



# Recreational Trail Impacts on Presence and Abundance Patterns of the California Slender Salamander (*Batrachoseps attenuatus*) in the Arcata Community Forest, CA

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## Background

- California hosts the most listed species imperiled by recreation because of its strong association with outdoor recreation [1].
- Hiking trails may create barriers to genetics and movement [2].
- Understanding how trails affect salamander abundance and presence is essential to the management strategies, as they are an indicator species [3].

**Objective:** This study aims to evaluate how the proximity of trails and streams influences the presence and abundance probabilities of salamanders

## Hypothesis

**Hypothesis 1:** If the salamander's presence and abundance are a function of distance from the trail, then we should find a higher abundance and presence of salamanders further from the trails

**Hypothesis 2:** If salamander abundance and presence are a function of proximity to the distance of the stream, then we should find a higher abundance and presence of salamanders closer to the stream

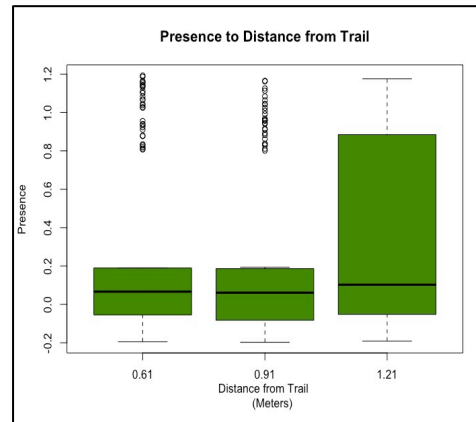
## Study Area



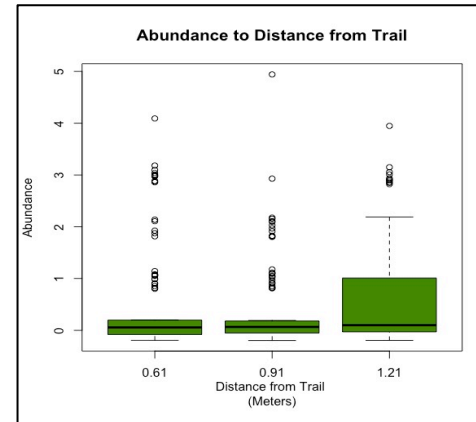
**Fig 5.** A map of Arcata Community Forest from the City of Arcata web page. Green indicates the Redwood Park Trail (0.28 miles), and the Orange is the Short Trail (0.41 miles).

## Results

### Hypothesis 1: Salamanders detection is affected by Trail Distance

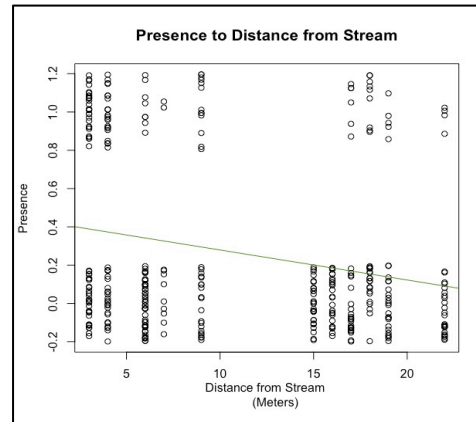


**Fig 1.** Presence as a function of Distance to Trail 0.61m [p-value = 4.55e-09], 0.91m [p-value = 0.77] and 1.21m [p-value = 0.144] (Supports H<sub>0</sub>)

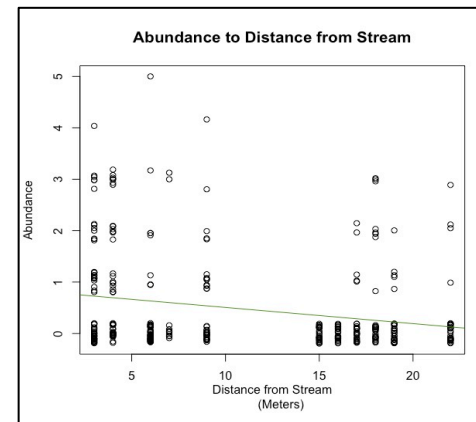


**Fig 2.** Abundance as a function of Distance to Trail 0.61m [p-value = 3.8e-08], 0.91m [p-value = 0.296], and 1.21m [p-value = 0.296] (Supports H<sub>0</sub>)

### Hypothesis 2: Salamander detection is affected by Stream Distance



**Fig 3.** Presence as a function of Distance to Stream [p-value = 5.696e-06] (Rejects H<sub>0</sub>)



**Fig 4.** Abundance as a function of Distance to Stream [p-value = 1.48e-05] (Rejects H<sub>0</sub>)

## Methods

- 3 Line transects that were 8 meters long and at different levels from the trail
- At each plot, I measured the following: Presence, Abundance, distance from the trail, and distance from the stream
- I visited each of the sites twice per week from February-April

## Discussion

I collected 360 data sets and ran a Linear regression model in RStudio.

My results have no significant difference for **Hypothesis 1** and are significantly different for **Hypothesis 2**.

1. Salamander abundance and presence are not affected by the distance of the trail (Fig. 1 & Fig. 2).
2. The distance of the stream impacts salamander abundance and presence (Fig. 3 & Fig. 4).

Further studies should collect data from multiple trails, as two trails may not be sufficient data. As well as measure microhabitat conditions such as soil moisture.

## Acknowledgements

I would like to thank the Wildlife Professors at Cal Poly Humboldt: Dr. Sinn, Dr. Fogarty, and Rob Blenk for their guidance, support and valuable feedback.

## Literature Review

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2. Cosentino, B. J., K.M. Brubaker. 2018. Effects of land use legacies and habitat fragmentation on salamander abundance. *Landscape Ecology*. 33:1573-1584.
3. Siddig, A.H.S., A. Ochs, A. M. Ellison. 2019. Do terrestrial salamanders indicate ecosystem changes in new england orests?. *Forests* 10.2:154.

