

7.5 Bumble Bee Populations

Figure 7.5.1. Bumble Bee.



Bumble bees are native to California and play an important role as pollinators for both natural ecosystems as well as agricultural crops. Photo credit: Dennis F. Larsen

Bumble bees (genus *Bombus*) are major pollinators that assist in the fertilization and the production of seeds by transferring pollen between plants. They significantly contribute to the global agricultural industry and are essential to the environment (Hatfield and Jepsen, 2021). California is home to more than half of the approximately 50 bumble bee species in North America – more than any other state in the country. Two of California’s species, Franklin’s bumble bee (*B. franklini*) and Crotch’s bumble bee (*B. crotchii*), are largely endemic (Hatfield and Jepsen, 2021).

Bumble bee populations are declining worldwide (Cameron and Sadd, 2020), including at least eight species in California (Hatfield and Jepsen, 2021). While the specific causes of bumble bee declines are largely unknown, shifts in temperature and rainfall associated with climate change may be pushing bumble bees beyond their ecological limits (Kerr et al., 2015; Soroye et al., 2020). Other key stressors include pathogen infection (e.g., *Nosema bombi*, *Crithidia bombi*, and viral spillover from managed bee populations used in agriculture) (Cameron et al., 2016), insecticide exposure (Wood and Goulson, 2017; Janousek et al., 2023), and habitat loss (Williams and Osborne, 2009), which may interact, creating synergistic effects and accelerating population declines (Cameron and Sadd, 2020). Climate change may further influence bee disease transmission, parasite dynamics, and predator-prey interactions (Vercelli et al., 2021). In



the western United States, bumble bee occupancy (the likelihood that bumble bees are present in a given area) declined by 57% from 1998 to 2020, with high temperatures, followed by drought and neonicotinoid pesticide exposure identified as the strongest predictors (Janousek et al., 2023). Warmer temperatures are also driving a decline in cold-adapted species and an increase in warm-adapted species among bumble bees in North America, and these shifts have accelerated in recent years (Hemberger and Williams, 2024).

Bumble bees have both contracted their ranges in warmer regions and expanded into cooler regions, although the extent of range loss far exceeds their range expansion. A study that mapped 66 bumble bee species across North American and European sites from 1900 to 2014 found that increases in frequency and severity of hotter temperatures between 1900-1974 and 2000-2014 correlated with increased local extinction rates, reduced colonization (spread to new areas), and declines in species richness (the number of different bumble bee species present together in local regions) (Soroye et al., 2020). The effects were independent of land use and were most pronounced in warmer regions of the Northern Hemisphere. Other analyses indicate that climate change and land use can also act together to influence bumble bee occurrence, with combined pressures reducing the likelihood of bumble bees being present across the same regions in natural habitats (Newbold et al., 2025). In contrast, climate warming increased occurrence probability in human-modified habitats, which may suggest a subset of more resilient species (Newbold et al., 2025). Because these studies evaluate broad patterns across multiple species and regions, they do not provide species-specific or statewide trends for California. Continued monitoring efforts are needed to better understand California bumble bee diversity and abundance statewide and the influence of climate change (Fisher et al., 2022).



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