

# Invasive Earthworms Impact on Red-backed Salamanders

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## INTRODUCTION

The study of invasive species is important in order to see how different species are impacting Connecticut's ecosystem. Invasive earthworms are a threat that many people do not recognize. Species such as the Asian jumping worm (*Amyntas spp.*), eat the leaf debris which is home to species such as the Red-backed salamander (*Plethodon cinereus*). I wanted to see how invasive earthworms impact the Red-backed salamander. My hypothesis was, the higher density of earthworms under a cover object, would mean there would be less salamanders.

Before I started this project, I learned about *P. cinereus*' environment in an experiment on how Gypsy moths impact different species. During the project, my group recognized that in areas where there was a higher density of earthworms, there were fewer salamanders, and where there were a smaller amount of earthworms, there were more salamanders.

My main goal throughout this project was to see if there was a correlation between invasive earthworms and salamanders. I could then use this information to see how this invasive species is impacting Connecticut's ecology.

## FIELD WORK

To begin my sampling, I needed to pick three appropriate sampling sites, each with a different earthworm density. The three sites I chose were Indian Ledge Park, Great Oak Park and Beach Memorial Park. My community partner and I decided that the most efficient and organized way to collect my data would be to use a simple data table. I used this table to take down information such as cover object type, number of salamanders, size and types of earthworms. I wanted to measure the size of each salamander, so I took a picture of each one in an iPhone box with a ruler in it, so that later I could measure them in ImageJ. After all of the details were settled, I went to each site twice for approximately three hours and took samples.



**Fig. A.** To collect data I had to look underneath cover objects.

**Fig. B.** To record my data, I used a simple data table that I kept updated in the field.

## ANALYSIS

After my field experience, I had to measure all of the salamanders in my data through ImageJ. Measuring on this program was easy, the most important part is to not forget to set a scale to millimeters. I had to measure the salamanders snout-vent length and the length of the snout to the tail. I measured the snout-vent length because when a salamander is frightened it drops its tail. Therefore, I used this measurement to get an accurate representation of my data. After I measured the salamanders, I was able to record and analyze my data in Google sheets.

