

From Creek to Cliff: Salamander Abundance in Wayne National Forest

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Introduction

Salamanders are an indicator of ecosystem health as they are sensitive to disruption associated with both waterways and forests alike (Pough et al. 1987). Wayne National Forest harbors a rich amphibian fauna, and wildlife managers have been monitoring Salamander species since 2018.

Long-term monitoring of amphibian populations using low-cost methods such as abundance surveys, provides :

- an effective way to determine the effects of forestry practices
- best forest management strategies for their protection

Key ecosystem functions (Davic & Welsh Jr, 2004):

- Mid-level predators
- Balancing trophic levels
- Connecting terrestrial and aquatic ecosystems

In this study, we used a 3-year survey dataset and investigated the relative species abundance of 9 salamander species in Wayne National Forest. Specifically, we evaluated location, stand-age, and vegetation differences in location sightings.

Methods

Data Collection: Thirty transects, each with sites along a ridge line, on a slope, and in a ravine were selected based off environmental characteristics. These transects were measured and marked at 50 meters long by 10 meters wide, and then traversed by researchers overturning rocks and logs in search of salamanders. Once all observations were recorded, the habitat was returned to its original state.

Data Analysis: We ran a Kruskal-Wallis test for several significant factors including location (ravine, slope, or ridge), stand age, and dominant vegetation of the stand. To determine whether the most abundant species in our transects is affected by the same factors, we also ran a Kruskal-Wallis test for how each factor affects only the Dusky salamanders.



Figure 1. Era (left) and Paige (right) surveying in a ravine after a large flooding event

