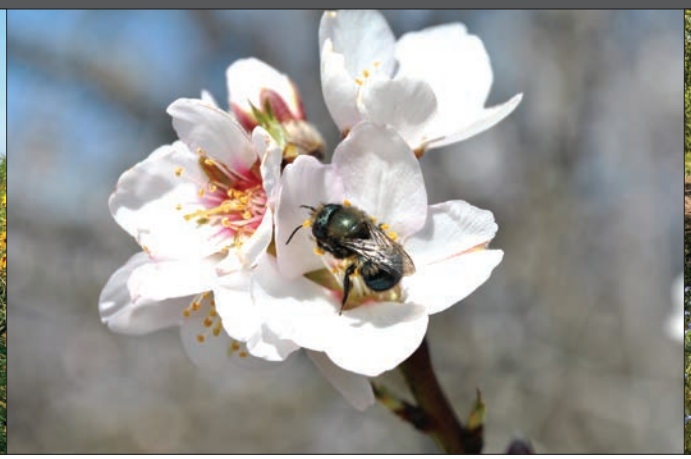
POLLINATORS AND CLIMATE CHANGE

Climate-Smart Agricultural Habitat


LEFT: Hedgerows and other linear habitat are key for increasing pollinator habitat connectivity. MIDDLE: Producers can play an important role in mitigating climate change and increasing climate resilience for pollinators. RIGHT: Practices that increase soil health, such as the use of cover crops, increase carbon sequestration while also providing resources for pollinators.

California Pollinators and Climate Change

More than 80% of all terrestrial plant species require an animal pollinator (usually an insect) to reproduce. About one-third of food production depends on pollinators, and 75% of all fruits and vegetables produce higher yields when visited by pollinators. While honey bees are very important to agriculture, native bees, butterflies, moths, flies, beetles, and wasps also contribute to pollination in many crops and are essential for pollination in natural landscapes. Some crops require pollination by native bees—for example, tomatoes require buzz pollination by bumble bees; honey bees are unable to perform this task. In other crops such as sunflowers, native bees supplement the activities of honey bees, and research has shown that fruit set is higher when native bees and honey bees are present, compared with only honey bees.

Unfortunately, native pollinators are in decline, and these declines are likely driven by pesticides (including herbicides, fungicides, and insecticides), habitat loss, disease, and climate change.

In California, climate change is expected to lead to increased temperatures and frequent heat waves. Droughts will become more frequent and last longer, and snowpack will be reduced. All of these factors may influence pollinators and the crops that rely on them. For example, changes in temperature can affect pollinator survival rates or their behaviors, including how much time they spend foraging (i.e., pollinating plants). Climate change may also influence pollinators by affecting plant communities. Changes in the abundance and diversity of flowering plants, as well as drought-related reductions in floral resources, can affect the pollinators that rely on these plants for food. Finally, climate change can interact with other stressors, such as habitat loss or pesticides, to amplify negative effects on pollinators.

You Can Help

You can take several actions to alleviate effects of climate change on pollinators. The first step is to provide habitat for pollinators. Pollinator habitat can take the form of cover crops, hedgerows, and wildflower plantings, as well as pollinator gardens near your home or other buildings. Increasing habitat availability will benefit honey bees and support a larger, more diverse pollinator community, enabling pollinators to better survive extreme weather events and potentially improving crop pollination and pest-control services.

The second step is to increase habitat connectivity. Hedgerows and other linear plantings are particularly valuable because they provide habitat corridors for pollinators. Corridors act as "roadways" for pollinators, providing safe habitat pollinators can use to move through the landscape.

The third step is to reduce pesticide use. Alone, pesticides can harm pollinators, but their use may also interact with climate change, magnifying the negative effects on pollinators. Reducing pesticide exposure will make your landscape healthier and more climate resilient for pollinators.

XERCES SOCIETY
for Invertebrate Conservation

Creating Climate-Resilient Habitat

Providing pollinators with habitat and habitat corridors protected from pesticides is key to improving climate resilience for Central Valley pollinators.

