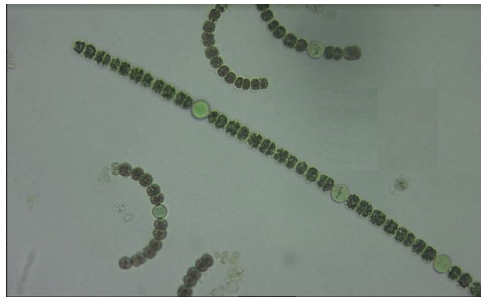
Assessment of zooplankton- phytoplankton relationships in Falls Lake to guide development of site specific numeric nutrient criteria

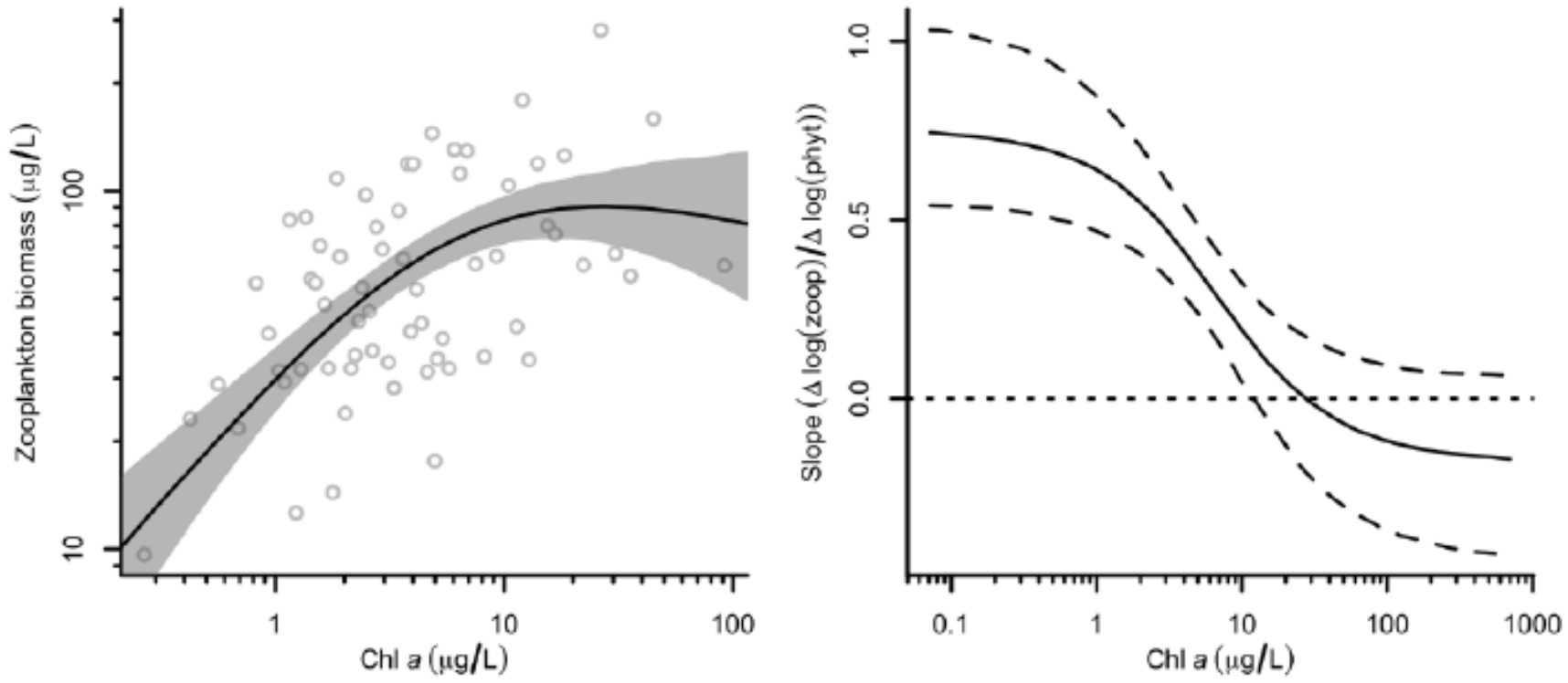


Nathan Hall and Michael Piehler
UNC Chapel Institute of Marine Sciences

Falls Lake Nutrient Study Research Symposium
7 April 2022

EPA proposes use of zooplankton: phytoplankton biomass to set standards for phytoplankton biomass