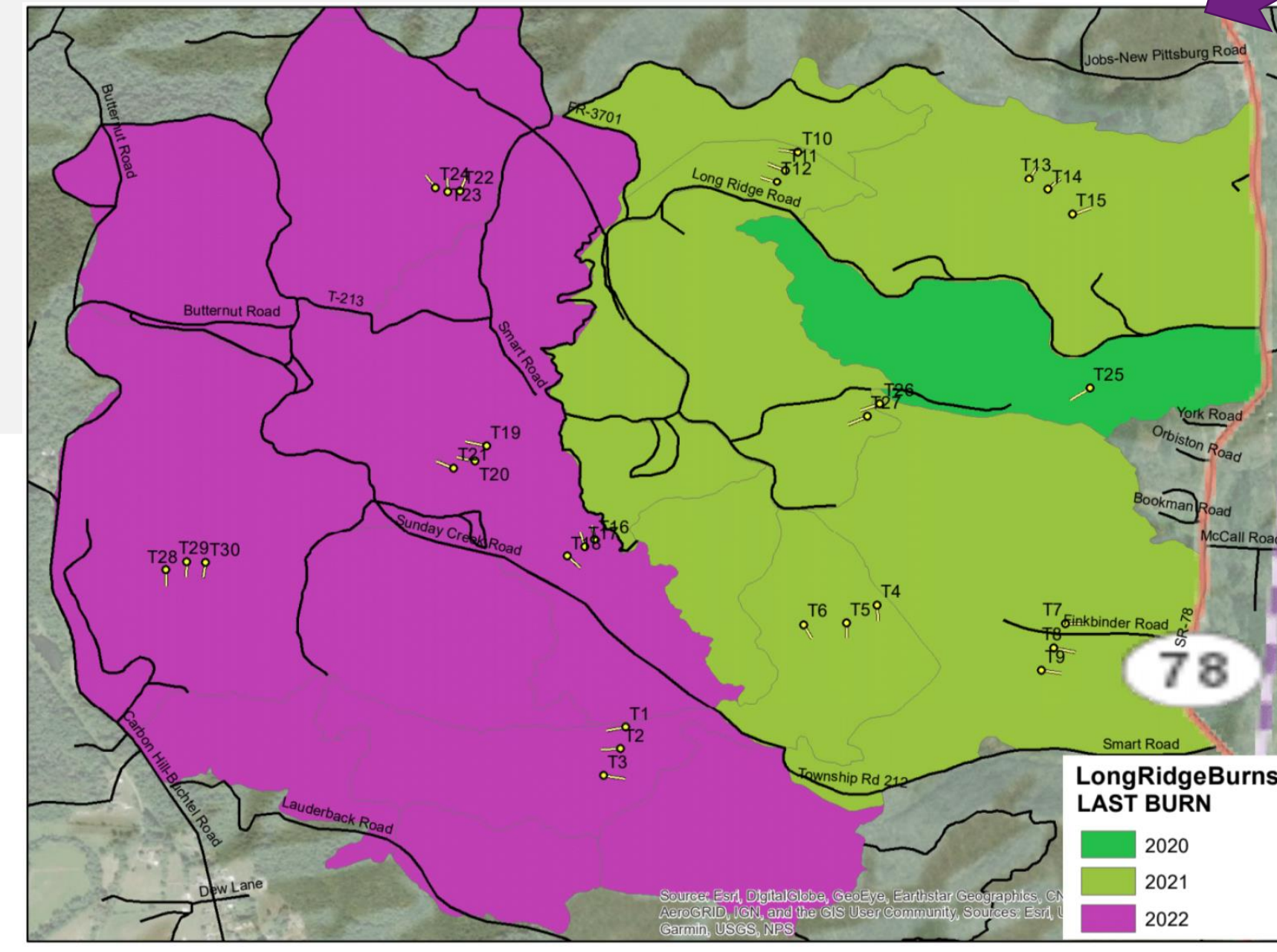


Figure 2. Maps from the US Forest Service of Wayne National Forests (Northwest Cluster) with consequent last burn years

