

native ranges, and ensure honey bee hives are kept out of natural areas where they can spread diseases and compete with native species. Use a thoughtful approach when mowing roadsides, grazing rangeland, or using prescribed fire.

Become an advocate for insect conservation. People rarely protect what they do not know and appreciate. Personal outreach to others is a powerful means for increasing awareness and appreciation of insects. Join Xerces community-science programs including our bumble bee and firefly atlas programs, apply to be a Xerces Ambassador, or get your children or your school involved in X Kids.

For more information visit xerces.org.

(This list of actions is partly based on the paper by Kawahara et al. published in *Proceedings of the National Academy of Sciences* in 2021.)

Will you support our work? Make a tax-deductible donation to the Xerces Society today! To learn more, visit xerces.org/donate.



Established in 1971, the Xerces Society is an international, donor-supported nonprofit dedicated to protecting the natural world by conserving invertebrates and their habitat. The Society uses hand-on conservation, advocacy, education, and applied research to protect the life that sustains us.

The Xerces Society for Invertebrate Conservation
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WHY WE NEED INSECTS AND OTHER INVERTEBRATES

And what you can do to help

Butterflies, bees, dragonflies, beetles, spiders, mussels, and other invertebrates sustain life as we know it. Yet many are declining due to habitat loss, pesticide use, climate change, and more. There are steps we can all take to help these vital animals.

Insects pollinate most flowering plants, including many of the fruits, vegetables, nuts, and seeds that both humans and wildlife depend on. The vast majority of bats, birds, and freshwater fish eat insects. Invertebrates clean our streams and rivers, and help clear up plant, animal, and human waste. One study found that the ecosystem services provided by insects are worth more than \$80 billion a year to the U.S. economy.

If you like to eat good food, you can thank an insect, and if you like birds in your trees and fish in your streams, you should be concerned about insect declines.

Causes of Decline

We have removed, degraded, or fragmented habitat in towns, cities, and agricultural areas. Less habitat means fewer individuals and fewer species. Pesticides are widely used to grow crops, as well as in the quest for blemish-free lawns and flowers, leaving toxic residues in the remaining habitats that can profoundly impact insects.

There are additional impacts from invasive plants and animals, diseases of bees and butterflies, poor water quality and quantity that imperils aquatic invertebrates, and lights that are disruptive to nighttime insects such as fireflies and moths.

Overlay all of this with the severe weather events and shifting rainfall patterns caused by climate change and you can see that it is hard to be an invertebrate in this human-dominated world.

The Good News Is That There Is Hope

Insects are resilient, and conservation, restoration, and management of habitat have been shown to produce positive outcomes for insect populations.

Anyone can contribute at any scale. All of us can do something, wherever we live. No action is too small. Grow more flowers; get rid of insecticides; buy local, organic, sustainably grown food when

possible; lower your climate footprint by eating more vegetables and less meat; and challenge your elected officials to commit to addressing biodiversity loss and climate change. If we all work together, we can make a difference.

We Have the Solutions to This Crisis

If we hope to stem the losses of invertebrate diversity and abundance, we must take steps at all levels to protect, restore, and enhance habitat for these animals across all landscapes. Ensuring high-quality habitat means providing a diversity of native plants, and also good water quality and quantity to support aquatic invertebrates.

Convert lawns into diverse natural habitats. There are over 40 million acres of turfgrass in the U.S. If every home, school, and local park converted at least 10% of their lawn into habitat, this would provide millions of acres for insects.

Grow native plants. Native plants typically provide more benefits to native insects than non-native species. Native plants are adapted to local climates and rainfall regimes, so are often easier to maintain. Growing plants in patches of any size, even a planter, can make a difference

Restore farm landscapes. We need to move away from fencerow-to-fencerow farming and pesticide use, and toward regenerative and organic farming. Plant hedgerows, flowering strips, and other habitats, and adopt integrated pest and pollinator management.

Eliminate or reduce pesticide use. In towns and cities, we must move away from pesticide use for cosmetic purposes—we should not poison our environment for tidy parks and gardens. In all landscapes, moving to an ecologically based integrated pest management approach is vital.

Managing other threats. Turn off lights at night or ensure that they are wildlife friendly. Do not move commercial bumble bees outside of their

Our World Depends on Invertebrates

Without insects and other invertebrates, life as we know it would cease to exist. Here are a few ways they keep our planet green, clean, and abundant.

1. **Wild plants depend on them.** Bees and butterflies are some of the thousands of species that pollinate plants in prairies, forests, and hedgerows.
2. **Insects pollinate our crops.** We can thank pollinators for as much as one third of our food.

3. **Insects convert plant energy.** Grasshoppers and caterpillars are herbivores, eating plants and converting that biomass into a form that can be eaten by other wildlife.

4. **Other animals eat invertebrates.** Insects are essential food items for fish, mammals, and birds, including barn swallows, woodpeckers, and, on the cover, chickadees.

5. **Predators control pests.** Dragonflies, tiger beetles, wasps, spiders, and other invertebrate predators keep pests such as mosquitoes, aphids, and mealybugs in check.

6. **Invertebrates recycle waste.** Snails, dung beetles, millipedes, and other detritivores eat decayed matter and waste, cleaning our landscape and recycling nutrients to grow new generations of plants.

7. **They give us clean water.** Freshwater mussels filter water in lakes and rivers. Also, mayflies, caddisflies, and many other aquatic species are eaten by wildlife.