Ambient Water Quality Criteria to Address Nutrient Pollution in Lakes and Reservoirs (2021)



Data from National Lakes Assessment- summertime survey of >1000 U.S. lakes and reservoirs

Research Questions

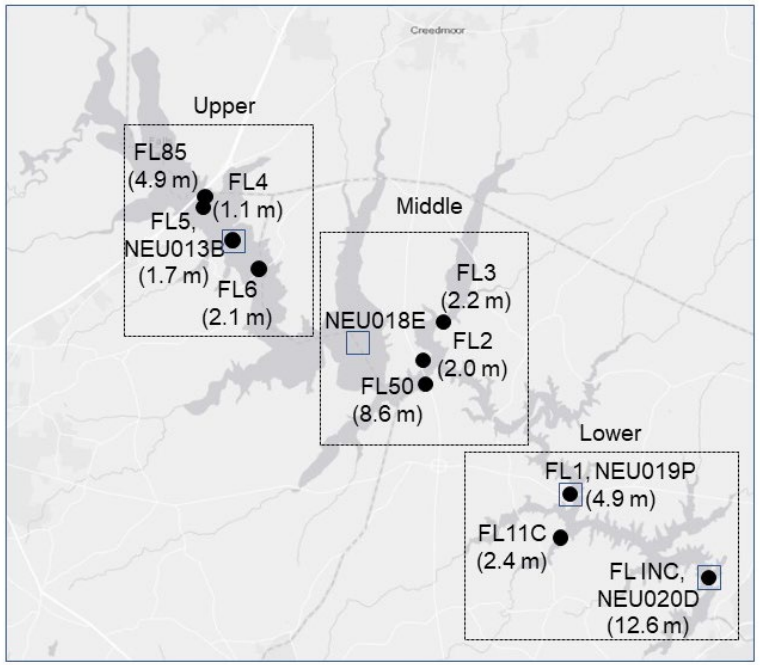
1) How does zooplankton/Chl *a* in Falls Lake compare to similar water bodies in the southeastern US?

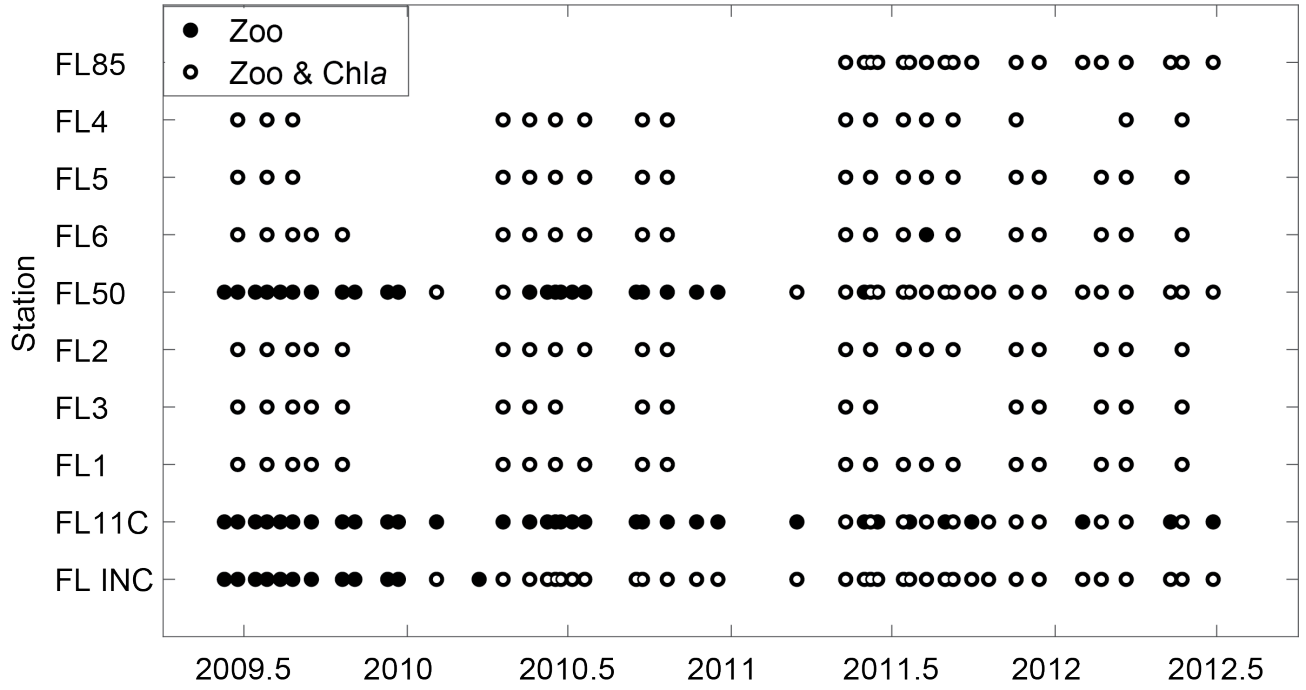
2) Is there a clear inflection point in zooplankton/Chl *a* for Falls Lake that to guide development of a site-specific Chl *a* criterion?