Results

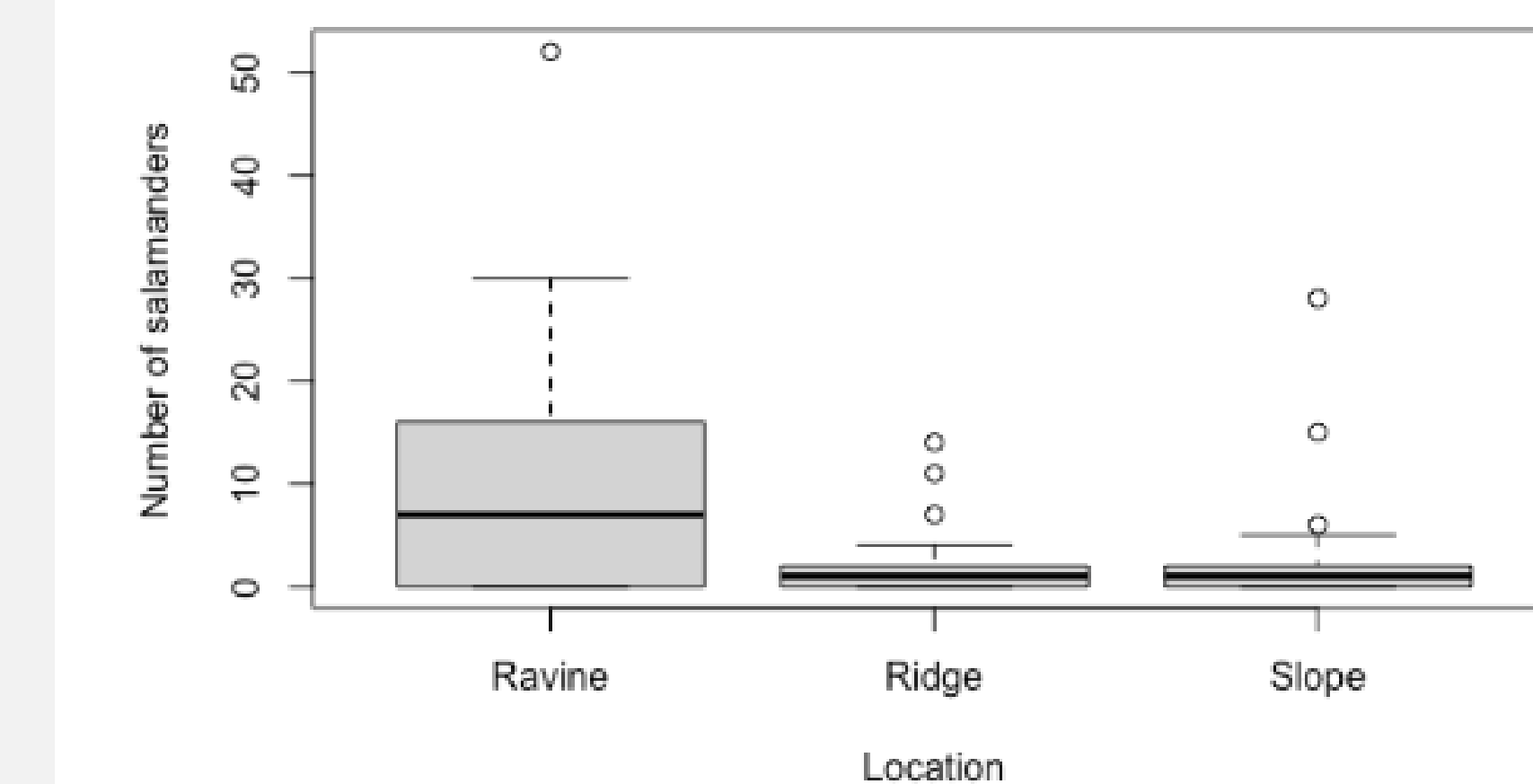


Figure 3. Northern Dusky Salamander (*Desmognathus fuscus*) found on vegetation in WNF on a wet afternoon

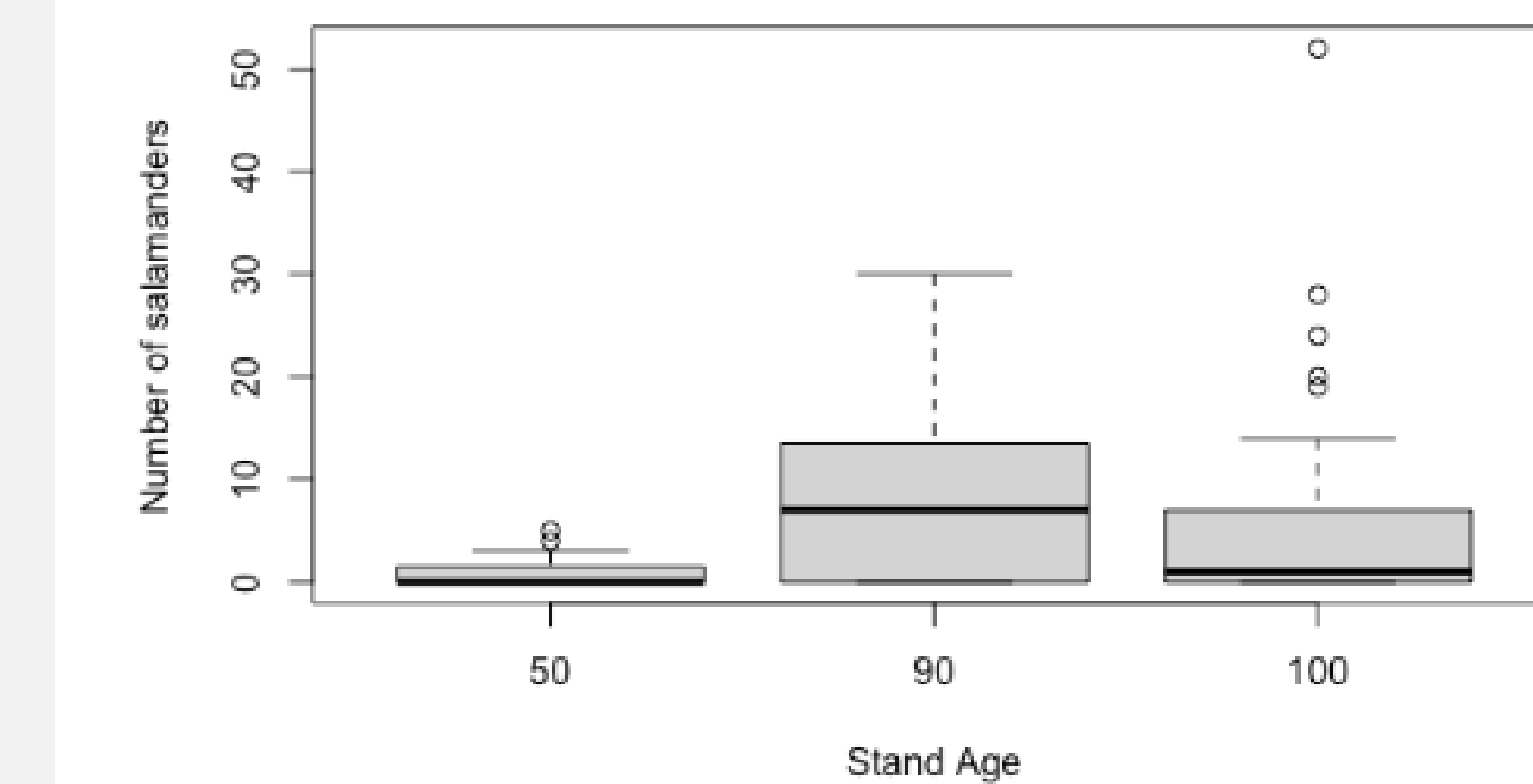
Of the 30 Transects and 9 species observed, Northern Dusky Salamanders were the most abundant species found in 2018 and 2021. In 2019, Red Back salamanders were the most abundant.

