

RESEARCH SUMMARY

Project Title:

The effects of changes in the pattern of snowmelt on bumble bee communities in the Sierra Nevada

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Bumble bees are one of the most important groups of pollinators for both native and cultivated plants, and populations have been declining worldwide for several years, presenting a serious threat to many ecosystems. This decline is particularly troubling in alpine and arctic environments. Bumble bees are often able to survive at higher elevations and latitudes than other bee species, making them the dominant pollinators in these systems; thus, serious disruptions to bumble bee populations could be catastrophic for the entire ecosystem.

Bumble bee communities are very sensitive to the timing of snowmelt in the spring. The twenty species of bumble bees present in the Sierra Nevada emerge from hibernation at different times, and compete for preexisting nest sites. Those establishing nests early in the season have a competitive advantage over those establishing nests later. However, nesting is not possible in areas that are still covered with snow, so species that emerge late in the season are able to establish nests in meadows where snowmelt occurs later in the year. However, if snowmelt occurs earlier even in these meadows as a result of climate change, species that emerge late may be unable to find vacant nest sites, and may have difficulty competing with other species that have already established nests.

Our research will use mathematical models of bumble bee communities to examine the effects of both mild and severe climate change scenarios on bumble bee populations in the Sierra Nevada. Our preliminary models suggest that climate change will lead to bumble bee communities made up primarily of species with broad tolerances and an ability to migrate, and that populations of other species will decline. To do the appropriate conservation planning for even the most conservative estimates of climate change, we must determine which species are most vulnerable to the effects of climate change and what kinds of habitat should be preserved as corridors for northward migration. Our models are the first step in this process.