

Hixon Center for Urban Ecology

Student Research Fellows

Urbanization of New England Wetlands

Evaluating the Impacts on Pond-Breeding Amphibians

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Problem Investigated:

Urbanization is rapidly increasing in New England, leading to the loss and alteration of many wetlands amphibians use for breeding. Previous research has shown that amphibian distributions are strongly altered in areas with increased human development. My research project sought to determine what specific factors associated with urbanization may be responsible for both declines and increases in amphibian populations.

Background:

- The majority of amphibian species in Connecticut depend on seasonal and permanent ponds for breeding.
- Aside from complete loss due to filling, human development can also alter wetlands by changing their chemical, physical and biological characteristics.
- Human impacts on the terrestrial landscape surrounding wetlands can impact amphibian dispersal ability and habitat for amphibian adults.
- Past studies have found decreased amphibian diversity with increased levels of urbanization.
- Spring peeper (*Pseudacris crucifer*) and Gray tree frog (*Hyla versicolor*) prevalence (proportion of ponds occupied) have also been found to decline with urbanization.
- Other species including bullfrogs (*Rana catesbeiana*) and American toads (*Bufo americanus*) have been found to increase with urbanization.



Figure 2. A and B. Two of the study ponds in urban areas. Within urbanized landscapes a range of habitats can be found, some of which support greater amphibian diversity. C. Gray tree frog metamorph.

Methods:

- I surveyed 30 ponds along an urbanization gradient in the Salmon River Watershed of eastern Connecticut.
- Each pond was visited twice to sample amphibian populations and collect data on the pond's chemical, physical and biological condition.
- Larval amphibians (tadpoles and salamander larvae) were counted and identified to determine trends in density and prevalence.
- Land use surrounding each pond was analyzed using GIS data.

Conclusions:

- Amphibian species richness (diversity) was highest in suburban areas, as was gray tree frog and spring peeper prevalence.
- Suburbs provided more permanent ponds than forested areas, which are beneficial to species that breed later in the spring, while also providing nearby forest habitat for adults.
- Maximum pond depth, temperature, pH, conductivity, dissolved oxygen, canopy cover and the presence of fish all differed significantly between forested and urban and suburban areas.
- Elevated nutrient levels in suburban and urban areas may have deleterious effects on amphibian populations.
- The ideal conditions for each species vary; in order to maintain diverse amphibian communities a range of habitats must be protected.

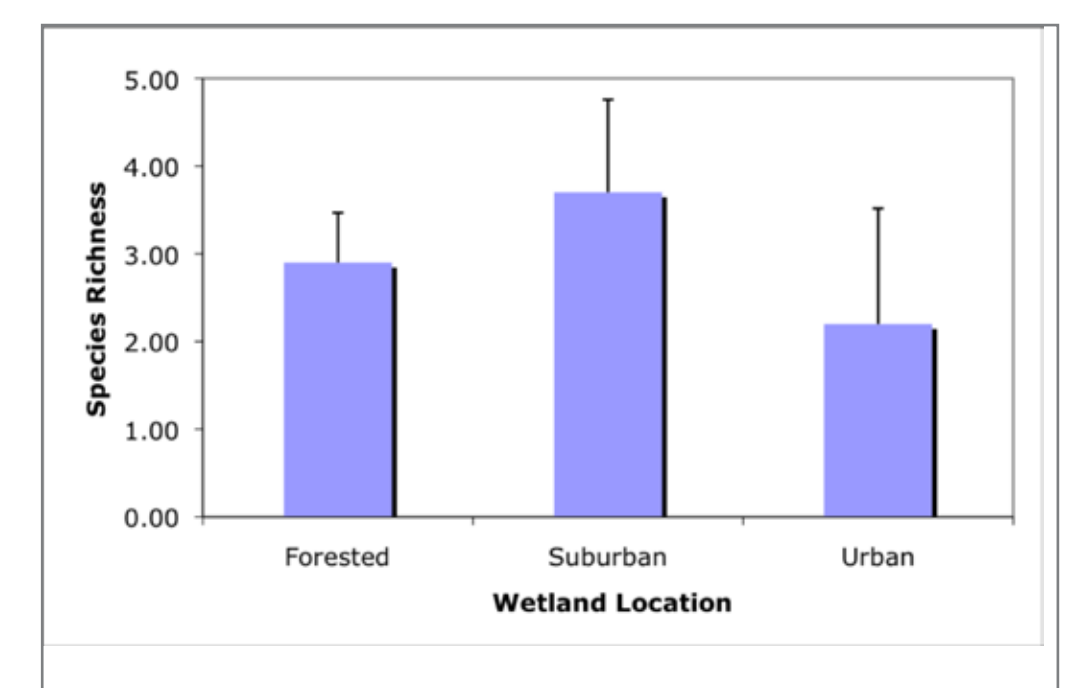


Figure 1. Amphibian species richness as found in wetlands in forested, suburban and urban areas. Suburban species richness is significantly higher than urban ($p=0.011$); forested ponds do not differ significantly from suburban or urban ponds.