3) Is there a clear inflection point in zooplankton/Chl *a* for southeastern reservoirs to guide development of a region-specific Chl *a* criterion?

Description of Data Set

- Zooplankton collected, identified, counted by Dr. Sandra Cooke (Greensboro College)
- Phytoplankton biomass as chlorophyll *a* measured by NC State's Center for Applied Aquatic Ecology
- Same sampling methods as the National Lakes Assessment

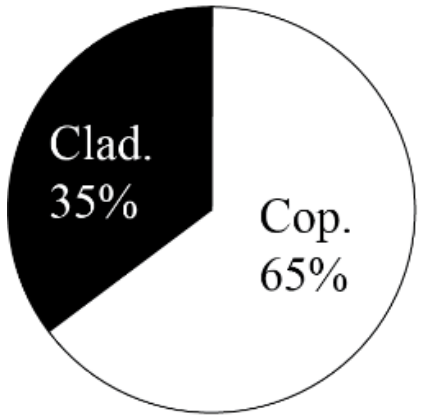




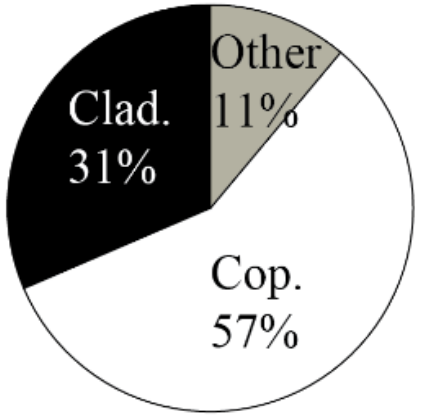
Falls Lake vs other southeast reservoirs

Median Values	Falls Lake	SE U.S. reservoirs
Chlorophyll *a*	35	12
Zoo. Biomass	10	36
Zoo. Biomass: Chlorophyll *a*	0.26	2.3

