

# Amphibian Conservation in Eastern Ontario



*Recommendations based on research conducted  
by Carleton University's Geomatics and Landscape  
Ecology Research Laboratory*





# Summary

## Why are local frog and toad populations important?



Eastern Ontario is home to 17 species of amphibians: nine frogs, one toad, and seven salamanders. Globally, one third of amphibian species are now thought to be threatened. Scientists consider habitat loss to be one of the major causes of widespread amphibian declines. In Ontario south of the Canadian Shield, approximately 75% of wetlands have been lost since European settlement. The remaining wetlands are threatened by land cover change, namely urbanisation and conversion to agricultural use, as well as inputs of pollutants such as pesticides, fertilisers and road salt. It is critical that we protect our amphibian populations from these threats and ensure their continued long-term persistence.

## Questions addressed in this publication:



**Question 1** Does the volume of traffic on roads affect frog and toad populations?

**YES!**

**Question 2** Are some frog species more affected by traffic than others?

**YES!**

**Recommendations** Build any future high-traffic roads away from frog and toad breeding sites (ponds, wetlands, wet forests) and reduce traffic on roads near these areas.



**Question 3** How far from ponds are landscape effects important?

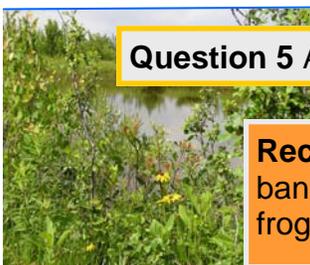
**Up to 2 km!**

**Question 4** Do frog and toad populations in one pond rely on nearby populations in other ponds?

**YES!**



**Recommendations** Think outside the pond. Protect terrestrial habitat within 2 km of breeding sites. Protect and restore networks of breeding sites.



**Question 5** Are frog and toad populations affected by different land uses?

**YES!**

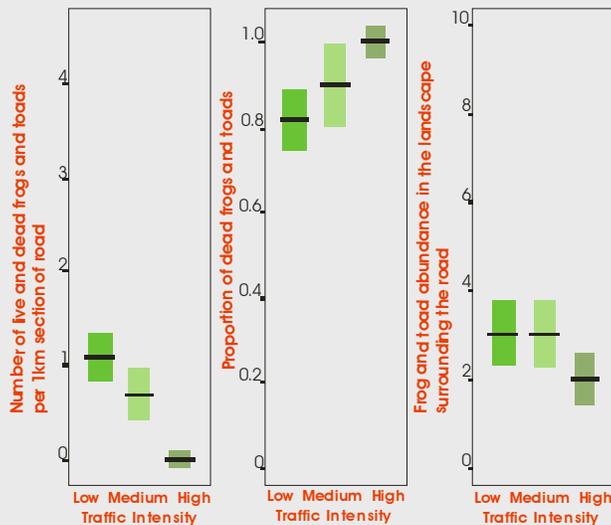
**Recommendations** Focus conservation efforts on frog and toad populations near urban areas. Protect several types of terrestrial habitat (forest, open) to ensure a diverse frog and toad community.

# The Effect Of Roads



**Question 1** Does the volume of traffic on roads affect frog & toad populations?

**Conclusion 1** High-traffic roads can reduce the size of frog and toad populations in the surrounding landscape.



Graph 1: Number of live and dead frogs and toads counted along 1 km stretches of road.

Graph 2: Proportion of dead frogs and toads counted along a 1km stretch of road.

Graph 3: Relative size of frog and toad populations adjacent to roads of varying traffic intensity as determined through call surveys.

\* The horizontal black lines in these figures indicate the mean value for the variable in question, while the coloured bars indicate the range within which each variable is expected to occur 95% of the time.

Reference: Fahrig, L. et al. *Biological Conservation* 73: 177-182 (1995).

**Question 2** Are some frog species more affected by traffic than others?

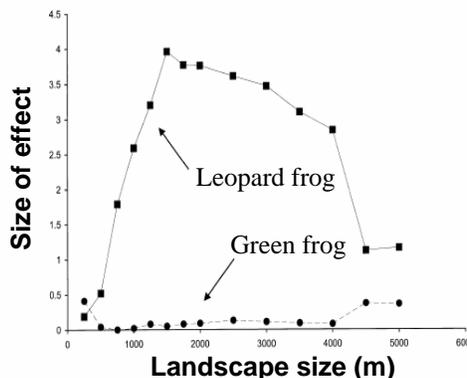
**Conclusion 2** Highly mobile frogs & toads are particularly strongly affected by traffic compared to more sedentary species.

