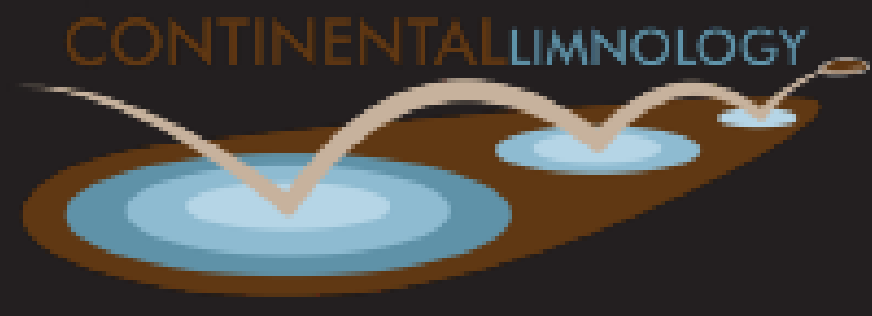


# Does Connectivity Control Lake Phosphorus Retention?

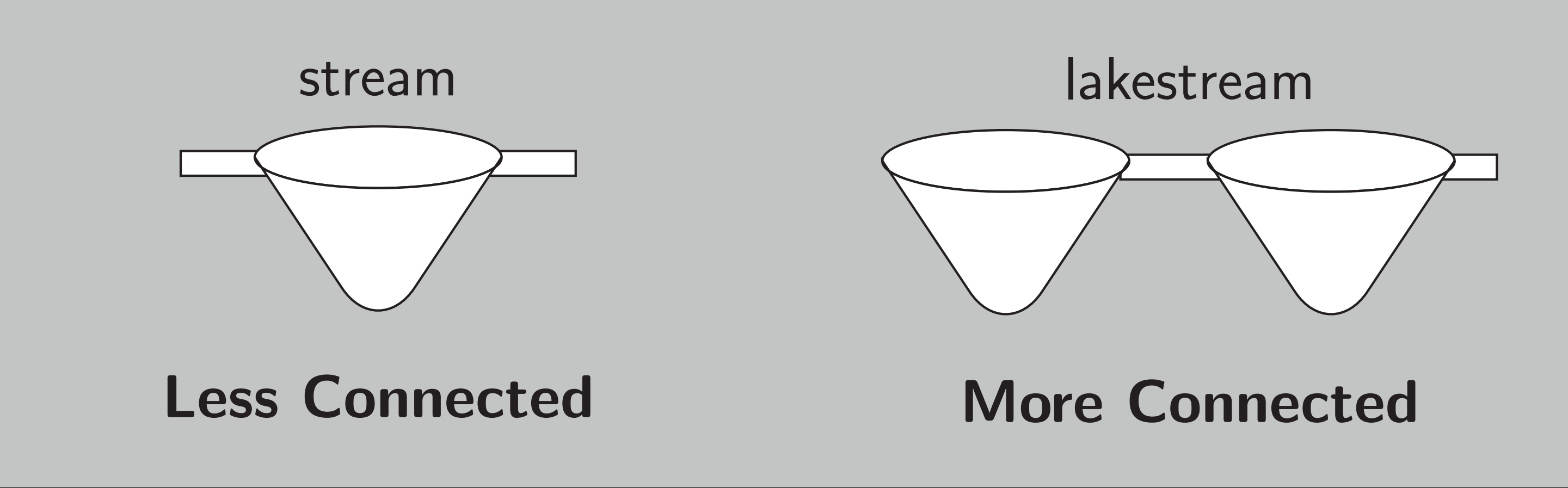
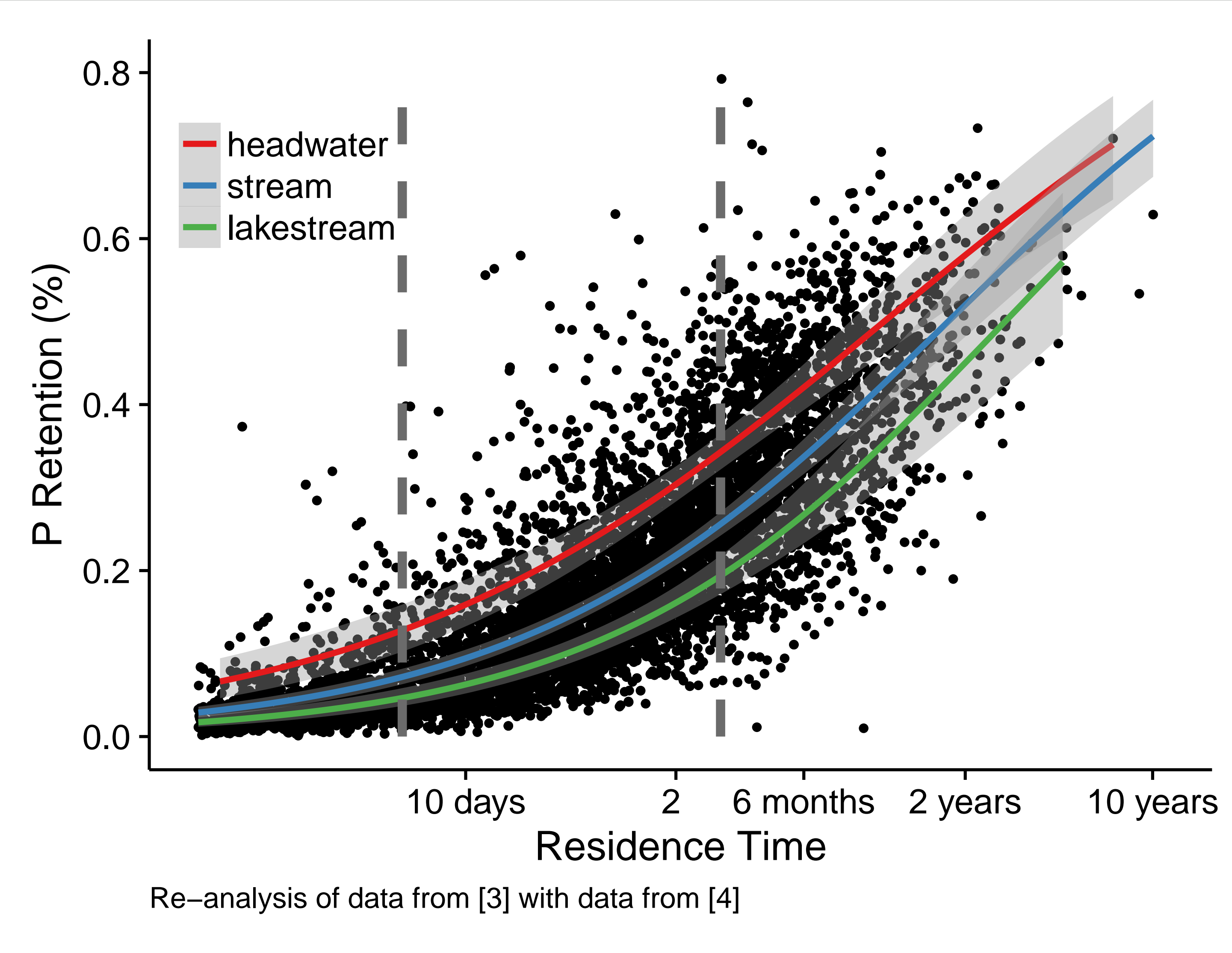
