

Research and Teaching Opportunities with a Large-scale Salamander Collaboration Network (SPARCnet)



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Photo by Jonathan Drescher-Lehman

Research Collaboration Network

- <u>SPARCnet</u> (Salamander Population & Adaptation Research Collaborative Network) is an intellectually and geographically distributed network founded in 2013 to understand salamander climate adaptation and population dynamics across multiple scales.
- SPARCnet aims to integrate scientific inquiry, education, and community engagement with resource management to address pressing ecological questions, range-wide patterns in populations dynamics, and individual-level responses to environmental variation.
- We are a diverse group of scientists from multiple research centers and disciplines using capture mark-recapture methods and a replicated plot study design.

Research Objectives:

- 1. Understand impacts of land use and climate change on salamander population dynamics
- 2. Develop models to describe local and regional drivers of spatial population dynamics
- 3. Understand the adaptive capacity of salamanders to environmental change http://sparcnet.org/

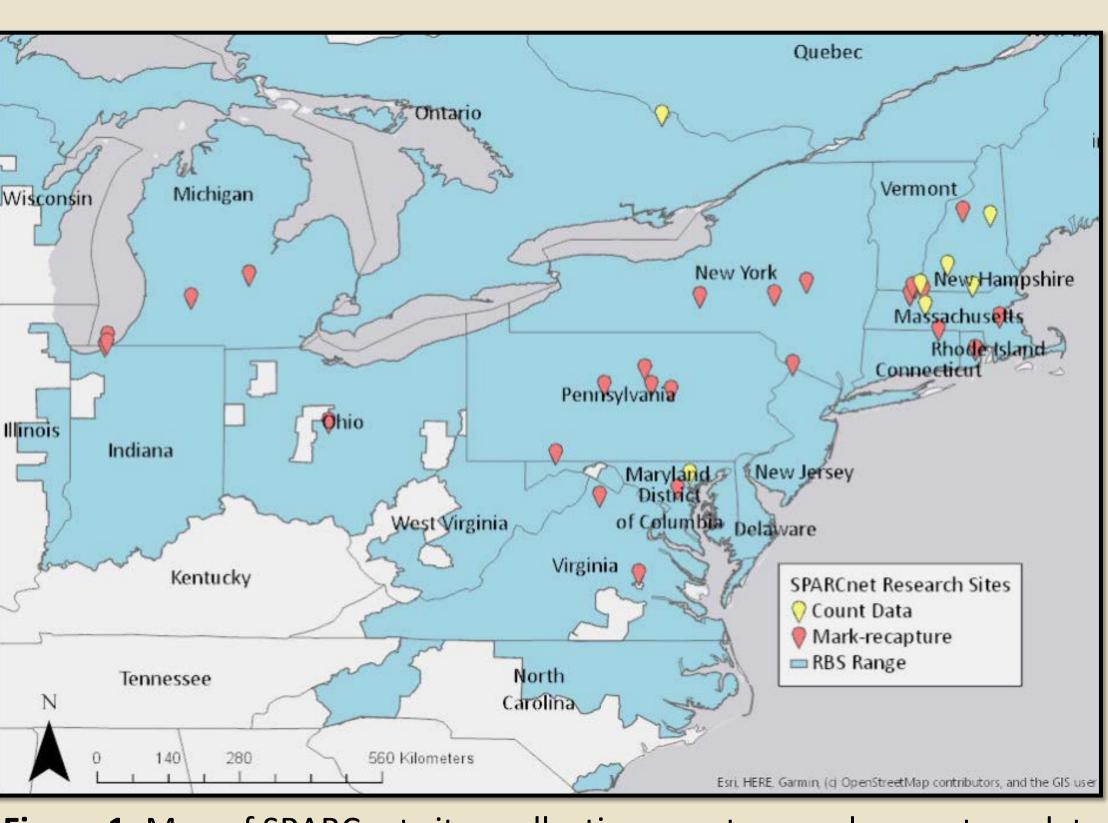


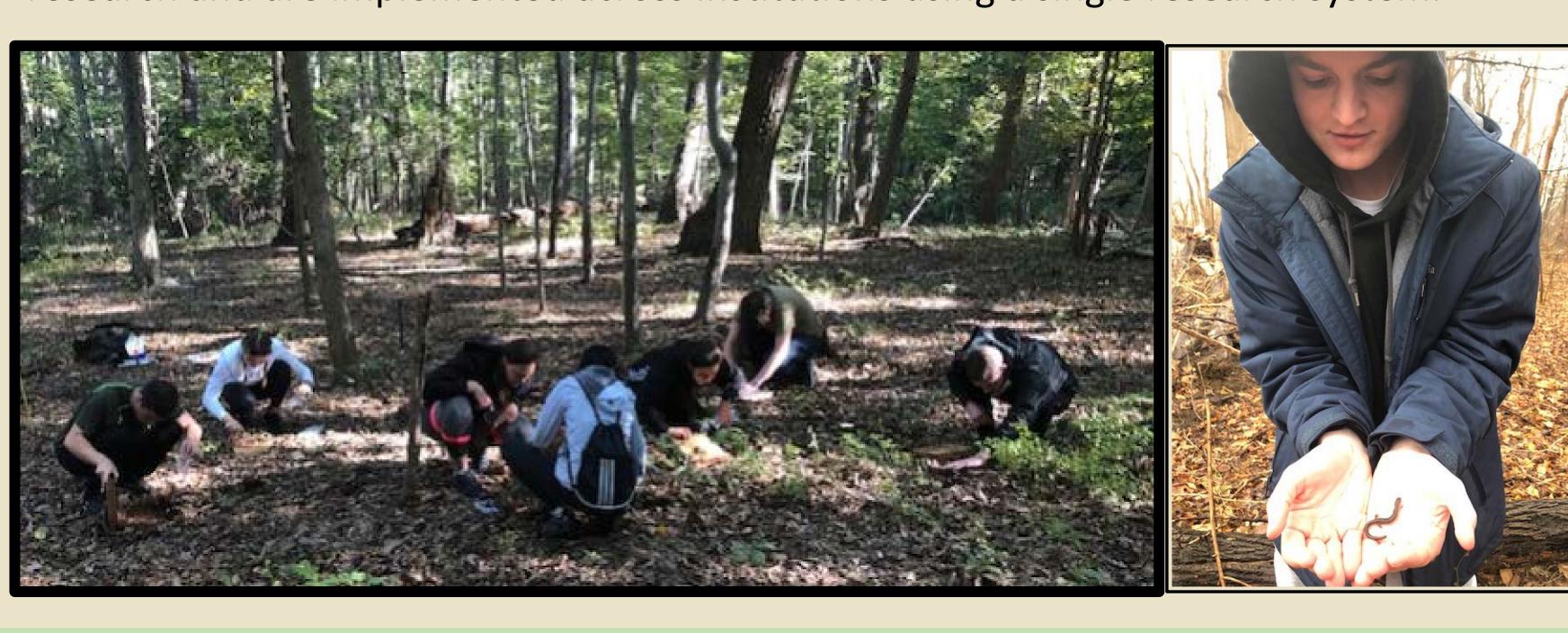
Figure 1. Map of SPARCnet sites collecting count or mark-recapture data

Education Research

Spatiotemporal Research Questions – Student Collected Data – Cross-Institution

As part of a NSF Improving Undergraduate STEM Education grant, we are testing several hypotheses related to the effectiveness of implementing the CURE model through linked multi-institutional investigations using SPARCnet data and field experiences.

- Students address spatiotemporal ecological and evolutionary research questions.
- Engagement in data collection and analysis promotes quantitative skills.
- Course-based research modules broaden participation of undergraduates in field-based research and are implemented across institutions using a single research system.



Course-based Research Design

- Recent evidence suggests Course-based Undergraduate Research Experiences (CUREs) lead to increased persistence of students in STEM disciplines.
- We are using SPARCnet teaching modules to engage undergraduates in collecting and analyzing field data while learning about the collaborative nature of science.

