Figures

Table 1: Mean and interquartile range of selected lake characteristics.

	Mean	IQR
Total Phosphorus (ug/L)	40.00	20 - 110
Chlorophyll (ug/L)	11.85	6.05 - 21.3
Secchi Depth (m)	1.50	0.9 - 2.4
P Retention (%)	0.46	0.24 - 0.59
Residence Time (yr)	0.63	0.2 - 1.8
Maximum Depth (m)	12.95	9.2 - 21.34
Agricultural Landuse (%)	53.27	17.68 - 74.05
Inter-lake Watershed Area (ha)	8839.44	2117.04 - 41005.75
Network Watershed Area (ha)	14326.22	5425.06 - 55026.39

Table 2: Classification and partition splits of lake depth and connectivity metrics ranked according to median effect size.

Metric	Scale	Connectivity Type	Split Value	Delta k
Average Link Length	nws	Longitudinal	2380.09	0.23
Closest lake distance	nws	Longitudinal	3273.65	0.22
Stream density	nws	Lateral	13.84	0.20
Lake Connection	focal	Longitudinal	-	0.17
Upstream lake area	nws	Longitudinal	153.50	0.16
Max Depth	focal	-	19.81	0.15
Average Link Length	iws	Longitudinal	2177.08	0.14
Baseflow	iws	Lateral	63.76	0.12
Stream order ratio	iws	Longitudinal	0.67	0.10
Baseflow	nws	Lateral	53.43	0.08
Closest lake distance	iws	Longitudinal	3773.61	0.05
Stream order ratio	nws	Longitudinal	0.40	0.04
Stream density	iws	Lateral	4.43	0.03

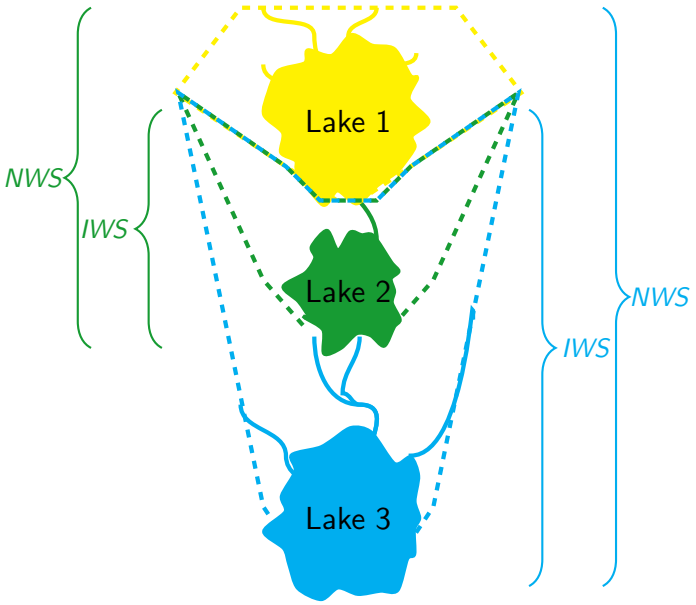

Figure 1: Diagram showing the inter-lake watershed (IWS) and network watershed (NWS) of three lakes. Here the IWS of lake 3 encompasses the IWS of lake 2 because of it is smaller than 10 ha small size but it does not encompass the IWS of lake 1 because it has an area of at least 10 ha. In contrast to the IWS boundaries, the NWS boundaries extend to the headwaters of the lake chain.