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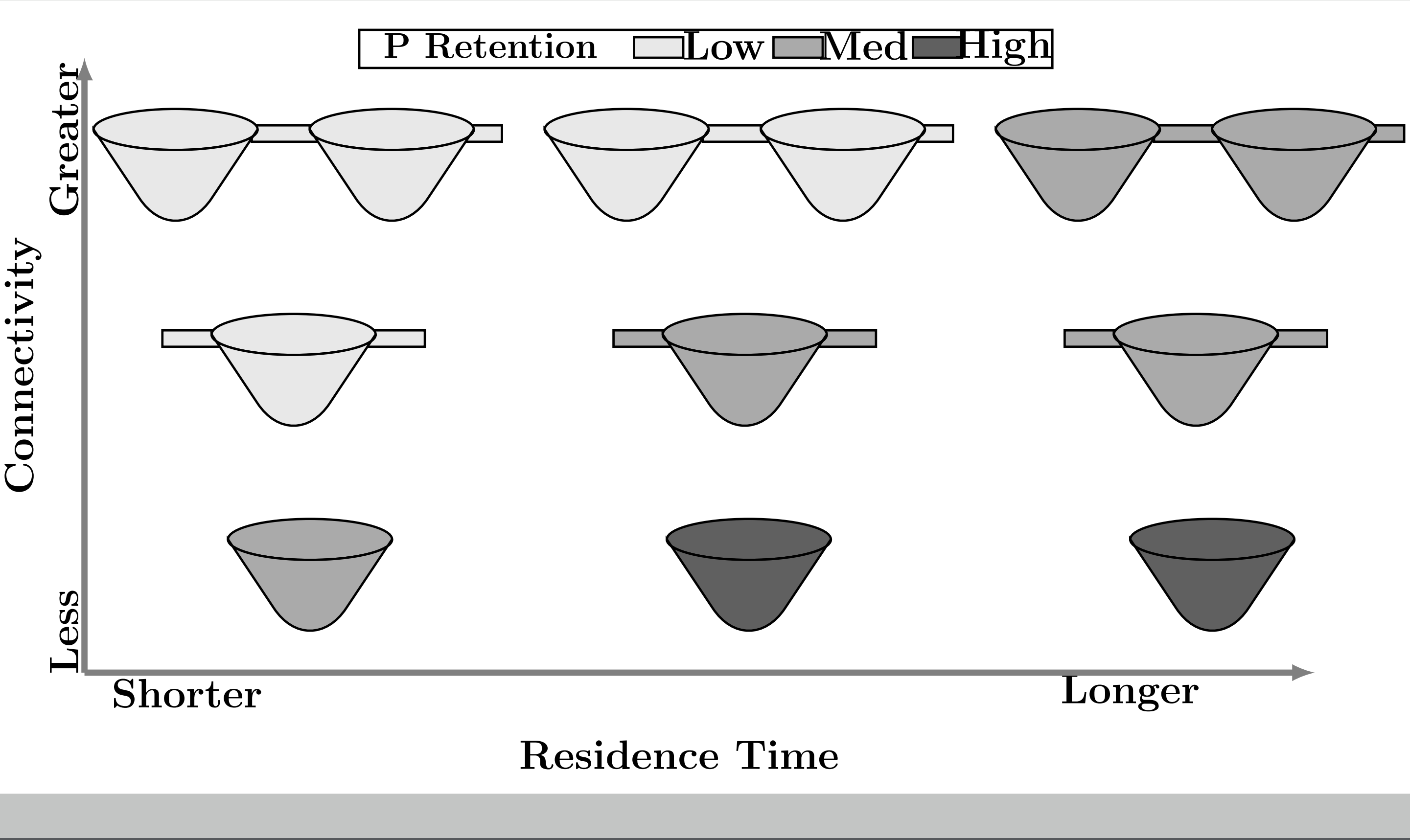
## Introduction