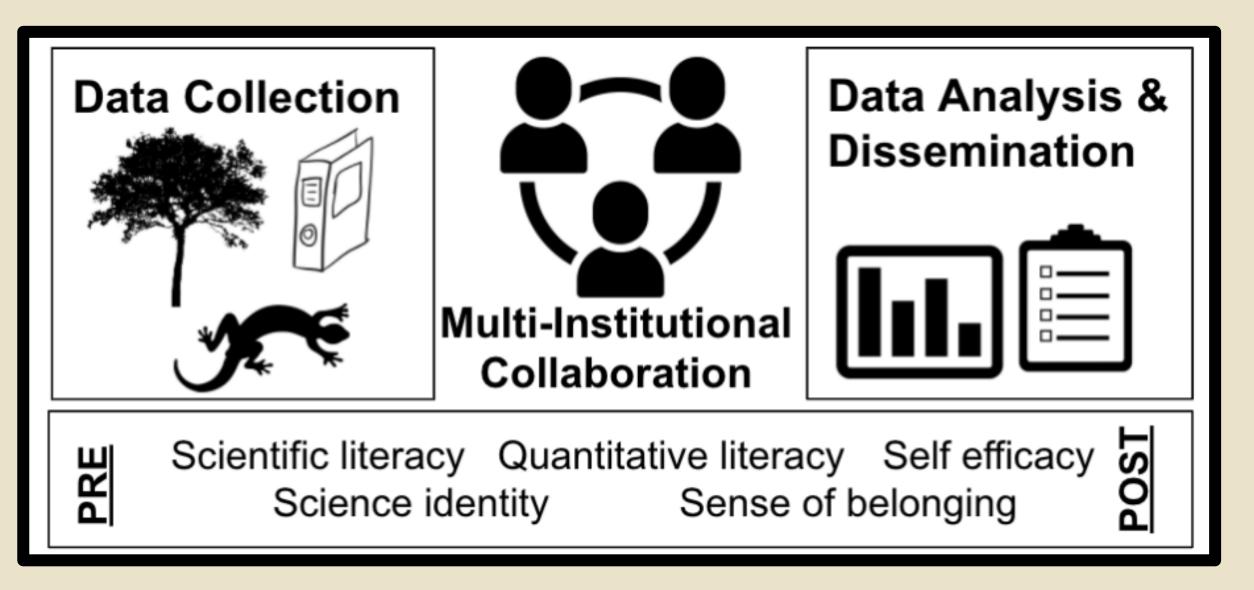


Figure 2. Structure of the SPARCnet CURE and measured course outcomes

Education Research Questions:

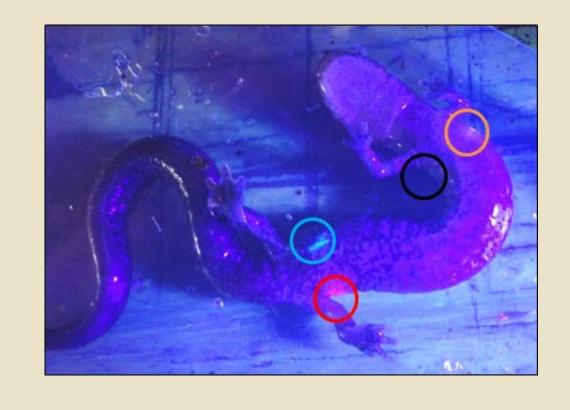
- 1. What are the specific learning gains in quantitative and scientific literacy for students engaging in SPARCnet teaching modules?
- 2. What impact do SPARCnet modules have on student self-efficacy and science identity?
- 3. Do students who complete SPARCnet modules and interact directly with the research network **through multi-institution collaborations** show a greater increase in their *sense of belonging*, *science identity*, and/or *self-efficacy*?

Salamanders as a Focal Species

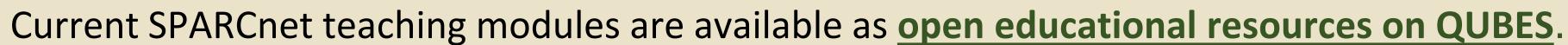
- The red-backed salamander (*Plethodon cinereus*) is among the most widely distributed salamander species in North America.
- This species plays an important role in forest food webs. Its sensitivity to environmental conditions and high site fidelity makes *P. cinereus* an ideal species for long-term monitoring.
- Cover boards are a well-documented method for surveying terrestrial salamanders. Spatial capture-recapture marks are given using visual implant elastomer (VIE).

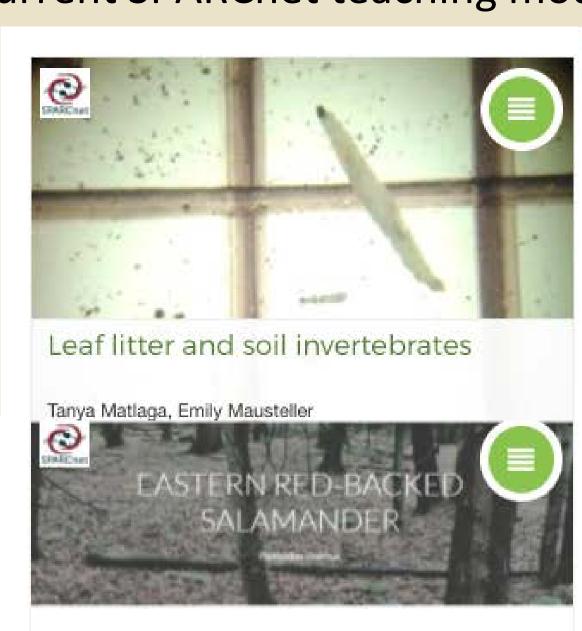






Available Teaching Materials





An Introduction to Red Backed

Tanya Matlaga, Fall 2015 Department of Biology Students

Salamander Ecology





One species, two species, red species,

lead species? Phylogenetics and...

M. Caitlin Fisher-Reid



How Many Salamanders are in the forest? Testing capture-recapture

Louise Mead, Kristine Grayson, Alexa Warwick, David Mille...

https://qubeshub.org/community/groups/sparcnet_ed/teaching_resources

Adjusting for Virtual Education

- We created a virtual lab group during the summer of 2020, bringing together undergrads from five of the SPARCnet institutions to test our cross-institutional collaboration model and learn about terrestrial salamander ecology.
- We are shifting our connected classroom model for this year from field-based experiences to sharing data across different sites for student projects.



Acknowledgements

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