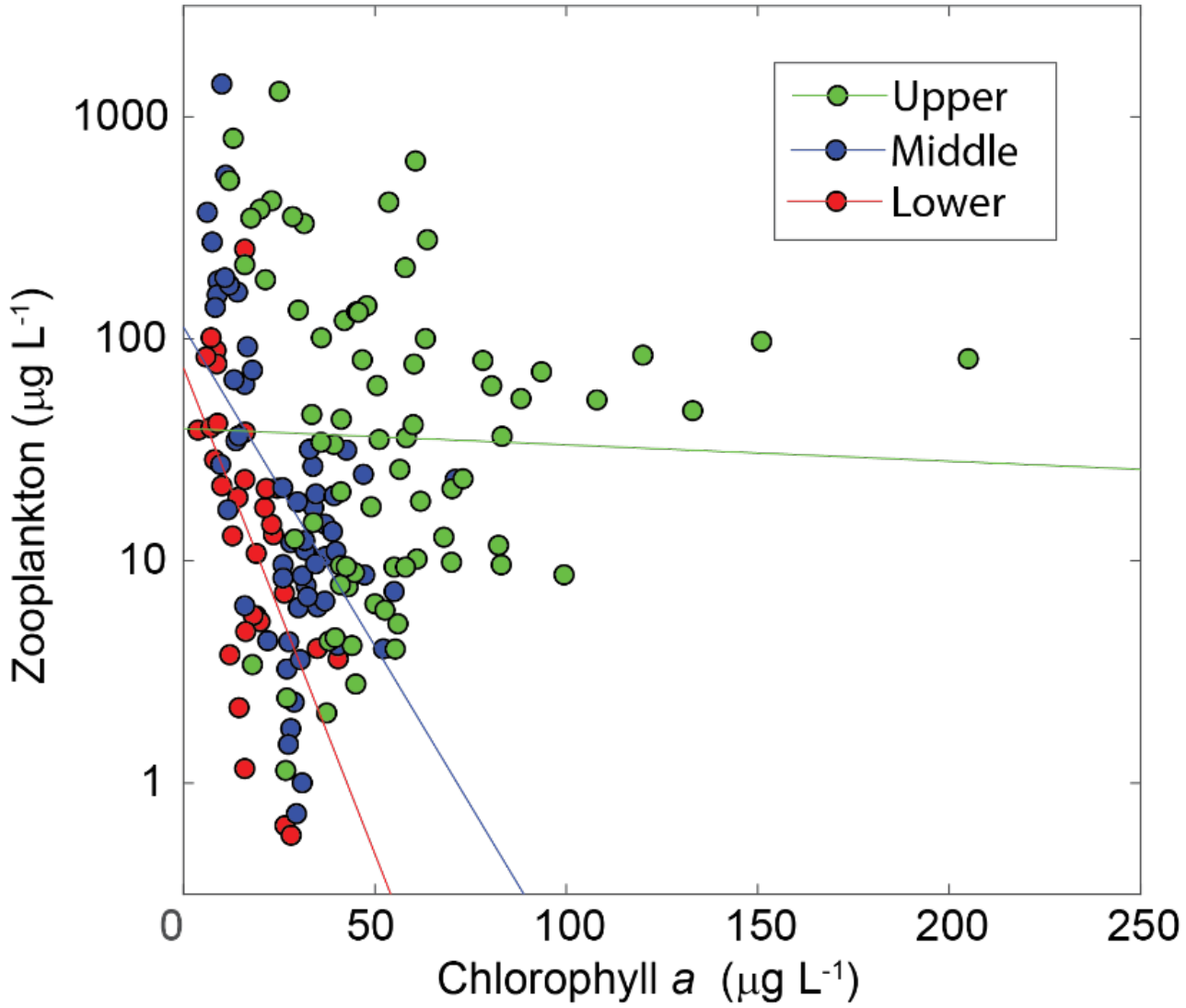
Falls Lake
Summer Biomass



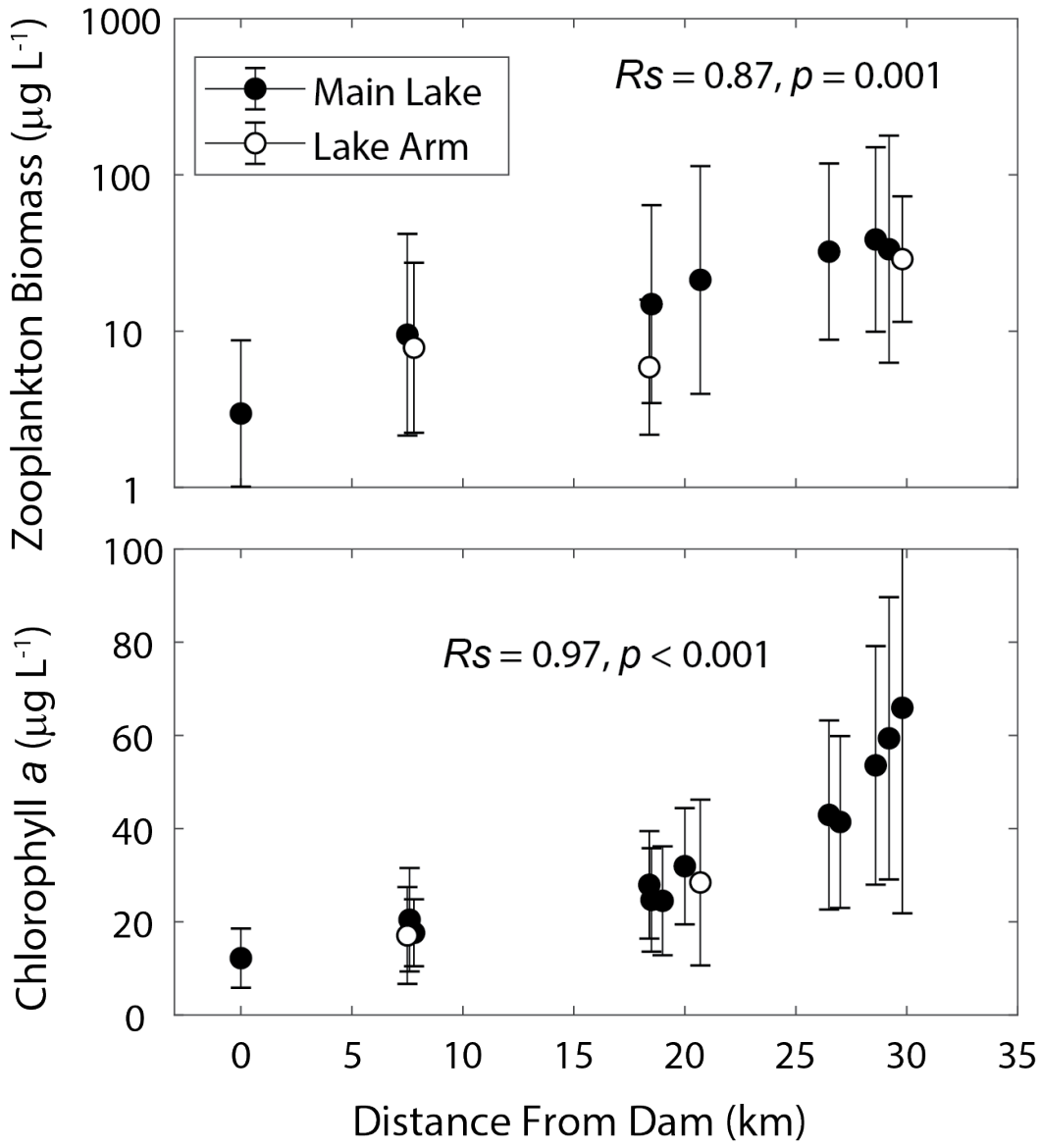
S.E. Reservoirs