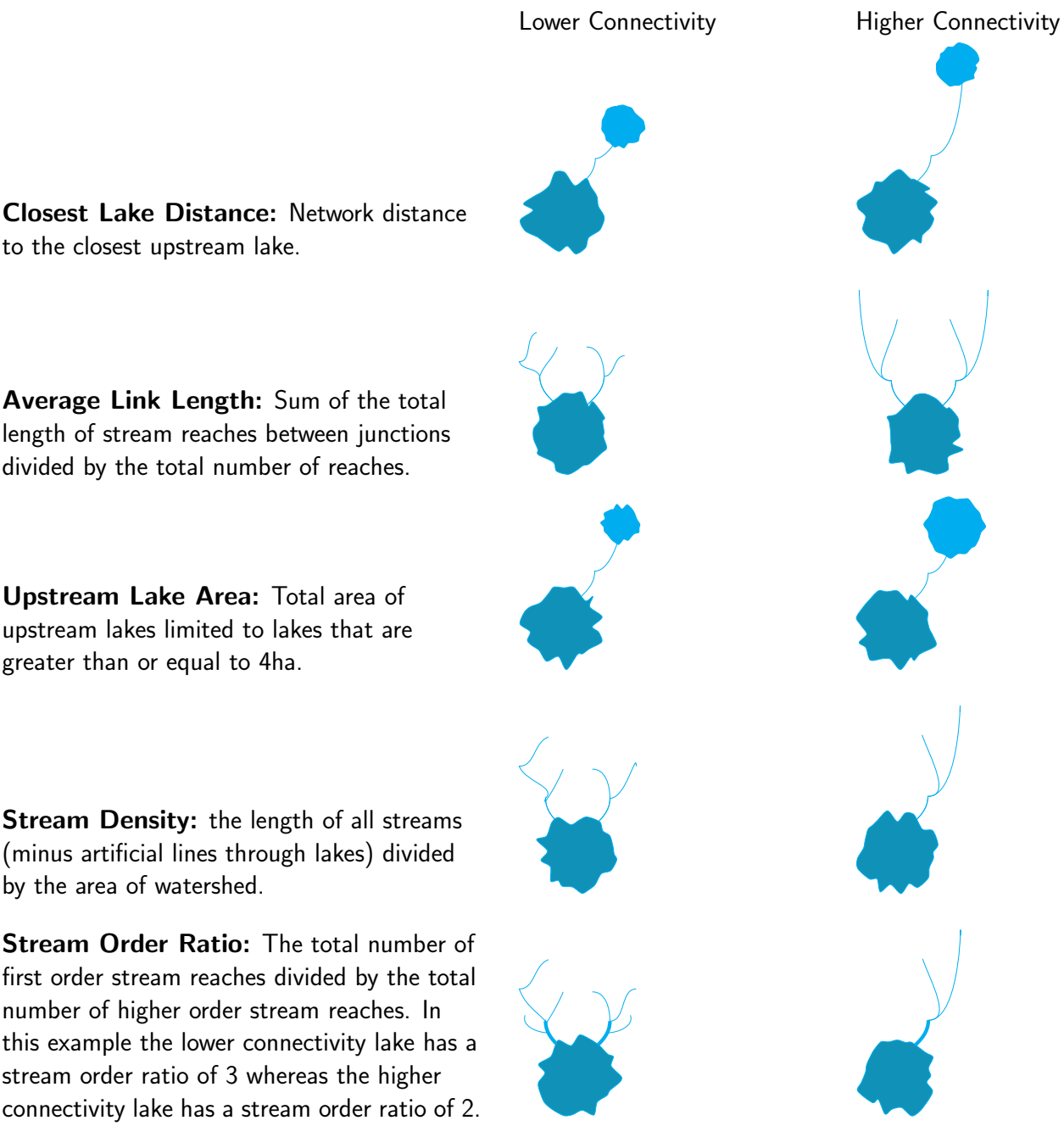

Figure 2: Connectivity metric definitions and examples of high and low connectivity lakes.