## Green frogs:

- Breed, forage & overwinter in ponds
- Relatively little movement in the landscape
- Not affected** by the amount of traffic in the landscape



Reference: Carr, L. W. & L. Fahrig. *Conservation Biology* 15: 1071-1078 (2001).



## Northern leopard frogs:

- Breed at ponds, forage in meadows and pastures, overwinter in streams
- Move through the landscape between ponds, pastures and streams twice a year
- Negatively affected** by traffic up to 1.5 km from breeding ponds



**Recommendations** Build any future high-traffic roads away from frog and toad breeding sites (ponds, wetlands, wet forests) and reduce traffic on roads near these areas.



# Think outside the pond

## Question 3 How far from ponds are landscape effects important?

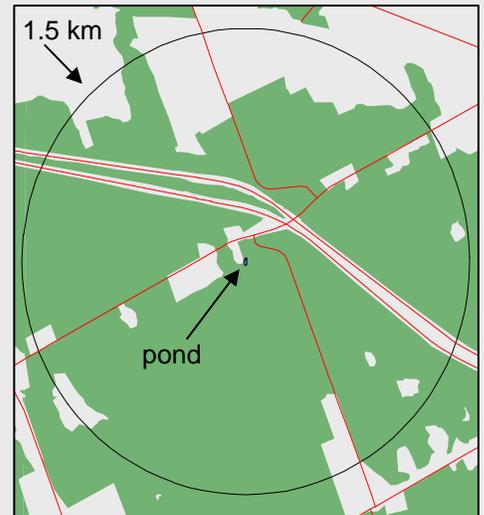
**Distances** from breeding ponds within which landscape effects are important:

Northern leopard frog abundance is positively influenced by the amount of open habitat within **1 km** of ponds, and negatively influenced by traffic volume up to **2 km** away from ponds,

Predominant land use within **1.5 km** determines the number of frog and toad species and their respective abundances in ponds,

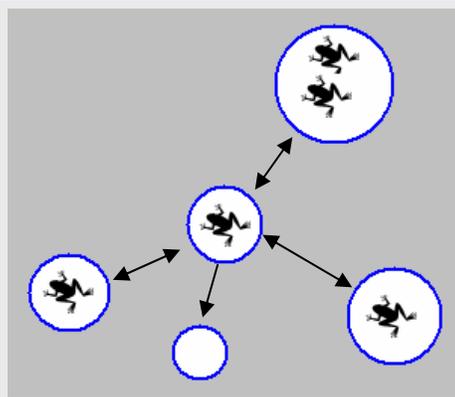
The length of streams within **1.5 km** of ponds positively affects green frog abundance.

References: Pope, S. E. et al. *Ecology* **81**: 2498-2508 (2000); Carr, L. W. & L. Fahrig. *Conservation Biology* **15**: 1071-1078 (2001); Gagné, S. A. & L. Fahrig. *Landscape Ecology* in press (2006).



**Conclusion 3 Frog and toad populations in breeding ponds are influenced by factors up to 2 km away.**

**Question 4 Do frog and toad populations in one pond rely on nearby populations in other ponds?**



The number of northern leopard frogs in a pond is influenced by the number of breeding sites (ponds, large drainage ditches and streams) with northern leopard frogs within **1.5 km** of the pond.

Reference: Pope, S. E. et al. *Ecology* **81**: 2498-2508 (2000).