Species:	2018	2019	2021
Red-Backed Salamander	21	61	7
Ravine Salamander	4	0	0
Newt	3	45	1
Long-tailed Salamander	9	18	15
Jefferson Salamander	4	0	0
Dusky Salamander	103	13	17
Two-lined Salamander	42	39	3
Slimy Salamander	1	5	2
Spotted Salamander	1	1	0

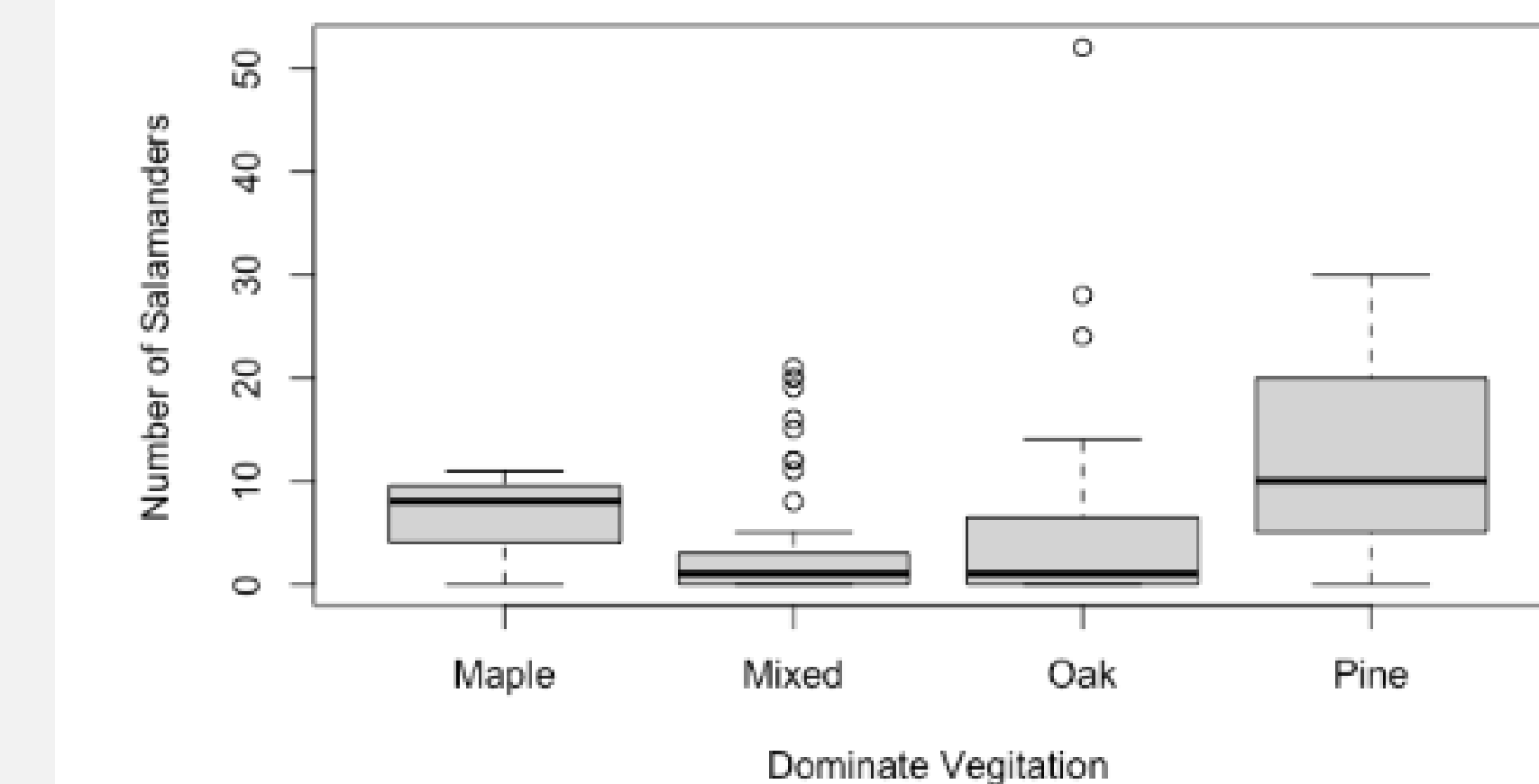
Table 1. Overall abundance found in three separate years