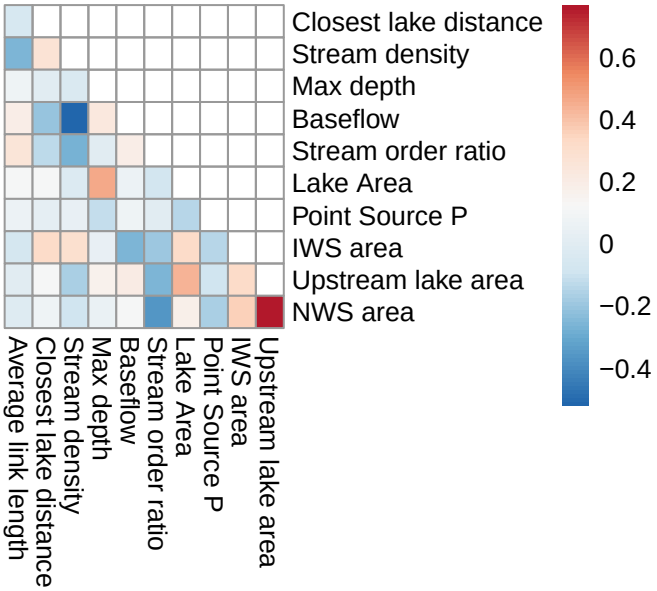

Figure 3: Correlation between connectivity metrics and selected lake characteristics.

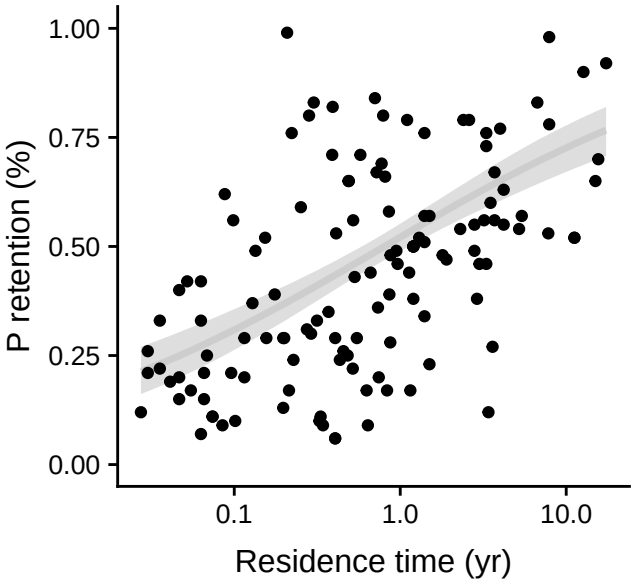

Figure 4: Residence time (yr) versus P retention for the NES dataset and the global model fit to the data as the median and central 95% interval estimates.

