The effect of land cover and human population density on freshwater fish in the Etowah watershed

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Background

- The Etowah River watershed is biodiverse, with over 70 endemic species of freshwater fish.
- Land cover changes as a result of urbanization and population growth can affect water quality and fish habitat, which can impact freshwater fish biodiversity.
- This study focuses on the relationship among fish community diversity, land cover types as defined by the National Land Cover Dataset, and population density.

Methods

- Freshwater fish abundance and presence data was collected in 288 samples from 183 sites from 2001 to 2018.
- We modeled species richness and other biodiversity endpoints using R.

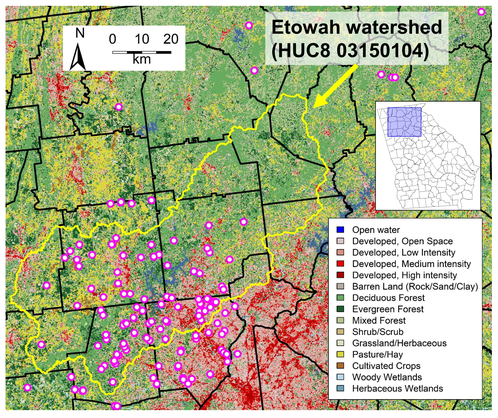

Figure 1. Map of sample locations in and around the Etowah watershed in Georgia, USA, superimposed on NLCD landcover.

Results

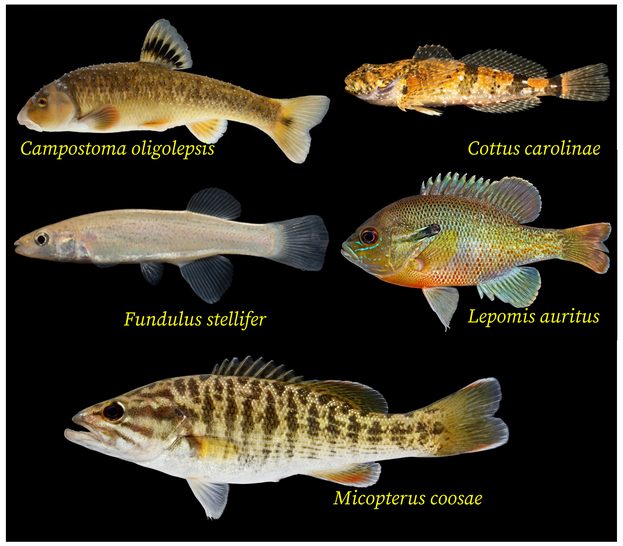

Figure 2. Pictures of fish common in the dataset. Photos from NANFA.org and NCFishes.org.

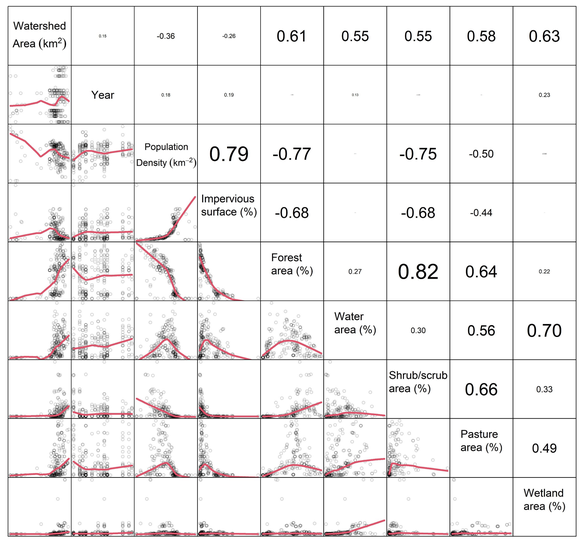

Figure 3. Matrix of pairwise relationships between predictor variables (watershed area, year, population density, impervious surface, forest area, water area, shrub/scrub area, pasture area, and wetland area)

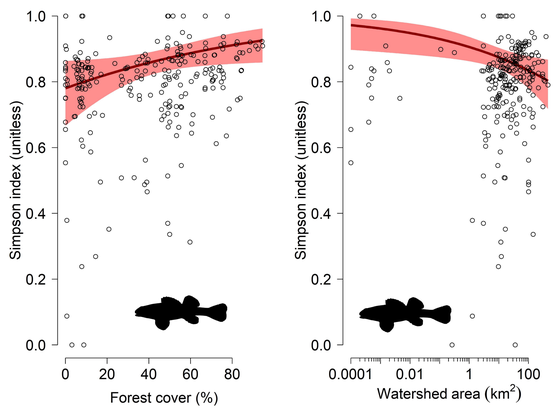

Figure 4. Simpson biodiversity index increased with watershed-scale forest cover and decreased with watershed area (km²).

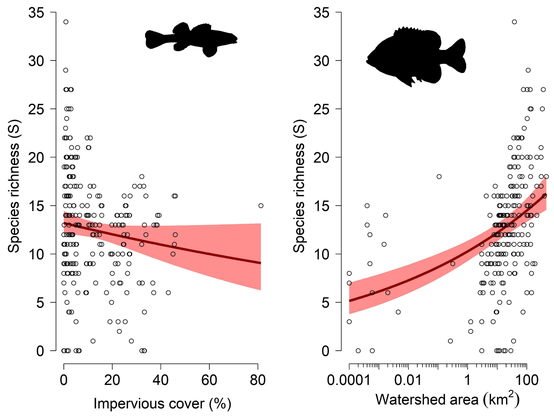

Figure 5. Species richness decreased with watershed-scale impervious surface cover and increased with watershed area (km²).

Conclusions

- Many potential watershed-level predictors were strongly correlated with each other, complicating data analysis.
- No consistent temporal trends in fish diversity were detected.
- Simpson biodiversity index was best explained by percentage of forest cover and watershed area. Diversity increased with forest cover and decreased with watershed area.
- Species richness was best explained by percentage impervious cover and watershed area. Species richness decreased with impervious cover and increased with watershed area.
- Future work will incorporate present and future hydrology and fish biological traits.

Acknowledgements

- We thank Bill Ensign of KSU (retired) for collecting these data and helping us utilize them.
- We also thank the countless KSU undergraduate and graduate students who assisted with data collection over the years.

Find out more about the Quantitative Ecology lab here: