Laura A. Lampe // Dr. Christopher T. Ivey

**Department of Biological Sciences // California State University, Chico**

**Inquiries to llampe@mail.csuchico.edu**

**Is there differential risk of climate-induced, ecologically disruptive mismatches in plant and pollinator phenology in alpine and lowland habitats?**

**The Data**

**Collection dates** of plant and insect specimens in herbaria and entomological museums can indicate changes in phenology over decades. Comparing long-term shifts in collection dates can reveal developing mismatches.

- **Represented Range**: 
  - Northern California
  - Lowland: 0-1500m
  - Alpines: 2700-3200+ m
  - Minimum alpine elevation limits vary by latitude

- **Plant Taxa**: 
  - 154 years
  - 1302 records
  - 26 taxa of 7 genera
  - Short flowering periods
  - Consipicuous flowers
  - Abundant records

- **Pollinator Taxa**: 
  - 117 years
  - 3283 records
  - 7 genera
  - Observed or documented relationships to the plants selected for study

**Analyses: Modeling Changes in Phenology**

- **Random-intercept, mixed-effect models** explain how phenology of each taxon varies over time
- **Magnitude and direction of resulting slope values characterize trends in changing phenology**

**Field Work**

- **Plant models used to predict peak flowering dates** of selected populations of each taxon (with restrictions due to fire and COVID-19)
- **Populations were visited and open flowers quantified on given dates**
- **Pollinators were collected or photographed**

**Impacts**

Understanding how important interactions between plants and pollinators may be changing in climate-sensitive habitats such as California’s alpine may aid climate-related conservation work impacting both groups. Similar studies of such interactions would benefit from an increase in alpine collection records, which limited the scope and power of these comparisons.

**Results**

**Phenological shifts of important pollinators are different than plants in both alpine and lowland habitats.**

The magnitude and direction of differences in collection date trends (and therefore phenology) vary among individual plant-pollinator partners. Similarly, ecological implications differ in specialist and generalist relationships, as the availability of alternate partners may vary.