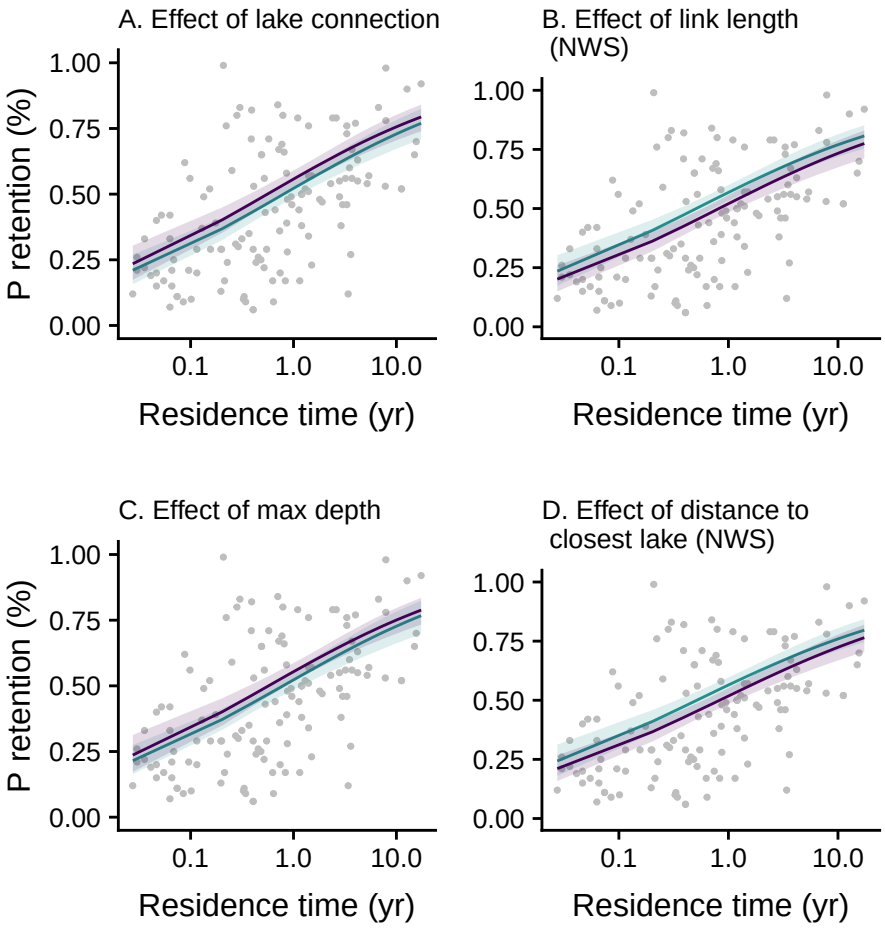

Figure 5: Residence time (yr) versus P retention (%) for the NES dataset and hierarchical model fits to the data as the median and central 95% interval estimates. The green lines and symbols are the estimates from the lower of the two partition groups while the purple lines are estimates for the upper of the two partition groups (see Table 2).

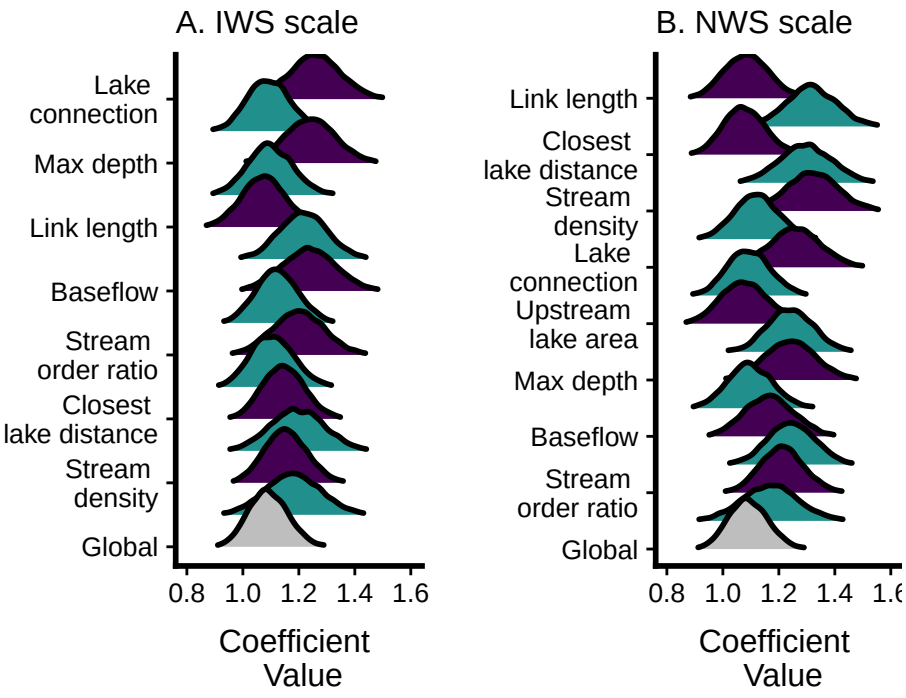

Figure 6: Distribution of the k parameter from the Vollenweider's equation in low and high connectivity partitions at the (A) IWS and (B) NWS scales. Green symbols indicate the lower of the two partition groups while purple symbols represent the higher of the two partition groups (see Table 2).