- There is some evidence that P retention in lakes and streams is affected by network connectivity:



## Research Questions

- Do connected lakes retain less P than less connected lakes (given equal residence times)?
- Are there differences in the relative influence of biological and hydrological control on P retention in lakes of differing connectivity?



## Methods

- Data on P loading, P export, and residence time from approximately 250 lakes included in the National Eutrophication Survey (1972 - 1975)[4].

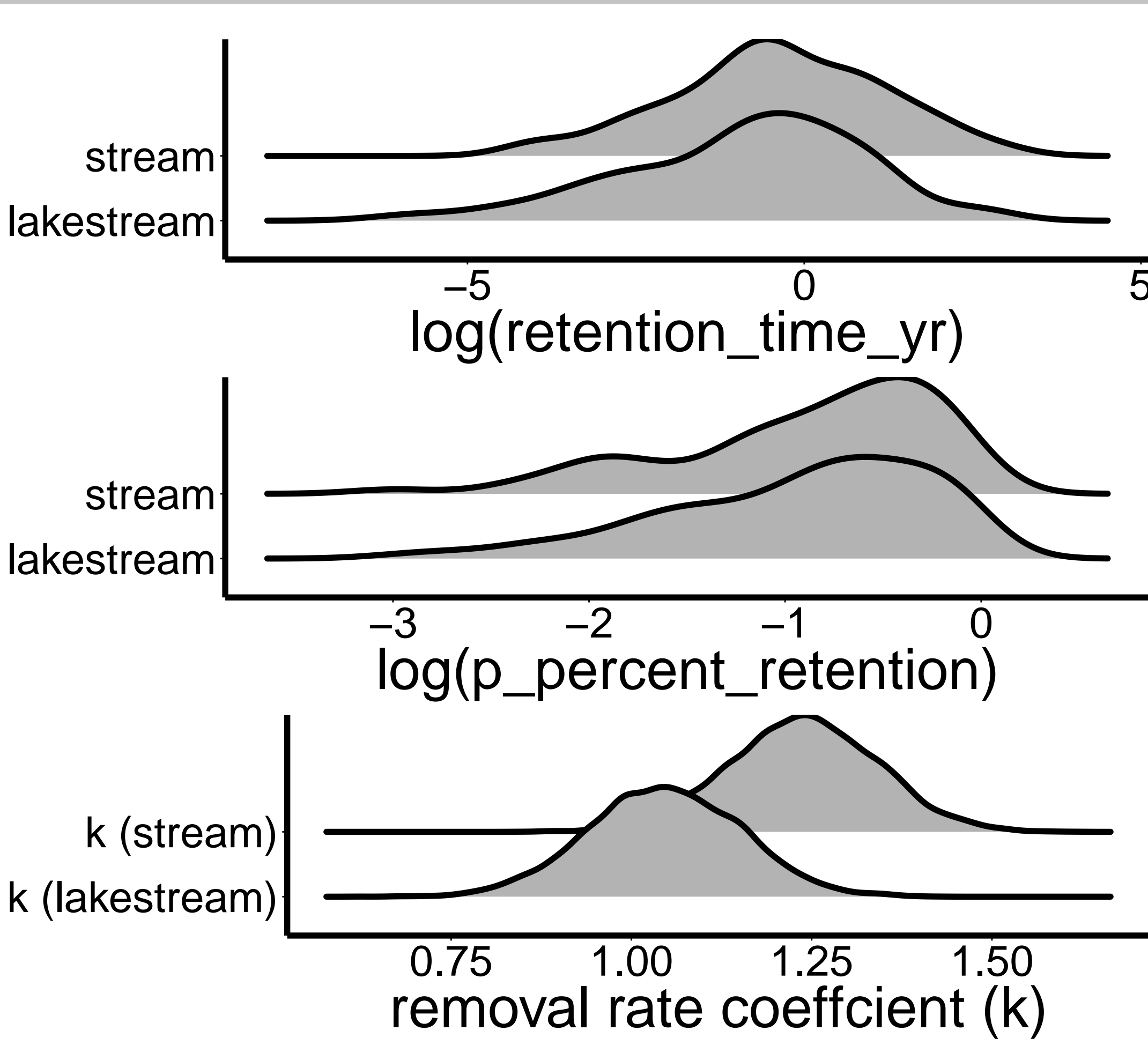
## Methods Con't

- Model P retention as a function of residence time using 2 parameter ( $k$ ,  $x$ ) Vollenweider models [1].
- $k$  (removal rate coefficient) and  $x$  (hydrologic flux coefficient) can be interpreted as representing biological and hydrological controls on P retention respectively.

## Results

- No, lakes with and without upstream lakes had similar distributions of residence time and P retention.
- Yes, estimates of the removal rate coefficient ( $k$ ) were higher in (less connected) lakes without upstream lakes.

This suggests that P inputs are controlled by biological processes to a greater extent in lakes without upstream lakes.



## 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.

## References

[1] M. Brett et al. *en. In: Freshwater Biology* 53 (2008).  
[2] W. B. Milstead et al. *en. In: PLoS ONE* 8.11 (2013).  
[3] P. Soranno et al. *en. In: GigaScience* 4.1 (2015).  
[4] J. Stachelek et al. *In: Earth System Science Data Discussions* (2017).



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