Kruskal-Wallis Rank Sum Test
chi squared = 9.6201 df = 2 p-value = 0.008147



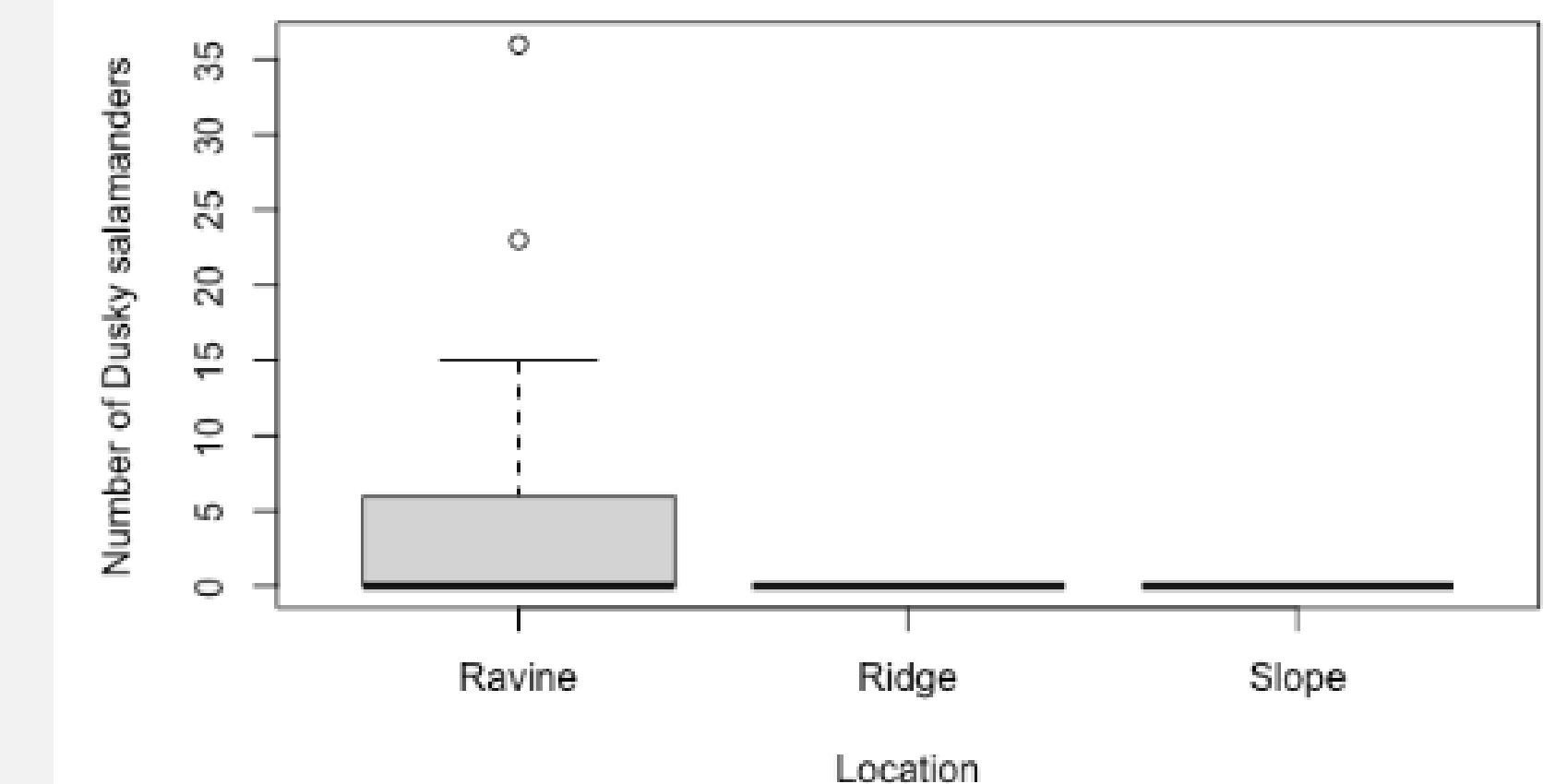
Kruskal-Wallis Rank Sum Test
chi squared = 10.776 df = 2 p-value = 0.004571