## ACKNOWLEDGEMENTS

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## RESULTS / DISCUSSION

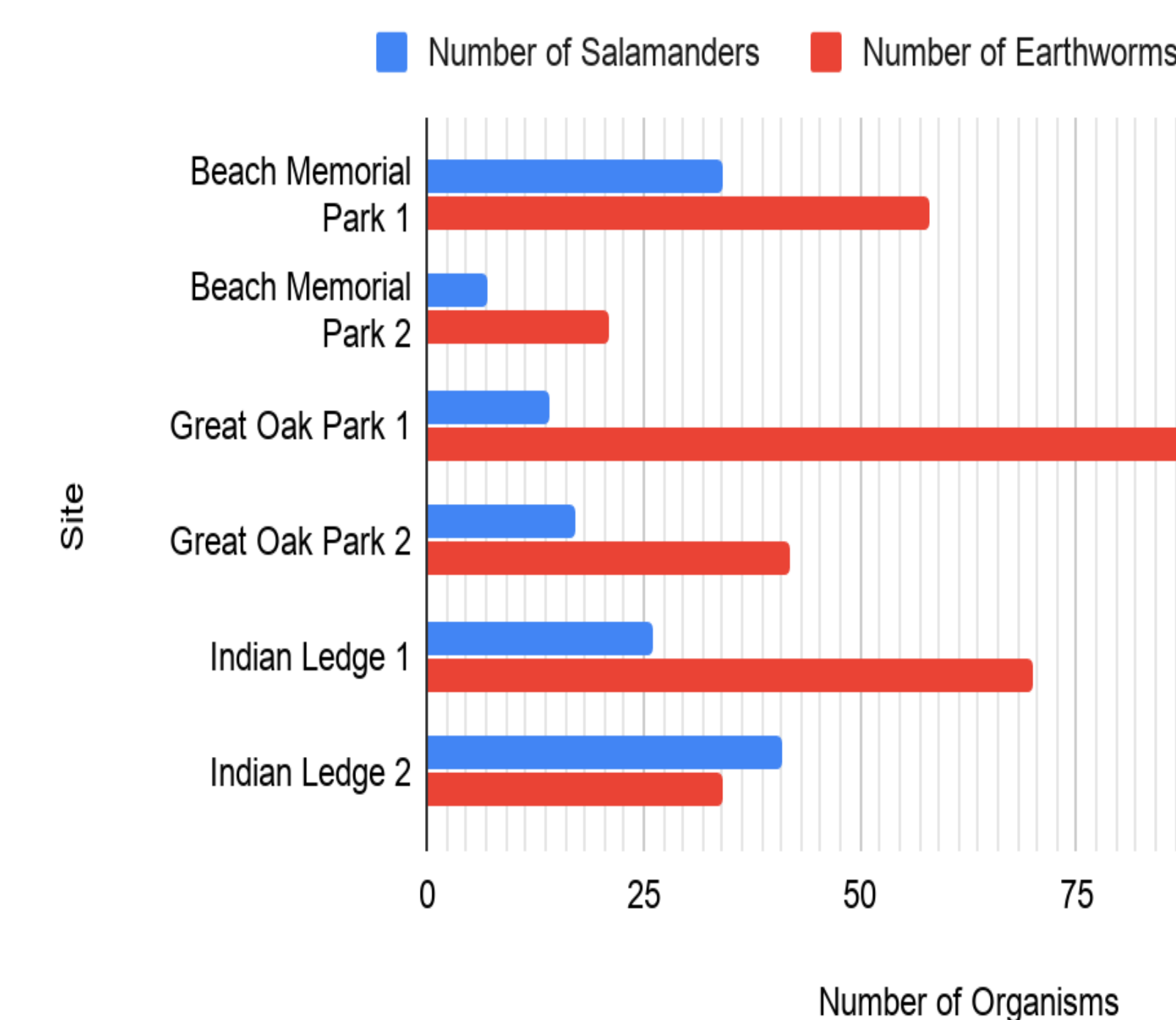
### Number of Salamanders Compared to Earthworms

- In my data I found that the earthworms outnumbered the salamanders at almost all the sites. The only outlier was at Indian Ledge 2, which was the site with the highest concentration of salamanders.
- Beach Memorial Park, which had the highest concentration of earthworms, averaged the least number of salamanders at only sixteen. While Indian Ledge averaged thirty four salamanders and Beach Memorial averaged twenty.