**Conclusion 4 Frog populations depend upon adjacent populations up to 1.5 km away.**

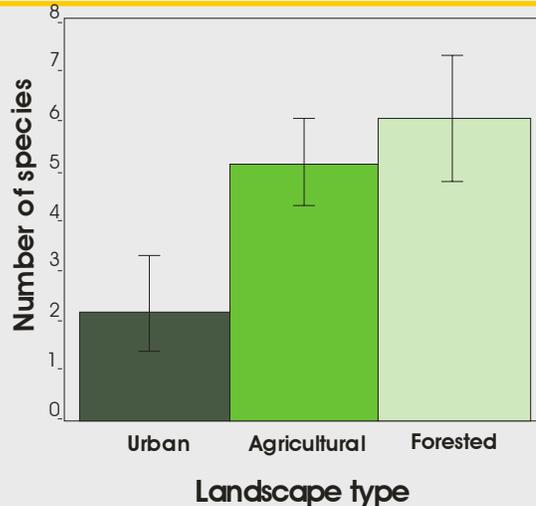
**Recommendations** Think outside the pond. Protect terrestrial habitat within 2 km of breeding sites. Protect and restore networks of breeding sites.

# The Effect of Land Use



## Question 5 Are frog and toad populations affected by different land uses?

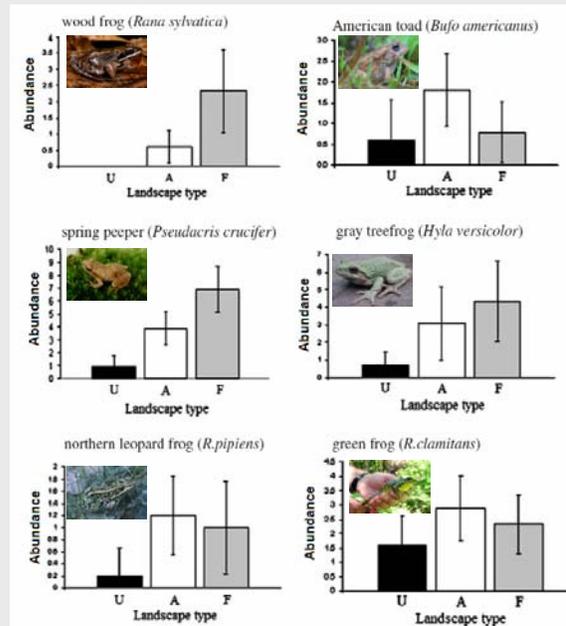
This figure shows the mean number of frog and toad species in urban, agricultural and forested landscapes. The number of species will fall within the range indicated by the error bars 95% of the time. While the number of frog and toad species is similar in agricultural and forested landscapes, different kinds of species occur in these two areas.



Reference: Gagné, S. A. & L. Fahrig. *Landscape Ecology* in press (2006).



- All frogs and toads are the least abundant in urban areas.
- Each species is the most common in the landscape type dominated by its preferred terrestrial habitat.
- The wood frog, spring peeper and gray treefrog need forest habitat outside of the breeding season.
- The American toad, the northern leopard frog and the green frog need open habitat outside of the breeding season.



Reference: Gagné, S. A. & L. Fahrig. *Landscape Ecology* in press (2006).



**Conclusion 5** Urban areas have the smallest and least diverse frog and toad populations. Agricultural and forested areas have similar numbers of frog and toad species but are dominated by different kinds of species.

**Recommendations** Focus conservation efforts on frog and toad populations near urban areas. Protect several types of terrestrial habitat (forest, open) to ensure a diverse frog and toad community.



# Ongoing Research

Here are some current research questions from the GLEL, along with some preliminary findings:

- Q:** Do frog and toad communities in urban ponds change with time since urbanisation?  
**A:** Yes! Total abundance, spring peeper abundance and gray treefrog abundance all decrease with increasing age of residential development.
- Q:** Are frog and toad populations in urban ponds more extinction-prone than those in agricultural ponds or forested ponds?  
**A:** Yes! Frog and toad populations go extinct more frequently in urban ponds, probably because frog and toad populations in urban areas are generally smaller to begin with.
- Q:** At what distance from breeding ponds do frogs and toads respond to forest loss and the amount of paved roads?  
**A:** Frogs and toads vary in their responses to forest loss and the amount of paved roads and are affected by these landscape elements within 500 - 2000 m of their breeding ponds.
- Q:** What is the relative effect of road traffic and forest loss on frogs and toads in eastern Ontario?  
**A:** Most species are more vulnerable to road traffic than to forest loss. However, spring peepers are extremely vulnerable to the loss of forest.



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