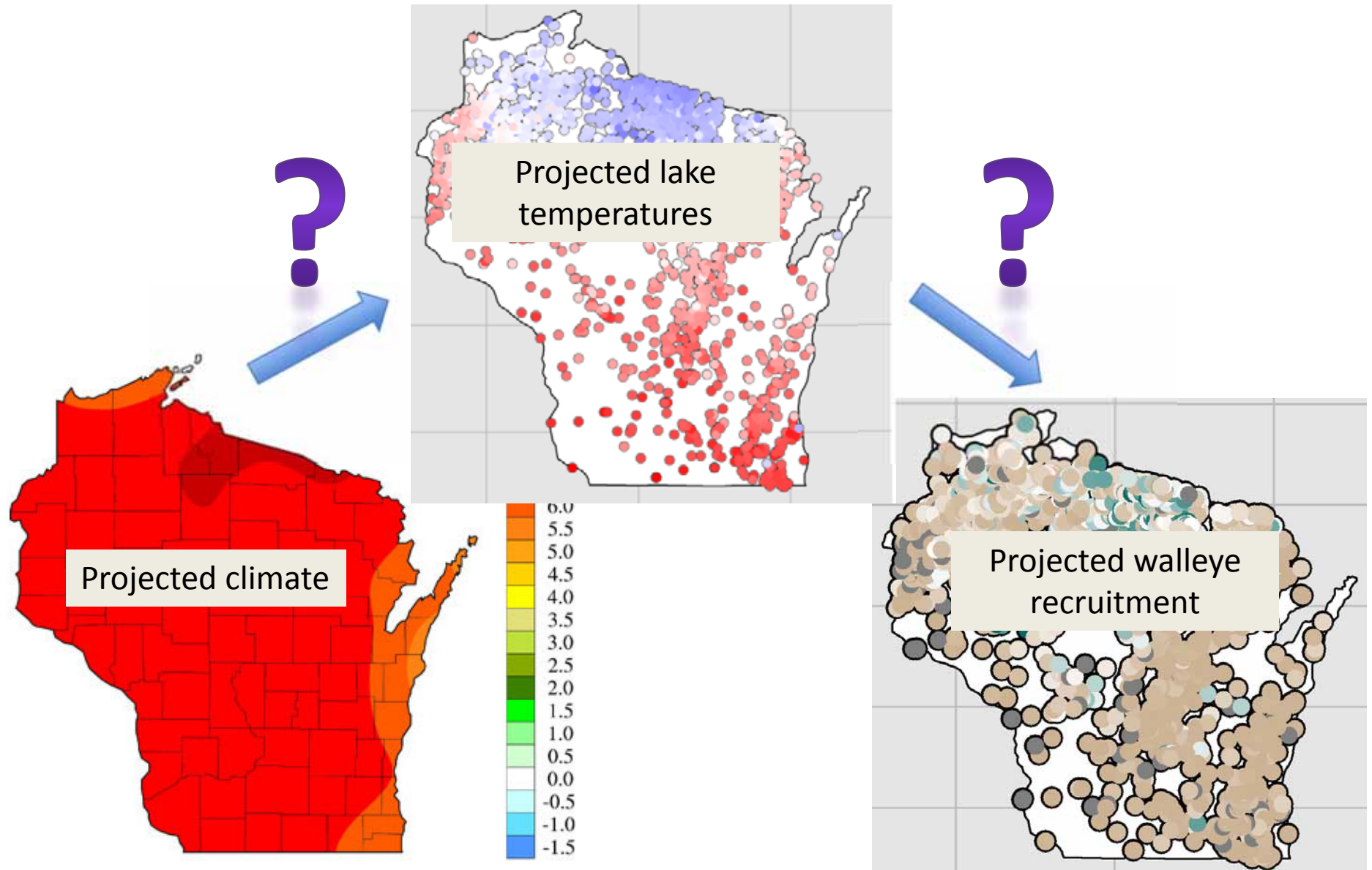
Temperature correlated with walleye recruitment



Predicted walleye recruitment probability (present day)



Model can be used for future projections



Future work

- Improve hindcast temperatures
 - Better clarity data
- Forecast water temperatures under various climate projections
- Incorporate dissolved oxygen
- Project changes to fish abundance, other in-lake processes

THANKS!

Jamon Van De Hoek, Corey Markfort, Paul Hanson,
Nate Booth, Ivan Suftin, Tom Kunicki, Jordan
Walker, Jereme Gaeta, Steve Greb, Alex Latzka



Questions?



Gretchen Hansen
(608) 221-6330
gretchen.hansen@
wisconsin.gov



Jordan Read
(608) 821-3922
jread@usgs.gov



Luke Winslow
(608)263-2465
lawinslow@wisc.edu