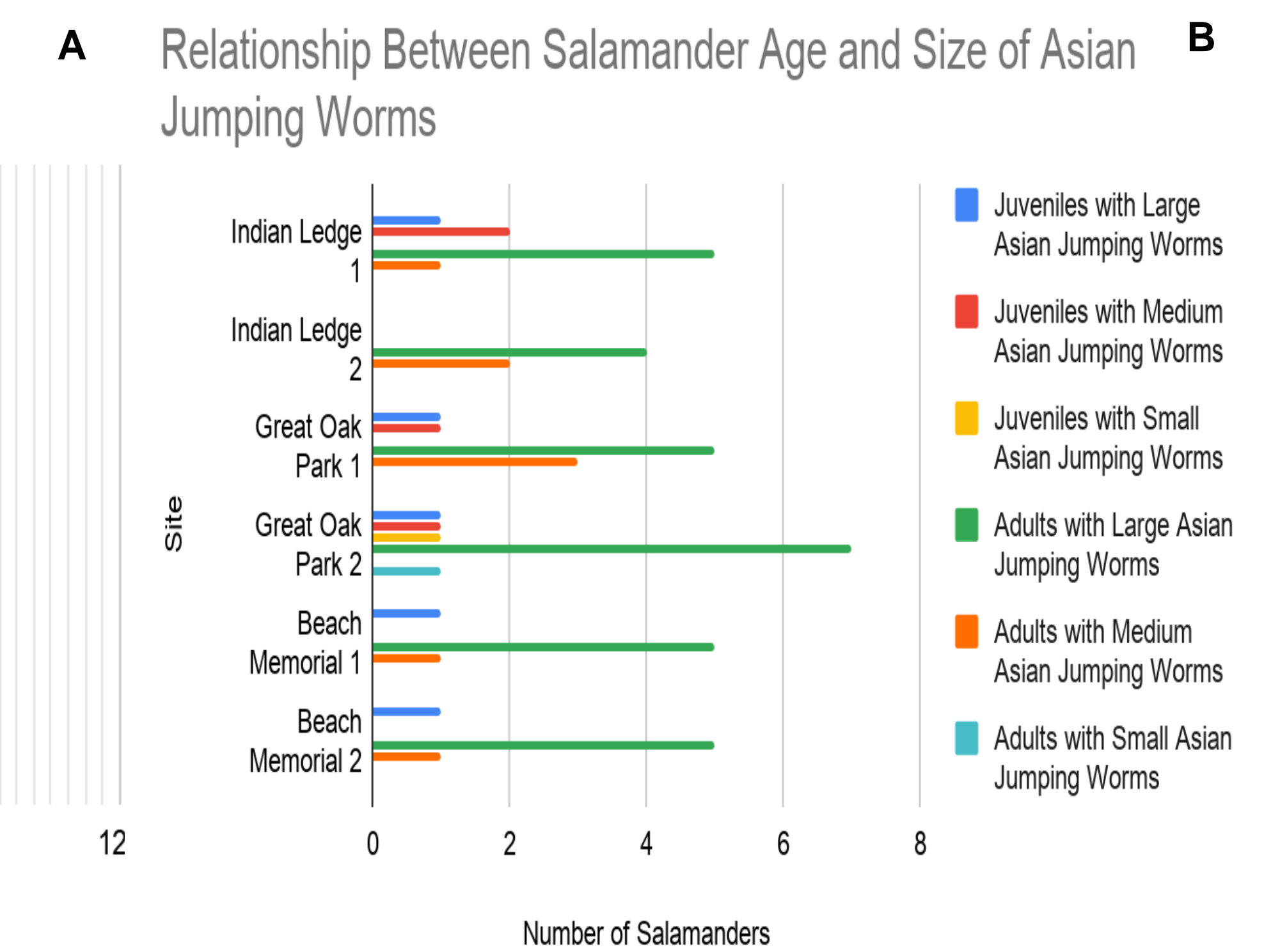
### Correlation of Salamander Age and Size of Earthworms

- Juvenile salamanders were usually not found under the same cover object as large Asian jumping worms. If there was an Asian jumping worm with a juvenile salamander then the salamander would usually be with another salamander, which is unusual.

Salamanders to Earthworms



**Fig. A.** The graph represents the relationship between the number of salamanders to earthworms at each site  
**Fig. B.** The graph represents the correlation between the size of earthworms to the age of a salamander