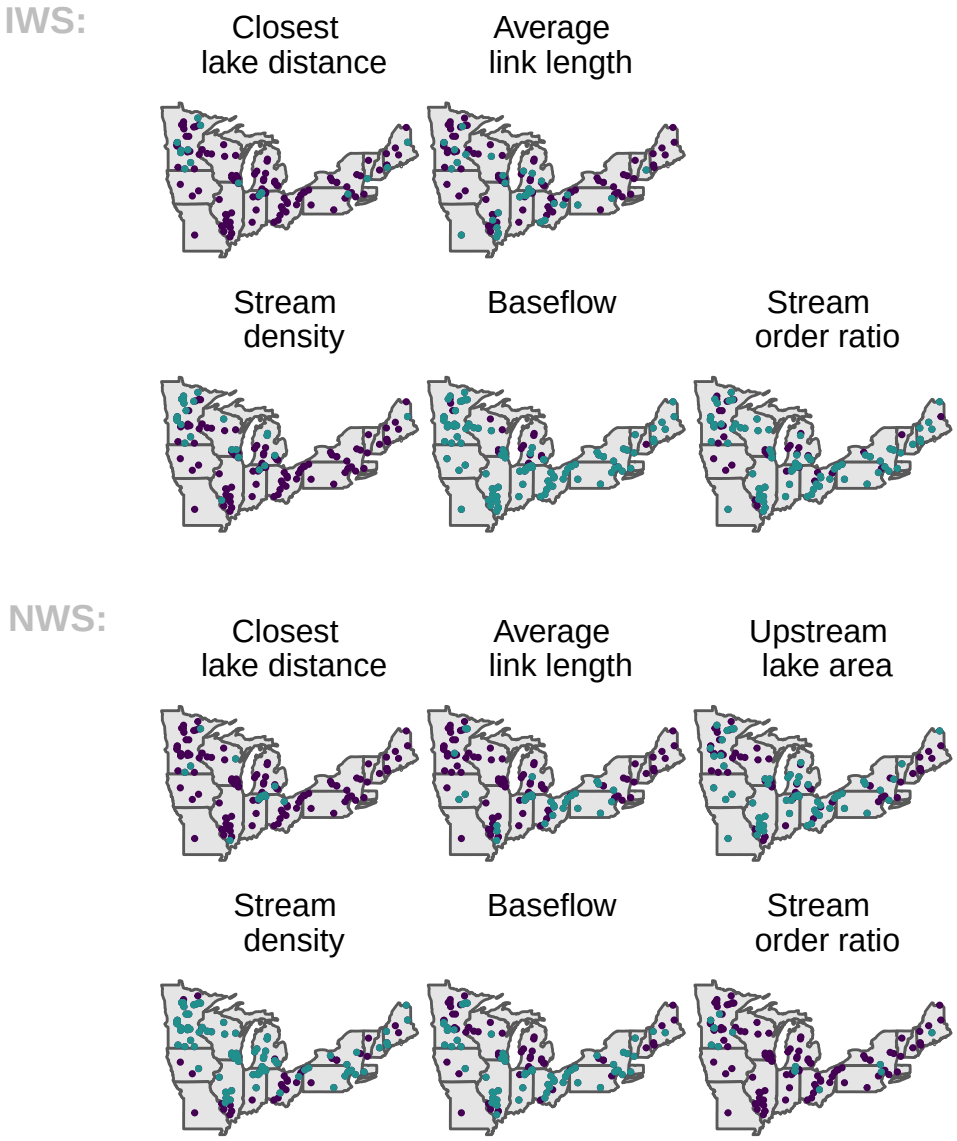

Figure 7: Maps showing the locations of lake connectivity partitions. Green symbols indicate the lower of the two partition groups while purple symbols represent the higher of the two partition groups (see Table 2).