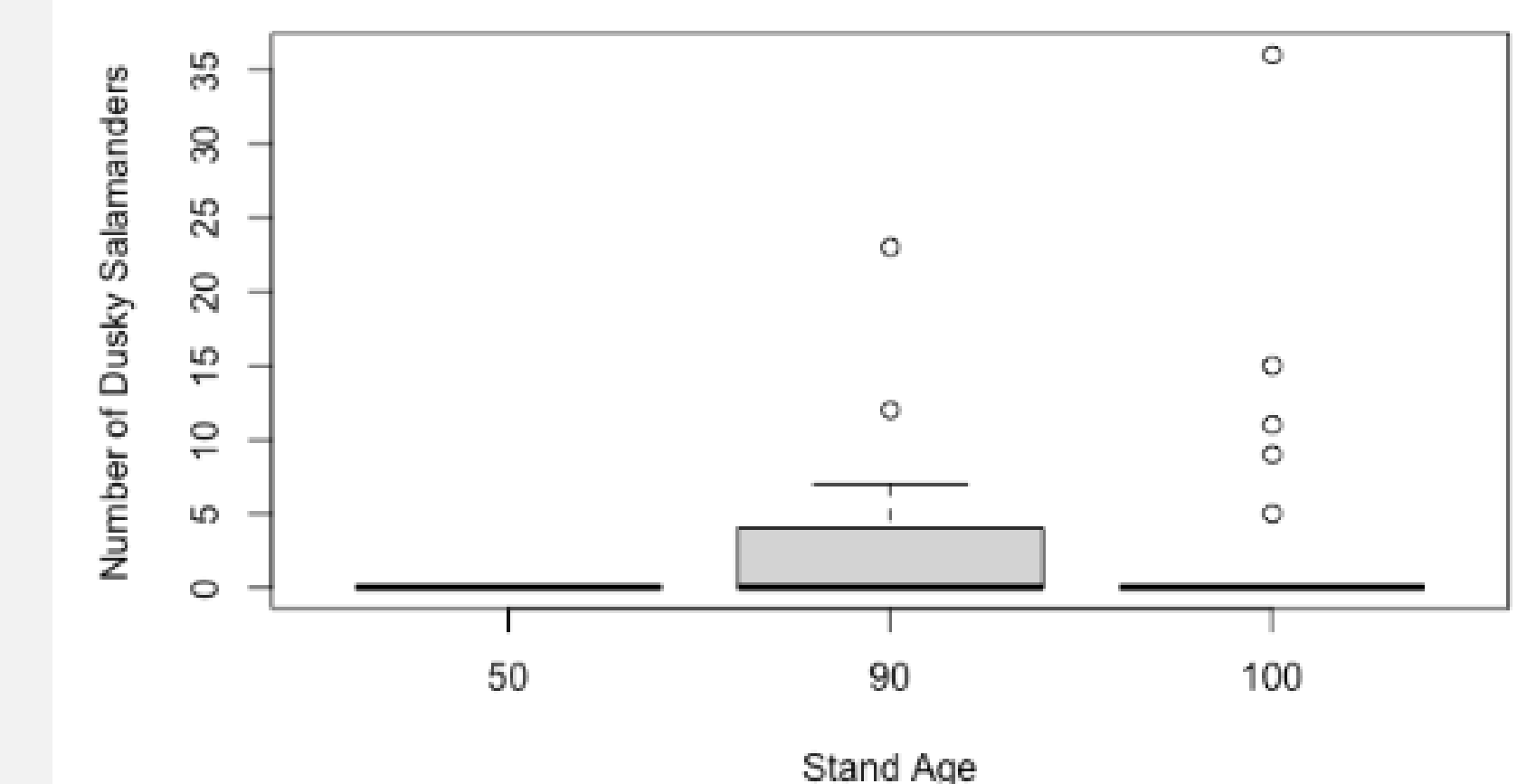
Kruskal-Wallis Rank Sum Test
chi squared = 2.8734 df = 3 p-value = 0.4116



