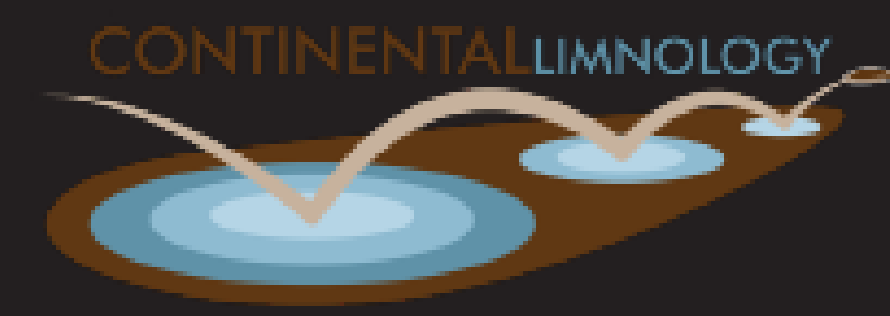


# The Effect of Lake Connectivity on Phosphorus Retention in Lakes

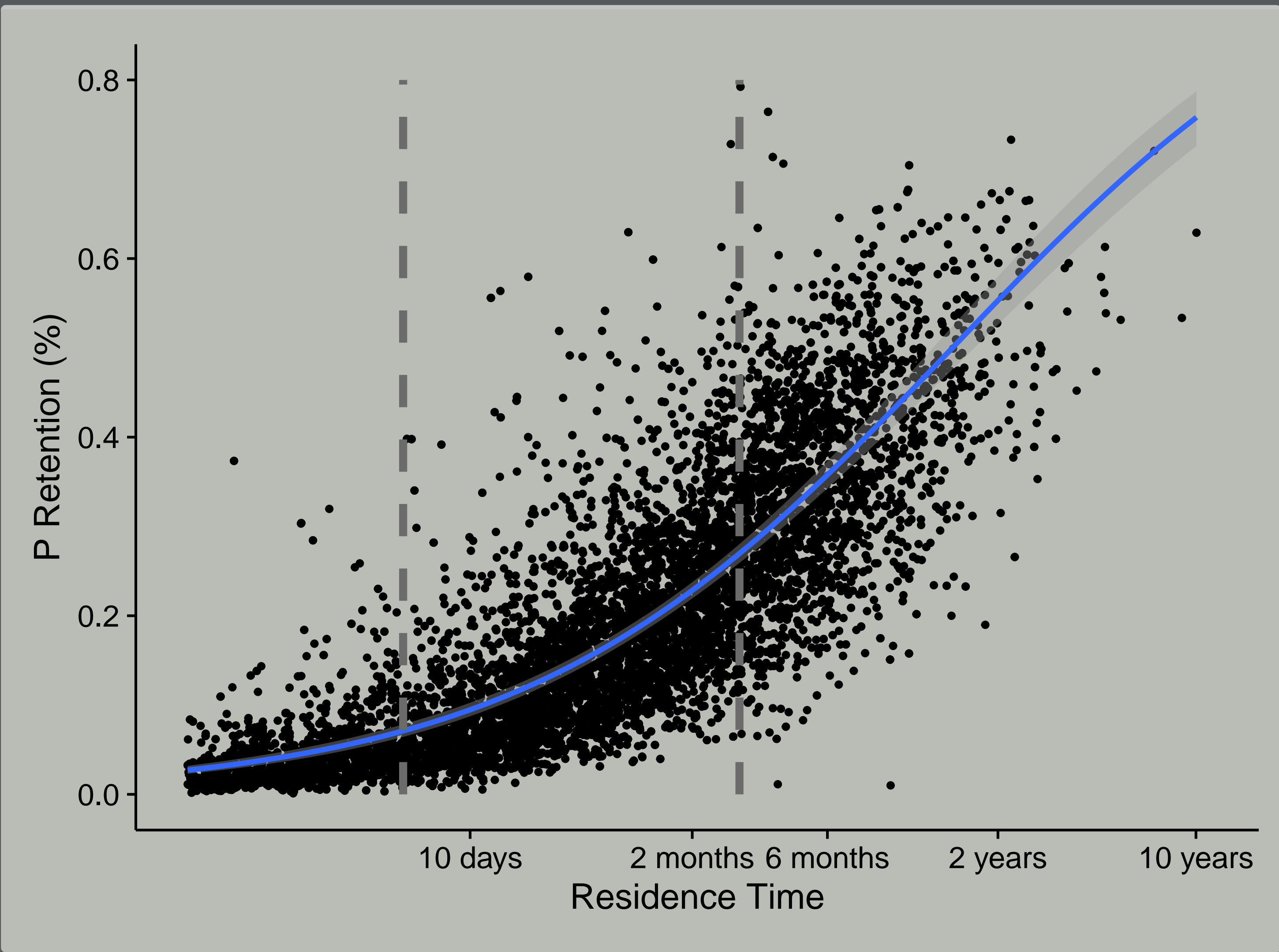
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## Introduction

