

Undergraduate Research: Conservation Biology in Native Palouse Prairie Remnants

During the summer after my sophomore year in college (2003), I secured a position in the University of Idaho's NSF REU program, working with Dr. Sanford Eigenbrode and his graduate student at the time, Dr. Chris Looney. Our project focused on the conservation biology of native Palouse prairie remnants embedded in agricultural land in Idaho and Washington. Last remnants of once extensive bunchgrass meadows, these habitats are small (generally < 1 ha) and highly fragmented, with very poorly understood biota. We sampled carrion-attracted beetles in prairie fragments to see if remnant size, amount of edge, or soil type influenced carrion beetle richness or diversity. This phase of the experiment taught me a great deal about experimental design and execution, as we worked through trapping design and determined the required sampling effort.

The next step of collaborative data analysis helped me develop necessary creativity and flexibility. We initially used linear regression to test whether abundance, diversity, or richness were correlated to remnant size, perimeter/area ratio, or distance to forest. When we didn't find a significant relationship, we turned to unpaired t-tests to test whether edaphic characteristics played a role in species associations. PCA and cluster analysis were used to group assemblages of species. Those assemblages suggested that carrion beetle communities in the area are more closely associated with soil types than prairie fragment size or edge. The atmosphere of communication and collaboration was enormously helpful. That summer I was able to go through every stage of a field research project. Although I was initially carefully guided, by the end of the project I worked semi-independently. This experience was excellent, both for the immediate results produced and in preparing me for my next summer's project, which took me even farther afield.

Undergraduate Research: Small Mammal and Human Ecology of a Tropical Forest Plantation

The next summer (2004), I developed and managed two grants from Eckerd College and the Ford Scholar's foundation to fund a collaborative research project with Thammasat University, Thailand. Working with Dr. Sompoad Srikasamatara and Tanapipat Walalit, our project focused on small mammal community composition in a managed forest plantation, with the object of comparison with the adjoining national forests. The area is of interest for studies of connectivity because of proximity to the Thai/Myanmar border, the intact forest ecosystems that persist on the Myanmar side of the border, and unique ecosystems resulting from the area's Karst topography and heavy rainfall. During this period, I was living and working exclusively with Thai nationals, in an area without telephone service. I had to learn quickly how to be resourceful, and draw on the experience of the Thai researchers in the area.

My analysis of the data after the first phase of trapping indicated that we needed to increase trapping effort, with richness as a function of trapping effort still increasing exponentially. Unfortunately, I developed acute appendicitis after the preliminary study and was unable to complete planned trapping in the national park. We were however, able to show suggestive differences in faunal communities within the plantation, laying the groundwork for further study.

The grant also funded my undergraduate advisor, Dr. Alison Ormsby, to travel to the area and conduct surveys with me of area communities' perception of the recently established national

park. This was my first opportunity for interdisciplinary research, as I helped design the survey and translated for all the interviews. Interviews with the surrounding Thai, Burmese, and national park staff indicated dramatically different perceptions of the national park, and reaffirmed the need for continuing efforts to assist the disadvantage and displaced persons in the surrounding communities as they adjusted to the presence of the national park. Results of the interdisciplinary research were presented at the Ford Scholar's research symposium at Eckerd College.

Graduate-level Research, Fire Impacts on Coast Redwood Regeneration and Persistence

This past year, working with Dr. Kevin O'Hara and Benjamin Ramage at the University of California, Berkeley, I worked on fire disturbance in coast redwood, focusing on this species because of its ecological and economic importance for California. Redwood is adapted to periodic fire and flood disturbance, and anthropogenic alterations of fire regimes, watersheds, and global climate have impacted its regeneration in ways that are not fully understood. Specifically, global warming may cause the redwood's potential range to move to the north, with implications for dispersal limitations in this species. Our research sought to document the effects of a recent fire that burned in stands throughout the area on redwood sprouting, the primary mode of reproduction for coastal redwood. We also sought to document seedling regeneration in studied stands. My work focused on the interactions between vigor, sprouting, and disturbance on redwood stands. These results will be important as the people of California decide how to preserve this important species in the face of climate change.

Our preliminary analysis indicates that fire plays a significant role not only in seed but also vegetative regeneration for the species, with strong correlations in linear regression analysis. Redwood seems to regenerate better after fire than its competitors. My initial analysis of vigor data indicates that cambial electrical resistance may be a more consistent and reliable indicator of instantaneous vigor immediately after disturbance than other measurements.

I am also involved in an ongoing lab project to more accurately measure the carbon content of different wood types and stand structures in redwood and western sierra species. We hope to use this data to improve modeling efforts of stand carbon, allowing managers to assess whether management at the local scale is economic.

SELECTED PUBLICATIONS AND PRESENTATIONS

- Looney C., B. T. Caldwell, and S. D. Eigenbrode. 2009. When the prairie varies: the importance of site characteristics for strategizing insect conservation. *Insect Conservation and Diversity*: In press.
- Looney, C., B. T. Caldwell, T. Hatten, C. Lorion, and S. D. Eigenbrode. 2006. *Potential habitat factors influencing carrion beetle communities of Palouse prairie remnants*. Egan, D. and J. Harrington, eds. **Proceedings of the Nineteenth North American Prairie Conference**. August 8-12, 2004, Madison, WI. Madison: University Communications.
- Looney, Chris, Benjamin T. Caldwell, Tim Hatten, Christopher Lorion, Sanford D. Eigenbrode. 2004. *Scabs, eyebrows, and carrion beetles*. **University of Idaho/Washington State University Initiative in Organismal Interactions annual retreat**, 26-28 August, Camp Wooten, Washington. (Oral presentation)
- Caldwell, B., Ormsby, Alison. 2004. Small Mammal Community Composition of a Forest Plantation in Tong Pa Phum, Thailand. **Ford Scholars Research Forum**. Eckerd

Previous Research Experience

Benjamin Caldwell

College, St. Petersburg, Fl. (Oral Presentation).