Providing pollinator habitat

- Ensure that plantings have a variety of pollinator-attractive native flowering plants, with at least three species blooming at all times during early spring through late fall. Habitat with many species of plants provides small spaces, called microhabitats, that vary in temperature and amount of cover. Microhabitats provide places for insect pollinators to take refuge during heat waves or other extreme weather events. Diverse plantings are more likely to provide resources for more pollinator species, and diverse pollinator communities are shown to improve crop pollination services.
- Use native plants, which tend to be drought tolerant and can therefore provide more reliable nectar and pollen sources throughout dry seasons. Native plants can also be more pest resistant. A list of pollinator-friendly native plants for the Central Valley is available at xerces.org.
- Include host plants for native butterflies and specialist bees, which may be more vulnerable to climate change due to their narrower food requirements.
- Include nesting resources for native bees. Having areas of bare soil will provide nest sites for ground-nesting bees, while cavity-nesting bees build nests in pithy-stemmed plants, such as *Solidago*. See Appendices E and F of Xerces' *Bee Better Certified Production Standards*, available at xerces.org, for plants commonly used by cavity-nesting bees.

Reducing pesticide risk

- Adopt integrated pest-management practices designed to prevent pest problems, reduce pesticide use, and expand implementation of nonchemical management techniques.
- Select habitat sites protected from pesticide use (e.g., where a spatial or vegetative buffer limits contamination or an area upwind of pesticide applications). If such a site does not exist, consider planting a vegetative buffer or establishing a setback where pesticides are not applied.
- Don't use pesticides inside habitat, other than targeted spot treatments for invasive weeds.
- If pesticide use cannot be avoided next to habitat, time applications to limit use when the crop or habitat are in bloom. This is especially important for insecticide applications, including the planting of treated seed. Due to their persistence and systemic nature, neonicotinoids should never be used in areas adjacent to habitat.

Creating pollinator habitat will have additional benefits. It can improve soil health, increasing water retention and reducing runoff. Healthy soils are better at sequestering carbon than poor soils. You can use a tool called COMET-Planner, created by the USDA and their partners, to estimate how different Natural Resources Conservation Service (NRCS) farming practices can affect carbon sequestration on your farm. For example, adding 0.5 acres of hedgerows leads to the sequestration of an additional 4 metric tons of carbon per year. Well-managed farms with healthy soils can be part of the solution to climate change by providing enhanced carbon-sequestration services while protecting pollinators.

Additional Resources

Bee Better Certified: https://beebettercertified.org/

California Department of Food and Agriculture, Healthy Soils Program: http://www.cdfa.ca.gov/oefi/healthysoils/

COMET-Planner: http://comet-planner-cdfahsp.com/

NRCS, vegetative buffers information: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/home/?cid=nrcs143_023568

University of California Statewide Integrated Pest Management, Precaution Pesticide Ratings: https://www2.ipm.ucanr.edu/beeprecaution/

US Fish and Wildlife Service, Partners for Fish and Wildlife Program: https://fws.gov/partners/

Xerces Society, *Bee Better Certified Production Standards*: https://beebettercertified.org/docs

Xerces Society, *Farming for Bees: Guidelines for Providing Native Bee Habitat on Farms*: https://xerces.org/publications/guidelines/farming-for-bees

Xerces Society, *Guidance to Protect Habitat from Pesticide Contamination*: https://xerces.org/publications/fact-sheets/guidance-to-protect-habitat-from-pesticide-contamination

Xerces Society, Pollinator Habitat Installation Guides: https://xerces.org/publications/higs

Xerces Society, Pollinator Resources–California: https://xerces.org/pollinator-conservation-resources/CA

Xerces Society, *Recommended Plants for Pollinators & Beneficial Insects: California Central Valley Region*: https://xerces.org/publications/plant-lists/california-central-valley-recommended-plants-seed-mixes-pollinators

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