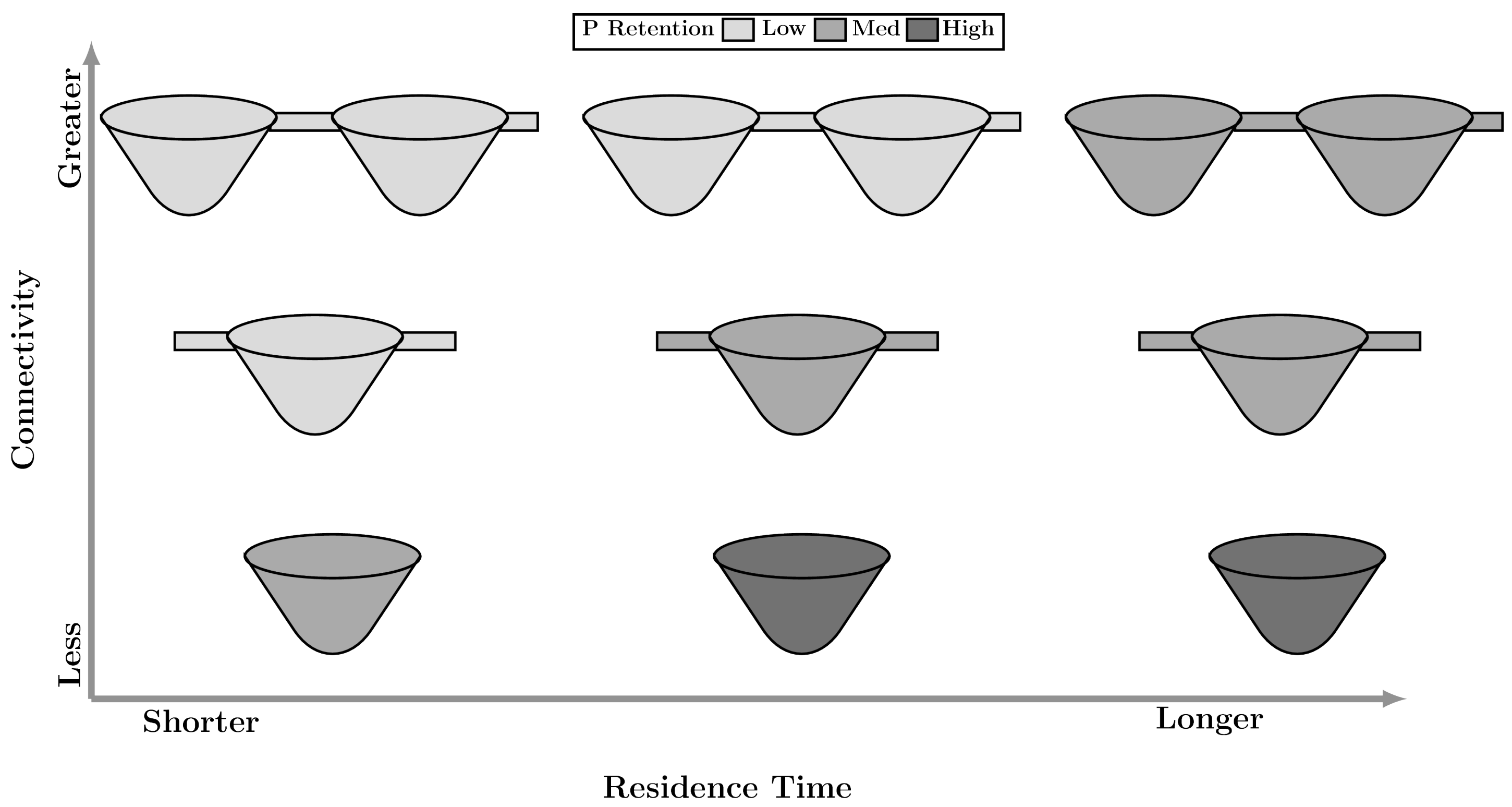
- ▶ A comprehensive understanding of phosphorus (P) cycling is necessary to predict P concentrations among many different lakes types and to better manage the risk of eutrophication from excess nutrient loading.
- ▶ P retention is a desirable metric for assessing eutrophication risk because it is a unitless measure that can be easily compared among different lake types irrespective of their baseline P concentrations or total P inputs.
- ▶ P retention is typically modelled as a function of a given lake's volume-weighted hydrologic flux (or its inverse, **residence time**).