Summer Biomass



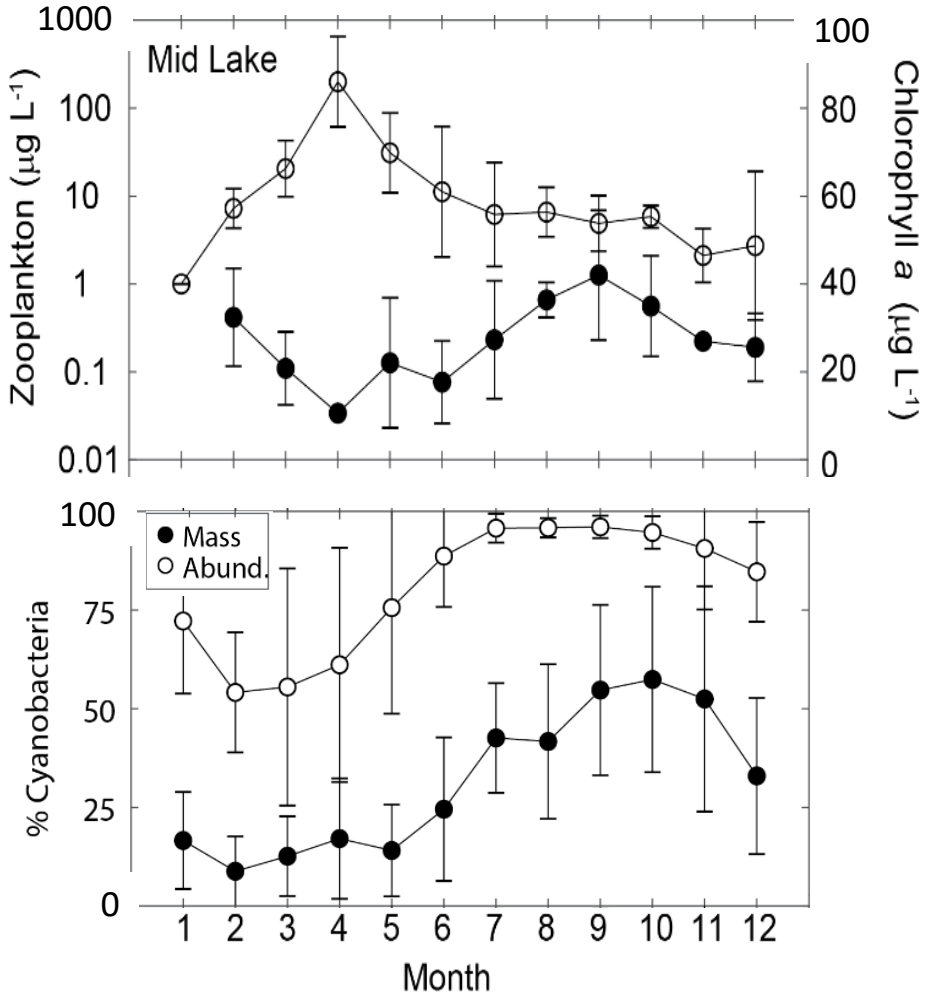
Negative relationship between Falls Lake zooplankton and phytoplankton biomass



