

# Slow 'n Steady Saves the Turtles: Using Citizen Science Data to Evaluate County-Level Urbanization Impact on Freshwater Turtle Mortality

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## Abstract

Freshwater turtles are increasingly threatened by habitat alteration via urbanization in the US mainland. To assess the impact of county-level urbanization specifically, open-source data from HerpMapper was accessed to evaluate differences in post-mortem observations of three freshwater turtle. Post-mortem records were compiled from 2000 to 2025 and classified by county urbanization using USDA Urban Influence Codes. *Chelydra serpentina*, the common snapping turtle, had the highest recorded post-mortem observations, and urban counties constituted 69.3% of sites. This suggests that *C. serpentina* are disproportionately affected by urbanization, and future conservation measures should be implemented to create safer riparian spaces for this species.

## Research Question & Hypotheses

**How does proximity to US urban centers affect the rate of post-mortem observations of *Chrysemys picta picta* (eastern painted turtle), *Chelydra serpentina* (common snapping turtle), and *Trachemys scripta elegans* (red-eared slider turtle)?**

- Native species have a higher recorded mortality rate compared to the invasive species, which is implied by less-frequent live catches in prior research studies.
- There are higher mortality rates within urban counties for all species because of habitat fragmentation caused by roadways, higher risk of vehicular slaughter, and exposure to pollutants.

## Introduction

In 2025, a previous research study in the Bronx River surveyed the presence of the invasive *T. scripta elegans* and native *C. picta picta* and *C. serpentina*.<sup>4</sup> There was a noticeable decrease in capture rates of native species compared to previous years,<sup>5</sup> and neither traditional catch and release methods nor eDNA analysis detected *C. picta picta*.

Considering the Bronx River is located within a densely-populated urban center, urbanization level may influence local turtle populations and distribution, thus resulting in less-frequent observations. Turtle habitat destruction and fragmentation caused by the construction of roadways, as well as vehicular slaughter caused primarily by major roadways, have a variable impact on freshwater turtle mortality due to the narrow, limited scope of prior research examining these variables,<sup>1,2</sup> so supplementing community science data may improve current understanding of this relationship.

This study aims to utilize verifiable, open-source data to survey the US mainland for records of post-mortem observations of three freshwater turtle species to **assess the relationship between deceased turtles' native or invasive status and county-level urbanization per site of death.**



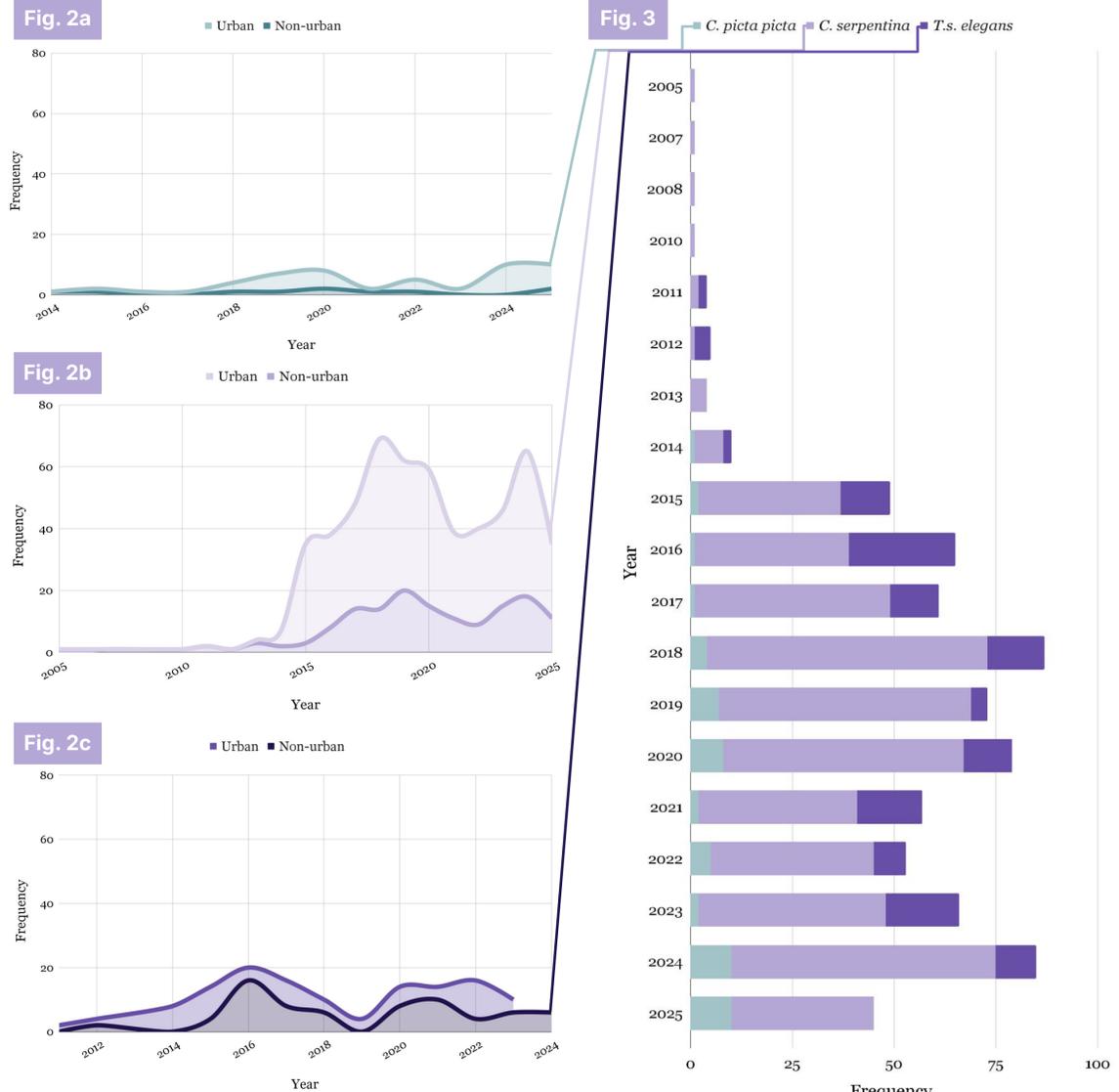
**Image 1**  
*C. picta picta* (left); *T. s. elegans* (right).  
Credit: Brian Saville

