

The Role of Climate in Declines of a Once Common Pollinator and Methods and Tools for Projecting Future Change

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The acute decline of global biodiversity has become ubiquitous across ecosystems and taxa. The loss of insect pollinators is of particular concern because of the ecological and economic value these organisms provide. One species that has experienced recent declines is the western bumble bee (*Bombus occidentalis*), once common throughout western North America and is now under consideration for ESA listing by the U.S. Fish and Wildlife Service (USFWS). We used a full lifecycle framework and a Bayesian hierarchical occupancy model leveraging 14,457 surveys conducted over 23 years (1998-2020) to evaluate the effects of 17 climate related variables. We found strong support for a negative relationship between occupancy and two climate components: temperature during the warmest quarter and drought; and a predicted mean decline of 57% across the species range. In this talk we will also cover methods, tools, and best practices for developing scenarios for future projections of wildlife populations using climate and land cover change forecasts. We used the results of the contemporary trend model to project future *B. occidentalis* occupancy to the mid-century (2050-2059), including changes in climate, land cover, and overall trend momentum across three scenarios that bound the plausible range of future conditions. By the 2050's, our most optimistic scenario projects occupancy declines in almost half of ecoregions; more severe scenarios project declines in all ecoregions ranging from 51% to 97%.