

# Do forest roads and streams restrict movement of red-backed salamanders (*Plethodon cinereus*)?



## Introduction

- Habitat alteration can fragment territories and create barriers for species with poor movement abilities. Such obstacles can create variability in distribution patterns (Ewers and Didham 2005).
- Several studies have shown that roads serve as obstacles in salamander movement (Marsh *et al.* 2005).
- The red-backed salamander (RBS), *Plethodon cinereus*, is an abundant and widely distributed species in central Pennsylvania. RBS can serve as a model for other *Plethodon* salamanders in understanding how barriers impact their movement (Marsh *et al.* 2008).
- RBS are territorial and are capable of returning to their home territory after being displaced up to 90 meters (Kleeberger and Werner 1982).
- Differences between sexes in return rate are topics on which little is known (Ousterhout and Liebgold 2010).

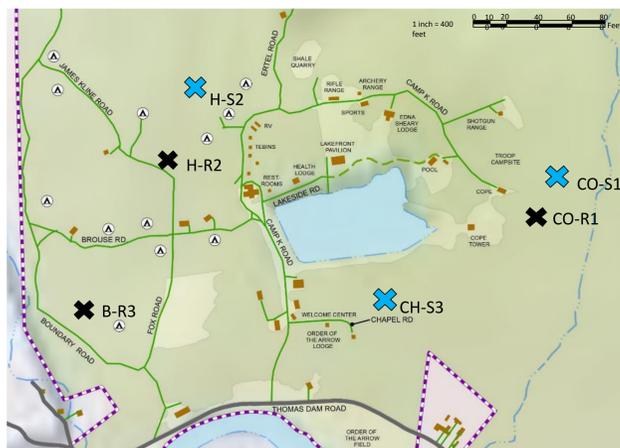
## Questions

- Are streams and forest roads obstacles in the return of red-backed salamanders to their territories?
- Will male RBS return more often than females to their site of origin?
- Are male RBS more likely to traverse farther distances than females?



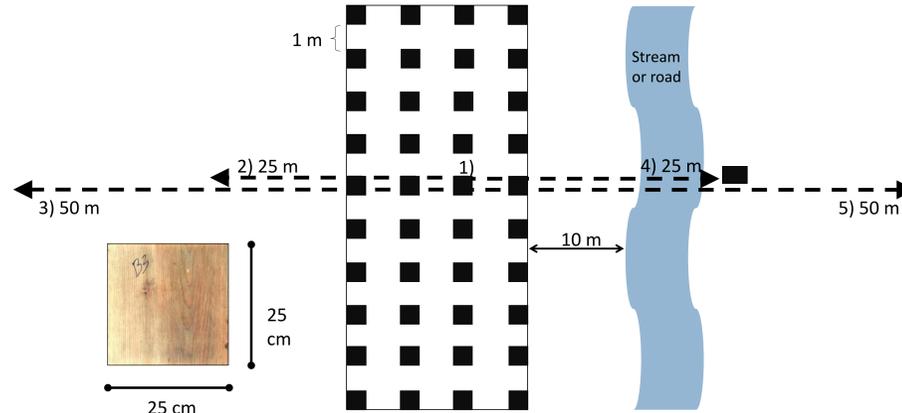
Cover board array with forest road barrier

## Site Overview



Camp Karoondinha, Millmont, Pennsylvania study site with plots. Sampled once a week, starting June 2015. Site locations in camp are indicated by X. Stream sites indicated in blue, road sites in black.

## Methods



Plot set-up with cover board array and treatment options. Treatments are shown with distance and direction of displacement.  
Field Methods

- Abiotic data collected
- Capture
  - Place in bag
  - Check for marks
  - Displaced boards observed for two weeks
- Measurement
  - SVL, TL
  - Sex (male – vas deferens, cirri; female – count for # of eggs; or unknown)
- Marking
  - Visual Implant Elastomer (VIE) tagging
  - Mark recapture method
- Salamander displacements
  - Treatment 1: Control
  - Treatment 2: 25m into forest
  - Treatment 3: 50m into forest
  - Treatment 4: 25m across barrier
  - Treatment 5: 50m across barrier



Visual Implant Elastomer colors



Salamander marking diagram (ventral)



Marking with VIE for identification

## Results

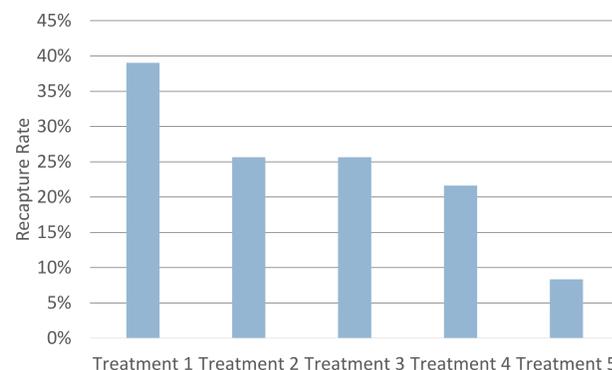


Figure 1. Percentage of RBS that have returned to their original cover boards out of the total number of RBS marked for that treatment.

- 192 individuals have been marked and included in the study
- 23% of total number of individuals in study were recaptured
- If a salamander has been recaptured after previously receiving a treatment, it receives the control treatment (treatment 1) for the remainder of the experiment.
- 24 individuals have been recaptured more than once
- Of the individuals recaptured from treatment 4, 3 had to cross roads and 5 had to cross streams. Of the individuals recaptured from treatment 5, 2 had to cross streams and 1 had to cross a road.
- Perhaps roads are more of a barrier to RBS movement than streams.

## Results

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Are male RBS more likely to traverse farther distances than females?

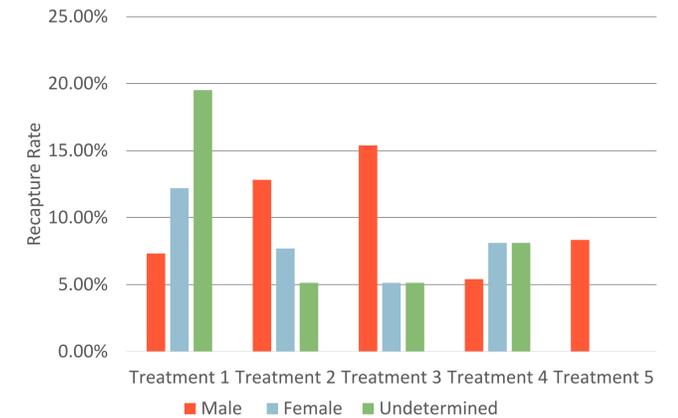


Figure 2. Male, female, and undetermined recaptures with corresponding treatment.

- Data suggests some difference in return rates between male and female RBS.
- Male return rate is higher for treatments 2, 3, and 5.
- Only males have returned to their site of origin from treatment 5.
- Females are more likely than males to stay under their cover board of origin (treatment 1) as well as return when given treatment 4.

## 7P Conclusions

Our results so far suggest that *P. cinereus* are capable of moving across barriers but return rates are reduced with greater distance and when an obstacle is present. We expect to continue our study until summer 2017 and continue to compare return rates across treatments, sexes and size classes to better understand the effects of roads and streams on terrestrial salamander movement.

## Literature Cited

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