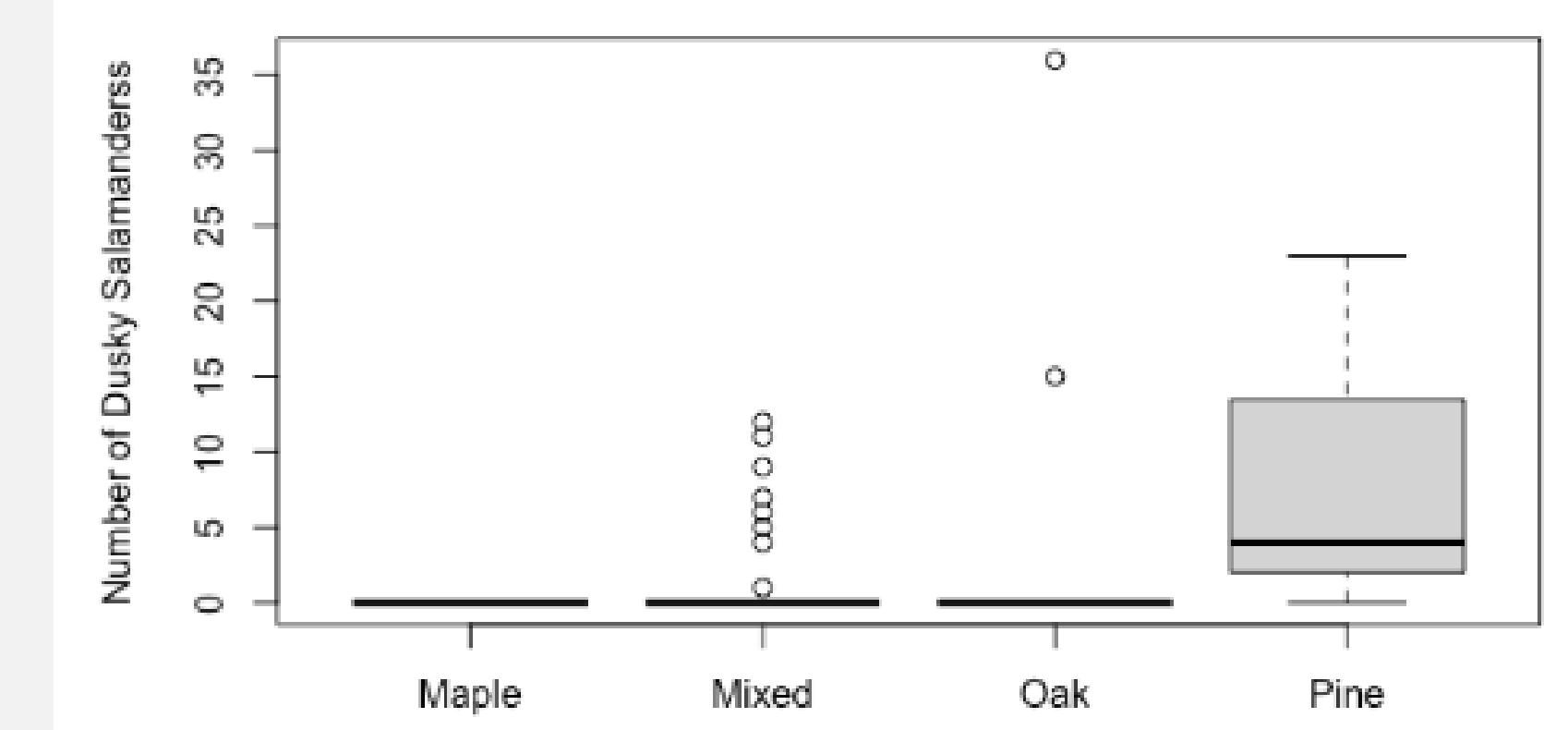
Figures 4-6. Salamander abundance vs different factors



Kruskal-Wallis Rank Sum Test
chi squared = 27.321 df = 2 p-value = 1.168e-06



Kruskal-Wallis Rank Sum Test
chi squared = 11.635 df = 2 p-value = 0.002975



Kruskal-Wallis Rank Sum Test
chi squared = 8.2143 df = 3 p-value = 0.04179

Figures 7-9. Northern Dusky Salamander abundance vs different factors

Discussion

Monitoring is crucial for ecosystem longevity of populations.

- Ravine habitat health is most at risk for pollution.
- Stand age is an important factor in explaining salamander abundance with many species preferring mid age trees (Ford et al. 2002).
- Dominant vegetation is an important factor in salamander abundance, as many species prefer mixed forests over any type of monoculture (Paquette & Messier 2010).
- These surveys must continue moving forward. Long-term monitoring programs have shown a delayed decline upwards of 7 years that is missed in shorter surveys (Hossack, Lowe, & Corn, 2013).

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Acknowledgments

This work is a collaboration between Wayne National Forest, the Ohio University Conservation Biology Lab, and the Ohio University Wildlife Club. Thank you to our advisor, Dr. Viorel Popescu. Special thanks to Kyle Brooks and Katrina Schultes from WNF for guiding the project. Financial support was provided by OhioU. We thank many volunteers that collected the survey data, including but not limited to: Abigail Didier, Tyler Stewart, Isaac Spangler, Laura Simon, and Andrew Connolly.