Spatial variation indicates strong phytoplankton/ zooplankton coupling



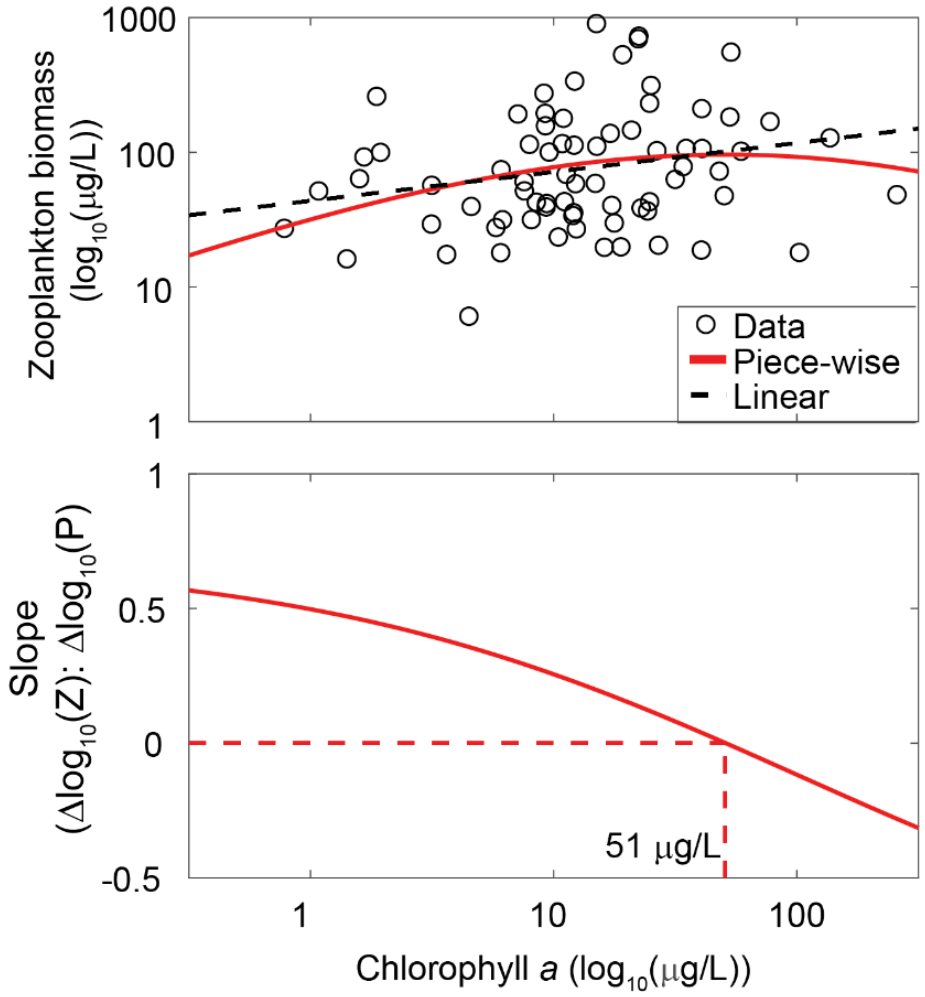
High zooplankton: Chl *a* in spring, low zooplankton: Chl *a* in summer



Possible causes- planktivorous fish more likely than inedible cyanobacteria

Summer might be a bad time to assess trophic transfer via Z:P ratios

Chl *a* threshold for Southeast U.S. reservoirs



Similar to threshold identified for shallow lakes (< 4 m) across the U.S.

But, relationship is very weak-other drivers important for zooplankton

Policy Implications

1) Zooplankton: Chl *a* is low in Falls Lake compared to other southeast reservoirs. Comparison possibly affected by seasonality
2) Analyses failed to identify a Falls Lake specific Chl a threshold based on zooplankton: Chl *a*

3) A region-specific threshold of 51 μg L^{-1} Chl *a* was calculated. Confidence in this threshold is low