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Regional and scale-specific effects of land use on amphibian diversity [poster]

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Regional and scale-specific effects of land use on amphibian diversity

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Objectives

Habitat loss and alteration are the most important factors driving global amphibian declines. Our goal was to understand the relationship between land use and anuran richness across the eastern USA.

Motivated by our prior analysis highlighting the importance of roads, we examine:

whether primary and secondary roads differ in their association with anuran richness and whether this correlation depends upon spatial scale.

Methods

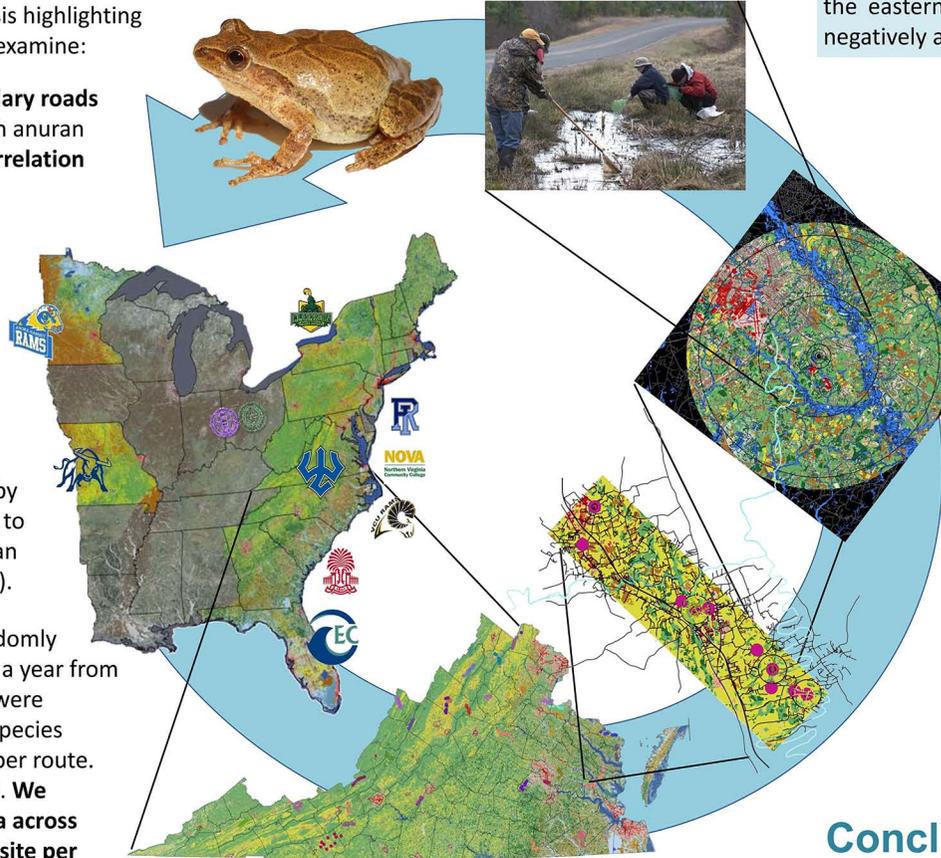
This was a collaborative undergraduate research project involving 12 universities.

Frog diversity data: Frog richness data were collected by citizen scientists contributing to the North American Amphibian Monitoring Program (NAAMP).

NAAMP surveyors visited randomly generated routes three times a year from 1999-2012. Frog call surveys were conducted to record anuran species present at 10 roadside stops per route. Road noise was also recorded. We summarized NAAMP call data across available years for 1 random site per route.

Land use data: Landscape characteristics including: Road length, % Development, % Agriculture and % Forest were quantified within five buffer zones between 300 - 10,000 m of each focal site using publically available GIS data layers.

Analyses: We obtained call and landscape data for 471 sites across 13 states. Pearson correlations were used to examine the association between richness and land use variables at each spatial scale. The aggregate effects of multiple land use predictors were assessed using general linear models. Analyses were conducted using R 2.11.



Results

Fig. 1. SEM results focused on landscape characteristics within a 1000 m buffer suggest a ubiquitous negative effect of roads on diversity across the eastern USA. Both road density and traffic were negatively associated with anuran richness.

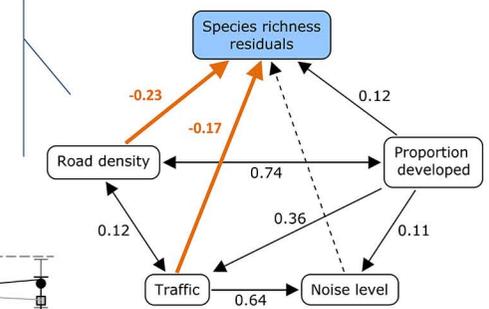
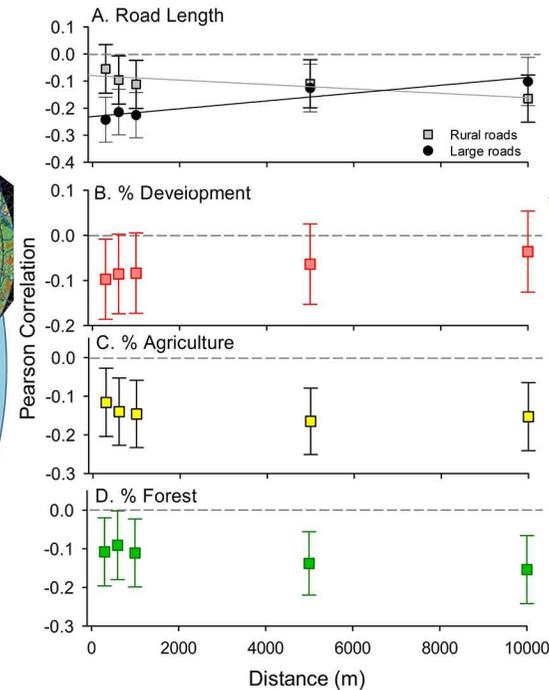


Fig. 2. Correlation (±95%CI) between richness and land use types across spatial scales. Road length overall was negatively correlated with anuran richness across spatial scales. Primary roads were more negatively associated than rural roads at local spatial scales. % Agriculture and % Forest cover were also negatively correlated with frog richness and the strength of the correlation was similar across spatial scales. % Development was negatively correlated at 300-600 m.

Conclusions

- This study corroborates our earlier analyses, highlighting that the negative association between several land use types and anuran richness persists across a range of spatial scales.
- Road length was most negatively associated with richness across scales. This negative association was strongest for primary roads near to survey sites. These results do not appear to be due simply to reduced detectability near roads.
- Findings indicate that the presence of primary roads near amphibian breeding habitats may be important for shaping anuran richness throughout the US, and that these effects may extend to common and wide-ranging species