Survival in a Drier World: A Study of Rapid Adaptation in Response to Drought in the Sierra Nevada Endemic Forb, *Erythranthe laciniatus*  
*Or: What to Expect When You’re Expecting Climate Change*  
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**CLIMATE CHANGE:** How will native plant populations respond?  
- The Sierra Nevada are a biological hotspot, home to at least 7,000 vascular plant species, with 400 of those endemic (Ingram and Kocher 2015)  
- A warmer, drier climate with higher incidence of climate anomalies is predicted for California  
- Little is known about how plants will respond to rapidly changing climatic conditions

**THE RESURRECTION APPROACH:** Measuring response to extreme drought  
- Resurrection experiments (Franks, Hamann, and Weis 2017) provide a framework to quantify change over time  
- To determine how plants responded to the historic 2012-2014 drought, seeds of *Erythranthe laciniata* produced before and during the drought were grown out in common conditions.

**STUDY QUESTIONS:**  
1. Are the observed phenological changes conserved in a second generation growout?  
2. Do responses vary between populations?

**METHODS:** Second generation growout  
- Second generation of resurrection experiment  
- Nine populations across the *E. laciniata* range  
- Pre-drought plants from 2005-2008  
- Drought plants from 2014  
- 304 families planted, 94% germinated  
- Plants grown in growth chambers, a common environment  
- Trays checked daily for phenology: days to emergence, budding, first flower, first fruit, and senescence

**RESULTS**  
**Days to emergence:**  
- Drought generation plants emerged 1.8 days earlier than pre-drought plants  
- Emergence rates differed between populations (p = 0.003), but not between generations

**Days to first flower:**  
- Drought generation plants flowered one day earlier than pre-drought plants  
- Drought generation plants senesced two days before pre-drought plants, but was not statistically significant

**CONCLUSIONS:** Drought avoidance?  
- Differences between the pre- and drought lineages are consistent with a drought avoidance strategy  
- Earlier emergence and flowering would result in less exposure to drought  
- Population responses differed  
- These responses may be exacerbated as climate continues to change  
- Some populations may be less adaptable and so are more vulnerable to climate change

**RAPID ADAPTATION VS PLASTICITY:** Future directions  
- Observed changes may be the result of rapid genetic adaptation, phenotypic plasticity, or genetic diversity in the seed bank  
- A drought study is planned to determine whether observed changes are adaptive and whether observed changes are sustained

**REFERENCES:**  
- Sexton, J. et al. “Gene Flow Increases Fitness at the Warm Edge of a Species’ Range.” PNAS. 108 (28)