## Research Questions

Given evidence that P retention in streams is affected by network connectivity:

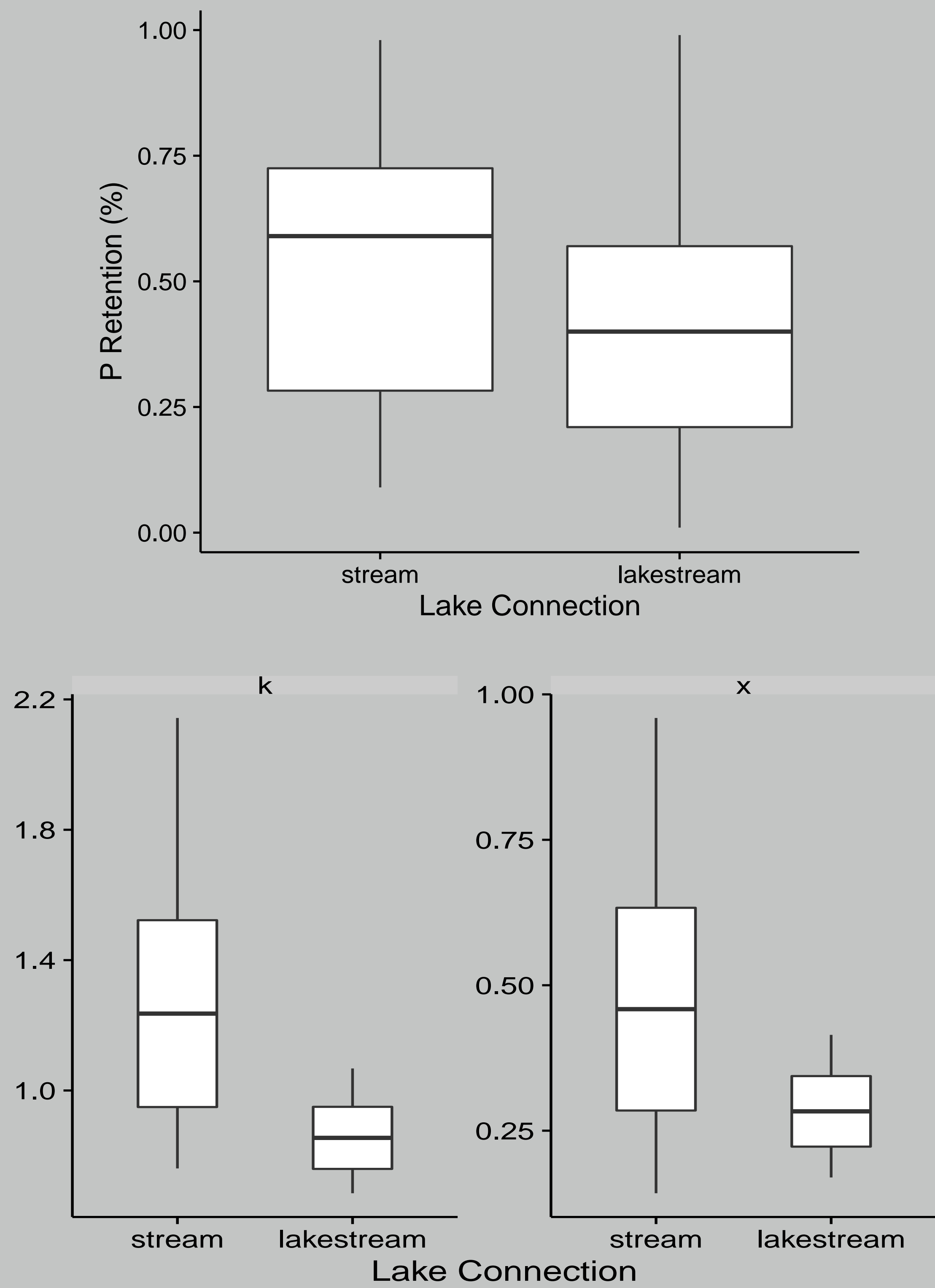
1. Do more well-connected lakes retain less P than lower connectivity lakes (given equal residence times)?
2. Is the effect of connectivity on P retention more prominent in lakes with intermediate residence times?



## Methods

- ▶ Data on P loading, P export, and residence time from approximately 250 lakes included in the National Eutrophication Survey (1972 - 1975)[2].

## Results



## Future Work

- ▶ Calculate network properties of each lake catchment such as stream density, upstream lake area, average link length, and stream order ratio.
- ▶ Model  $k$  and  $x$  separately via 2-component hierarchical models that relate P retention to **lake catchment network properties** as well as other potential explanatory factors such as landuse and climate.

$$P \text{ Retention} \sim k, x$$

$$k \sim \text{Network Properties} + \text{Landuse} + \text{Climate}$$

## References

- [1] M.T. Brett and M.M. Benjamin. A review and reassessment of lake phosphorus retention and the nutrient loading concept. *Freshwater Biology*, 0(0):070907013155001-???, September 2007.
- [2] J. Stachelek, C. Ford, D. Kincaid, K. King, H. Miller, and R. Nagelkirk. The National Eutrophication Survey: Lake characteristics and historical nutrient concentrations. *Earth System Science Data Discussions*, pages 1–11, July 2017.