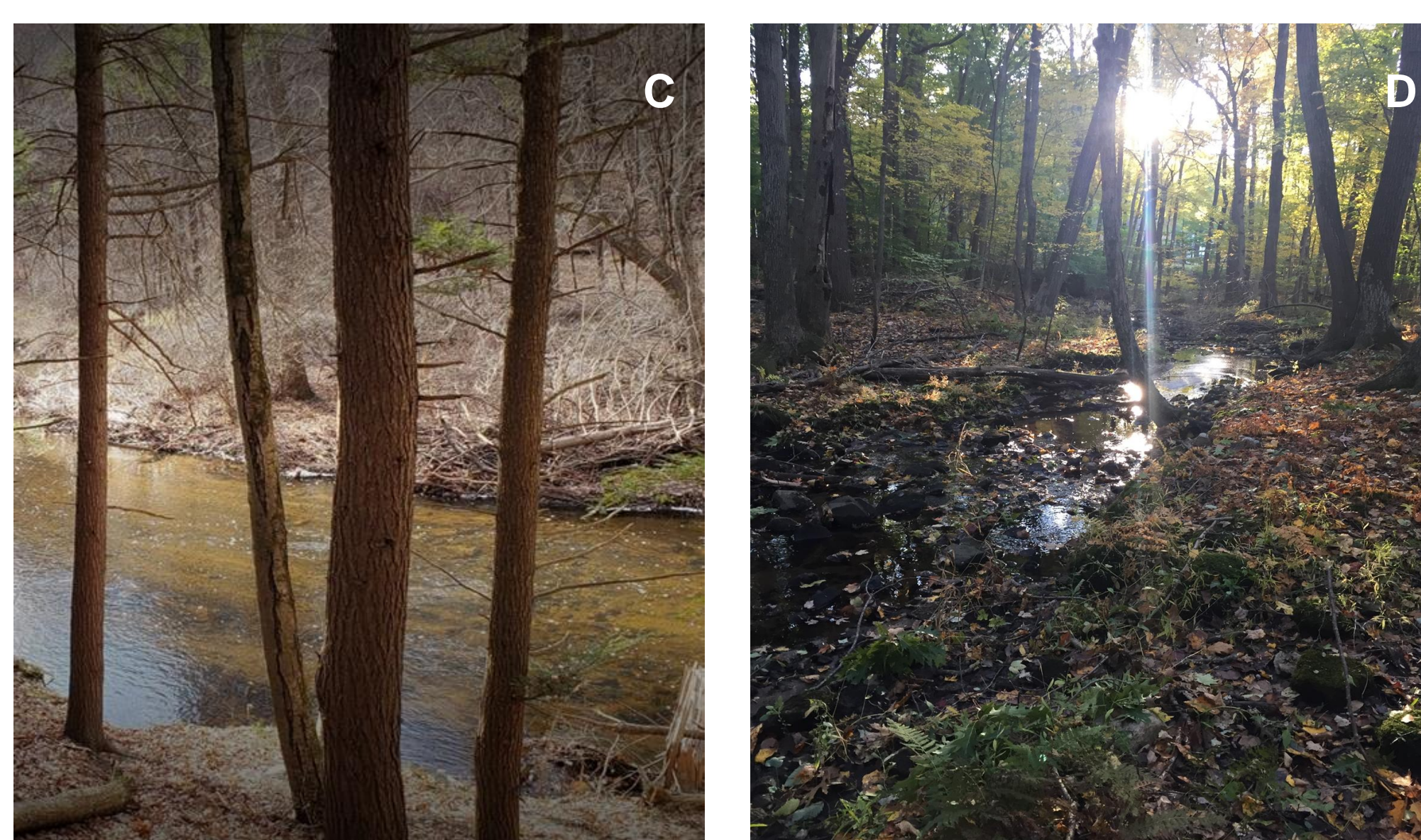


## CONCLUSION

The study results showed a relationship between the number of earthworms and salamanders. As the number of earthworms increased, there were fewer salamanders. This could be because of the Asian jumping worm eating the leaf litter where the salamanders live. Without this leaf litter layer, an area may become uninhabitable for the salamanders. Another result of this study was that juvenile salamanders were rarely found with earthworms. This is probably because the juvenile salamanders cannot consume these earthworms. As mentioned before, the earthworms consume the leaf litter, where most of the small arthropods live that the juvenile salamanders eat. This turns into a bigger issue if the juvenile salamanders do not reach adulthood and reproduce.

Without the salamanders, there are more insects and these insects consume fungi that act as needed decomposers. *P. cinereus* is a keystone species. If you take them out of the environment, there is nothing to control the insects that eat all of the decomposers, causing detritus to pile up and preventing nutrients from being released back into the environment.

I hope that this study will make citizens of Connecticut more aware of invasive earthworms and convince people to get involved in trying to regulate the issue. Although a method of controlling invasive earthworms has not been found, people can learn to identify these worms and remove them from gardens and lawns. People should also be aware of using these worms for composting and bait. Invasive species such as Asian jumping worms are not well known, but these invertebrates have a huge impact on Connecticut's fragile ecology.



**Fig. A.** This is a picture of an Asian Jumping Worm (*Amyntas spp.*)

**Fig. B.** This is a juvenile red-backed salamander I found in the field.

**Fig. C.** This is Indian Ledge Park, one of my sample sites

**Fig. D.** This is Old Oak park, one of my sample sites.