

## **A Brief Summary of Climate Change Impacts on Native Bees on Public Lands**

Climate change is bringing myriad changes to all life on Earth, and thus to native bee-flower interactions. As some wet areas are becoming wetter and many dry areas are becoming drier, the changes are not the same for all flowers or all bees. Some types of changes (e.g., drought) have implications for all native bee species. Other changes (e.g., absence of a particular plant species that blooms during monsoons in a region where monsoons are becoming less frequent) primarily may affect a particular, specialized bee. The list below is a sample of potential impacts of climate change, combined with management, on native bees on public lands:

- **Drought.** Prolonged or repeated droughts, or hot droughts (i.e., droughts occurring at higher temperatures than in the recent past) can reduce general plant and flower production, and thus the availability of pollen and nectar.
- **Phenology.** The timing of when a particular plant species blooms and when a particular bee species that pollinates that plant species emerges may no longer be matched.
- **Invasive species.** Increased temperature, occurrence of droughts, and fires may favor the spread of invasive species, at the expense of native plants which provide greater pollen or nectar sources, or particular flower types to which some bees are adapted.
- **Ungulates.** If livestock or wild ungulates such as deer and elk are facing reduced plant production (i.e., forage) amid drought, the ungulates may eat plant species they otherwise had not favored in the past, including plant species upon which particular bees depend. They may also consume plants with a greater intensity, given reduced production.
- **Fire.** In some regions, wildland fires are becoming more frequent and/or hotter. Also, some land managers are increasing their use of prescribed fire in order to seek better control of when fires burn (e.g., earlier in the growing season). While some plant species can rapidly return to a burned area, others, particularly particular shrub species, may be absent for extended periods of time.
- **Slow plant recovery.** Plant species that do not return after a fire because the site is now dramatically different (e.g., more exposed to the sun) may be eliminated as a pollination source for native bees for extended periods of time.

- **Permanent loss of particular plant species.** Some plant species can no longer live in a particular area due to increased temperature or other factors, and yet do not have the ability to migrate to a more favorable site (e.g., some alpine plant species have no higher, cooler habitat they can reach).

--Mary O'Brien, May 2021