Does Lake and Stream Connectivity Control Phosphorus Retention in Lakes?

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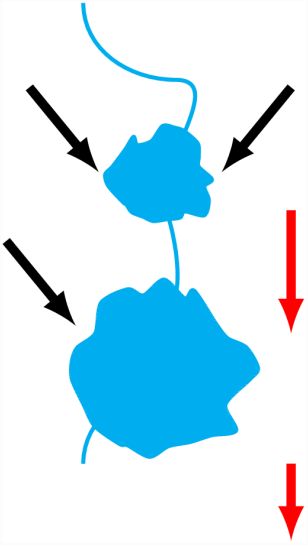
P RETENTION IS IMPORTANT AND WELL-STUDIED

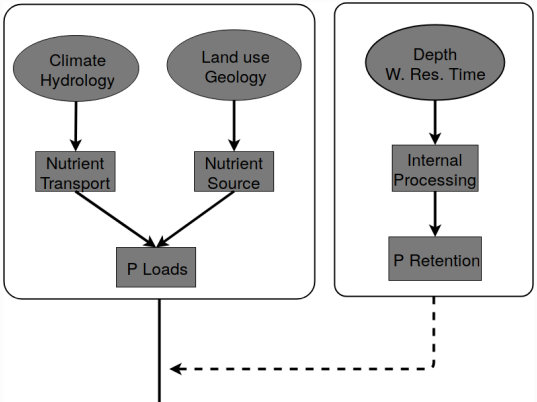


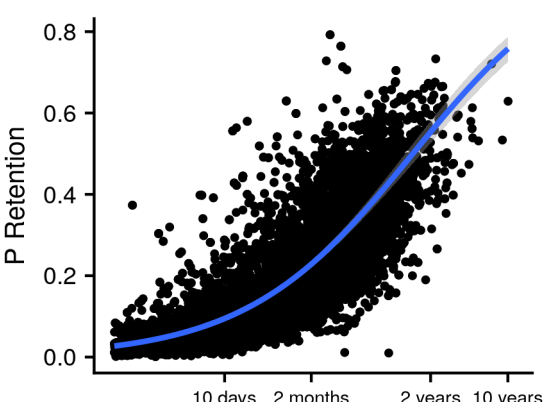
P retention directly controls downstream transport [Alexander et al., 2002]

P retention indirectly controls sediment P accumulation [Søndergaard et al., 2013]

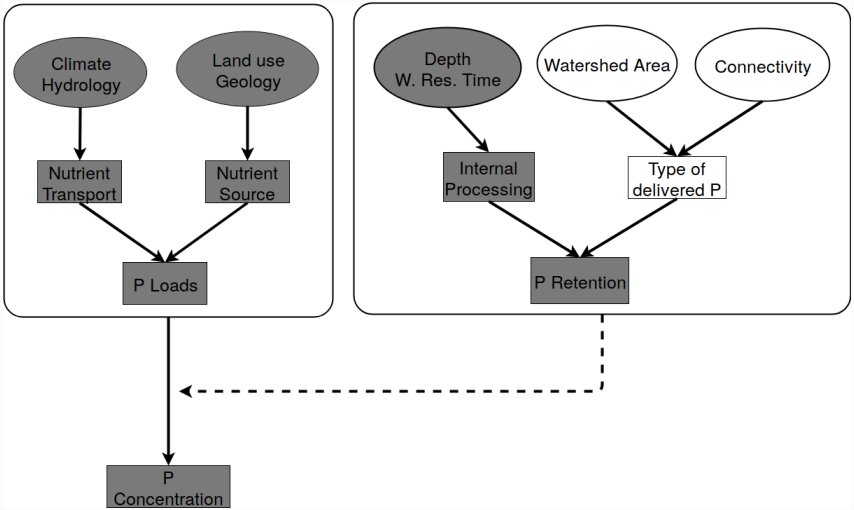
P RETENTION IS NOT JUST ABOUT WATER RESIDENCE TIME

- P retention is primarily controlled by water residence time [Vollenweider, 1975]





WHAT ARE SOME OTHER POTENTIAL CONTROLS ON P RETENTION?