## Methodology

Post-mortem data were collected using open-source records from HerpMapper, where community observers report herpetofaunal sightings with photo evidence. From 2000 to 2025, data regarding county name, state, and date of observations of the three freshwater turtle species were exported, cleaned, and pivoted for visual analysis as seen in **Fig. 2a-d, 3.**

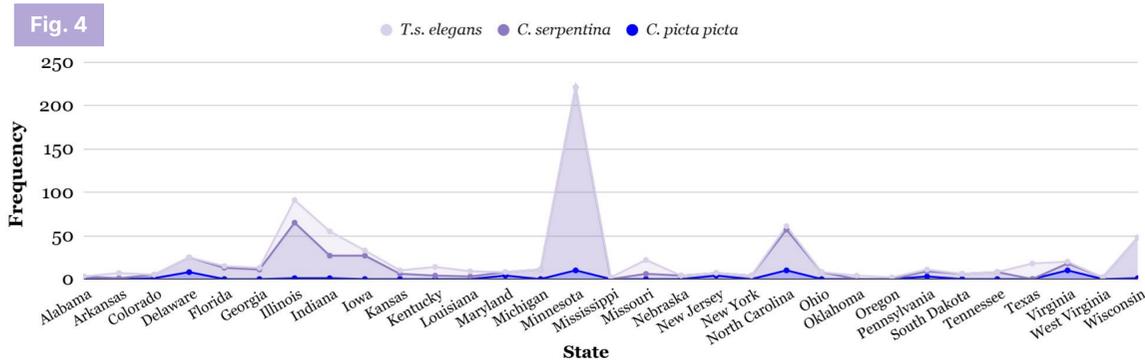
To categorize county-level urbanization, an urban/non-urban dichotomy was created based on USDA Database of Urban Influence Codes (UIC).<sup>6</sup> Any county assigned a UIC of 1, 2, or 4 were classified as "Urban;" all other counties were classified as "Non-urban" and used to distinguish post-mortem observations in **Fig. 2a-c.**

## Data & Figures



**Fig. 2a** (*C. picta picta*), **2b** (*C. serpentina*), & **2c** (*T. s. elegans*) - Stacked area graphs of frequency of post-mortem from date of first observation to 2025.

**Fig. 3** - Stacked bar graph of yearly post-mortem observation frequency from year of first observation to 2025.



**Fig. 4** - Frequency of post-mortem observation by state from date of first observation to 2025.

## Results & Discussion

Based on the data collected, there was a disproportionately higher mortality rate in urban counties versus non-urban counties for the native *C. serpentina*. Minnesota contributed the largest volume of records, comprising 38.1% (n = 211) of all post-mortem *C. serpentina* observations (n = 554) in the past twenty-five years. In addition, urban counties composed 69.3% (n = 518) of all post-mortem observations (n = 747). Hennepin, Minnesota, categorized by the USDA UIC index as a large metropolitan area, provided the most recorded data throughout the US mainland, corroborating the hypothesis that urban counties will experience higher frequencies of freshwater turtle mortality.



**Image 2** *C. serpentina*.  
Credit: Aveena Khan

*C. serpentina* was the most frequently reported species in the dataset, highlighting its high visibility and vulnerability in metro areas. The discrepancy in data collection could be a result of multiple factors including snapping turtles' extensive movements during nesting and mating seasons, and a potentially higher likelihood of being noticed by people when crossing roads or appearing in residential areas due to their distinct features and size at full maturity.

Future research should probe urban centers further and evaluate specific means of death for native turtle species. Wildlife-vehicle collisions and poisoning from pollutants, for instance, may be potential causes worth investigating as results could provide support towards initiatives to reduce negative anthropogenic impact on native wildlife species.

## Acknowledgements

We would like to thank Max Falkenberg, Lowell Iporac and Brian Saville for their guidance, and, the Wildlife Conservation Society and the Pinkerton Foundation for making this study possible.

## References

- Beaudry, F., deMaynadier, P. G., & Hunter Jr, M. L. (2008). Identifying road mortality threat at multiple spatial scales for semi-aquatic turtles. *Biological Conservation*, 141(10), 2550-2563.
- Dorland A, Rytwinski T, Fahrig L (2014) Do Roads Reduce Painted Turtle (*Chrysemys picta*) Populations? *PLoS ONE* 9(5): e98414.
- HerpMapper community. Observations of *C. picta picta*, *C. serpentina*, *T. s. elegans* from US mainland observed from 2000 to 2025. Exported from HerpMapper.
- Khan, A., Rahman, A., Velazquez, C., Nguyen, D., Figueroa, E., Morel, M. (2025). Celebrities or "Shell"-outs? Incorporating Novel eDNA Analysis to Survey the Bronx River's Freshwater Turtle Species. *Wildlife Conservation Society*.
- Mera, Z., Ahmed, Z., Galib, A., Lin, J., Nurani, A., Vargas, C. J. (2024). Shell-ebrating the Bronx River! Investigating Turtles and Riparian Zones. *Wildlife Conservation Society*.
- Urban Influence Codes. U.S. Department of Agriculture. <https://www.ers.usda.gov/data-products/urban-influence-codes>.