

# ENVIRONMENTAL SYSTEMS

## PH.D. DISSERTATION DEFENSE SEMINAR

### Contemporary Evolution, Range Limits, and Climate Change: An Investigation of of Population Adaptation across Species Ranges

Lillie Pennington  
Environmental Systems Graduate Group  
University of California, Merced

#### ABSTRACT

Climate change is a major challenge facing all ecosystems on earth. It is expected to have variable effects on ecosystems, with species populations potentially facing myriad environmental changes across their ranges. This research addresses range-wide effects of climate change, with an emphasis on adaptation at range limits. First, I compiled a short review of range limits research. Then, using the ecological model organism *Erythranthe laciniata* (cutleaf monkeyflower), I examined range-wide implications of the 2012-2016 drought in California, which was exacerbated by climate change. Using a resurrection approach, I grew pre-drought and drought generation plants collected from populations across the species range in an experimental drought and heat-stress growth chamber study, and I used those same populations in a range-wide common garden field study. I found that the average drought generation plant does have an advantage in some stressful environments, but that overall, high heat conditions reduce fitness across the range. Finally, to understand how adaptation may vary across species' ranges, I and my collaborators performed a literature review and meta-analysis of range-wide quantitative genetic variation (QGV) studies. QGV is the variation that selection acts on and can be estimated through heritability and variation estimates. It has been theorized that QGV, and therefore adaptability, will be highest at the center of a species geographic and/or niche range. We found little evidence to support that central populations are higher in QGV. This study highlights the need for more research into QGV variation across species' ranges. Taken together, my dissertation work emphasizes the importance of understanding range-wide patterns of adaptation to climate change.

#### Schedule

Date: 04/17/2023  
Time: 10:00 am- 11:00 am  
Location: GRAN 103  
Zoom Link:  
<https://ucmerced.zoom.us/j/87299710597>

#### More Information:

Lillie Pennington  
[lpennington@ucmerced.edu](mailto:lpennington@ucmerced.edu)

Faculty Advisor:  
Jason Sexton  
[jsexton2@ucmerced.edu](mailto:jsexton2@ucmerced.edu)



#### BIOGRAPHY

Lillie Pennington graduated with her B.S. from Oklahoma City University and is currently a Ph.D. candidate at the University of California, Merced. She is interested in plant adaptation, specifically in the context of climate change. Lillie was supported by the Eugene Cota-Robles fellowship early in her Ph.D. career and was awarded the Ford Dissertation Year fellowship to finish her degree. She will go on to be an NSF Post-Doctoral Researcher at the University of Georgia. Lillie enjoys birding, baking, and playing video games in her spare time.