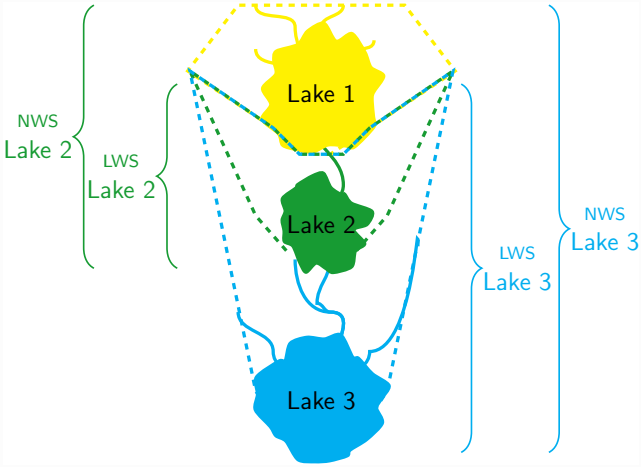


MULTIPLE WAYS TO DEFINE CONNECTIVITY

Closest Lake Distance: Network distance to the closest upstream lake.

Average Link Length: Sum of the total length of stream reaches between junctions divided by the total number of reaches.

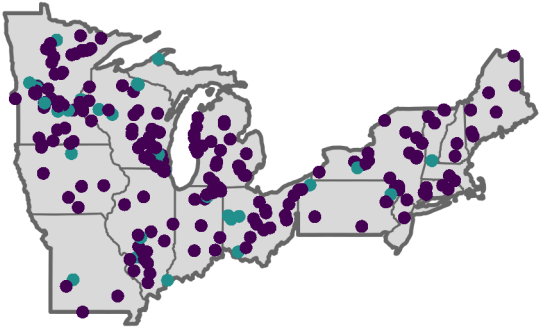
WHAT IS AN APPROPRIATE SCALE FOR MEASURING CONNECTIVITY?

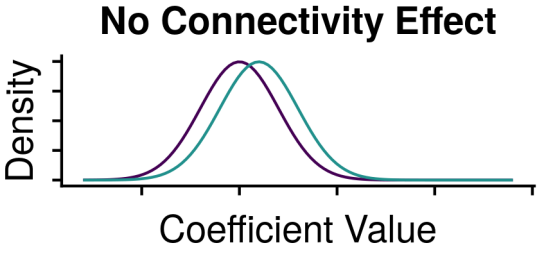


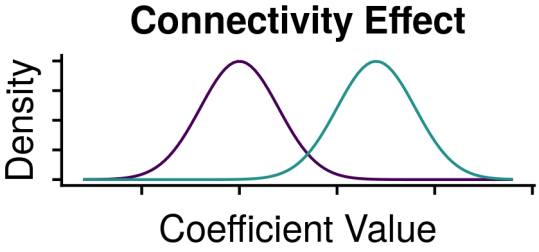
Does connectivity of lakes and their watersheds influence lake phosphorus retention?

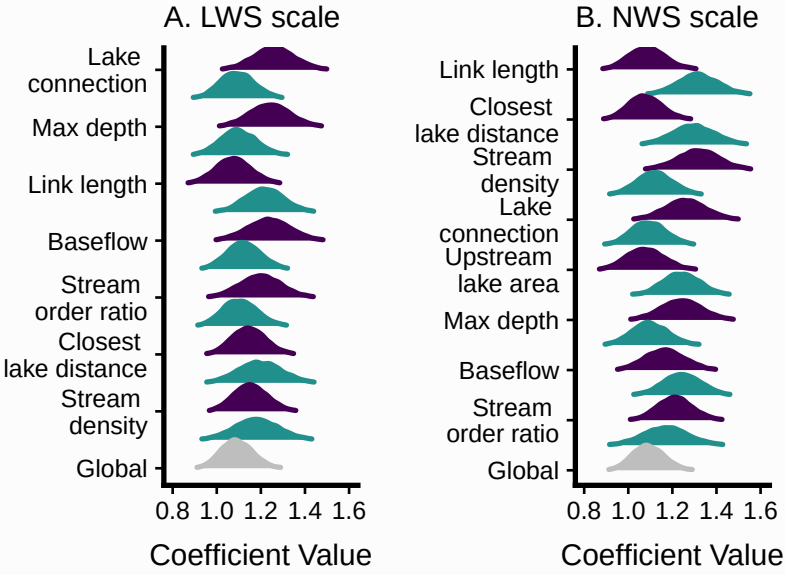
What is the relative importance of different connectivity types in determining lake P retention and what spatial extents are most important for connectivity and P retention?

METHODS

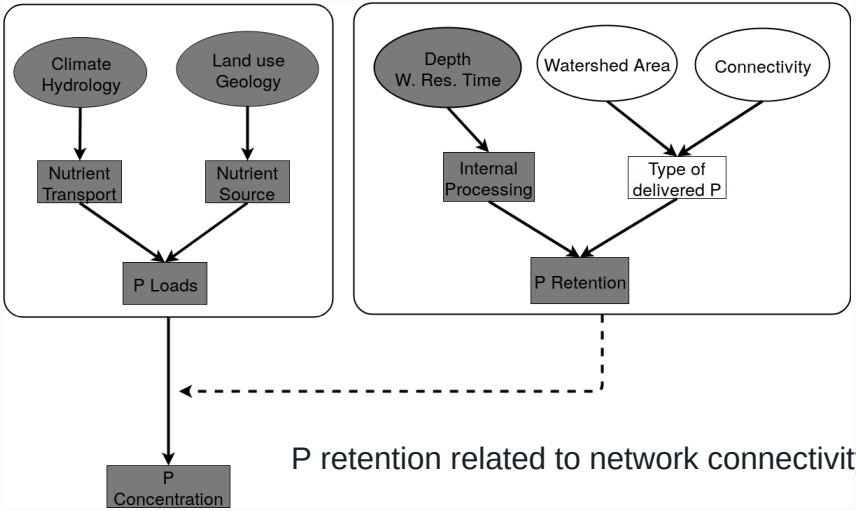

connectivity
High
Low


No Connectivity Effect
Density
Coefficient Value


Connectivity Effect
Density
Coefficient Value

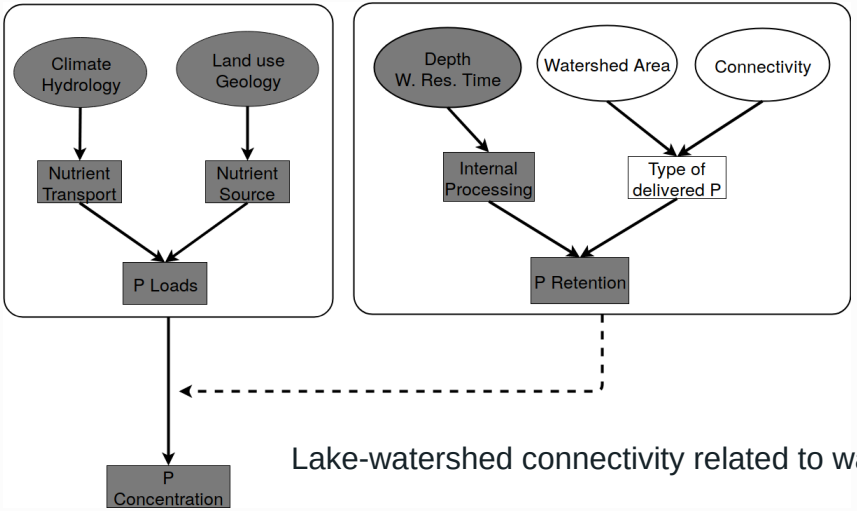

A. LWS scale
Lake connection
Max depth
Link length
Baseflow
Stream order ratio
Closest lake distance
Stream density
Global
0.8 1.0 1.2 1.4 1.6
Coefficient Value
B. NWS scale
Link length
Closest lake distance
Stream density
Lake connection
Upstream lake area
Max depth
Baseflow
Stream order ratio
Global
0.8 1.0 1.2 1.4 1.6
Coefficient Value

CONCLUSION



P retention related to network connectivity metrics

CONCLUSION



Lake-watershed connectivity related to watershed area

- Alexander, R. B., Elliott, A. H., Shankar, U., and McBride, G. B. (2002). Estimating the sources and transport of nutrients in the Waikato River Basin, New Zealand: Sources and transport of nutrients. *Water Resources Research*, 38(12):4–1–4–23.
- Søndergaard, M., Bjerring, R., and Jeppesen, E. (2013). Persistent internal phosphorus loading during summer in shallow eutrophic lakes. *Hydrobiologia*, 710(1):95–107.
- Vollenweider, R. A. (1975). Input-output models. *Aquatic Sciences-Research across boundaries*, 37(1):53–84.