

grazing to provide time for vegetation to recover.

Pesticides. There is a growing body of evidence showing that pesticides contaminate habitat at levels that could harm butterflies. We recommend against the use of pesticides, including insecticides, herbicides, and fungicides, whenever possible. If there is pesticide use in or around habitat, you should take steps to protect monarchs, even if the use is by neighboring landowners. Using integrated pest management methods grounded in pest prevention and focusing on strategies other than chemical control will reduce reliance on pesticides, thus helping to protect monarchs. For situations where there is a demonstrated need for a pesticide, choose targeted products with the least toxic ingredients, follow the manufacturer's directions, apply the pesticide as directly and precisely as possible, and avoid applications while monarchs are present. Also, avoid the use of systemic (e.g., neonicotinoid) and broad-spectrum (e.g., organophosphate and pyrethroid) insecticides.

Overwintering. If monarchs overwinter on or adjacent to your land in coastal California, consult with a monarch expert before cutting or trimming trees, as this may negatively affect the microclimatic conditions and wind protection on which monarchs rely.



MONARCH CONSERVATION

A Guide to Saving America's Butterfly

The monarch, the beloved butterfly that connects communities across North America, is in trouble, suffering from habitat loss and the effects of pesticide use. Changing this will require conservation action from grassroots groups, gardeners, farmers, policy-makers, and scientists.

A major factor in the monarch's decline has been the disappearance of milkweed, the essential food for its caterpillars, but the monarch also needs wildflowers for nectar, habitat safe from pesticides, and forested groves in which to overwinter.

Inside you'll find more information about what you can do to protect the monarch butterfly and its remarkable migration.

Status and Trends

Monarch populations in North America have recently declined to a fraction of their previous size. In the 1990s, up to a billion monarchs overwintered in forests in the mountains of central Mexico and more than one million in coastal tree groves in California. Today, the number of monarchs overwintering in Mexico has declined by as much as 80% and in California by over 70%. The loss of milkweed in the Midwest, due to the increased use of genetically modified herbicide-resistant crops, is an important factor in the decline of monarchs in the eastern U.S. Evidence for breeding habitat loss is less clear in the western states. The continent-wide decline in monarch numbers may be compounded by the loss of wildflowers, use of neonicotinoid insecticides, increased frequency of drought due to climate change, disease, and destruction of overwintering habitat.

Migration

Each fall, monarchs make an astonishing migration to overwintering sites. Monarchs that breed east of the Rocky Mountains undertake a 3,000-mile flight to the oyamel fir forests in central Mexico. Those west of the Rockies migrate either to these sites in Mexico or to forested groves along the California coast.



Yellow arrows show spring/summer movement, red arrows the fall migration to overwintering sites in central Mexico and along the Pacific coast. Small nonmigratory population in Florida (purple).

Xerces Society Conservation Resources

Project Milkweed provides information on which milkweed species are native and appropriate for your area, connects you with sources of native seed, and provides technical guidance on growing milkweed.

Region-specific **Monarch Nectar Plants** fact sheets list commercially available native flowers used by monarchs, including information on bloom time.

The **Pollinator Conservation Resource Center** offers guides and other resources to help you create habitat for pollinators, including monarchs.

Roadside Best Management Practices that Benefit Pollinators is a handbook to help any transportation agency enhance roadside vegetation for pollinators.

Find all Xerces resources at www.xerces.org/monarchs.

Citizen Science

There are many citizen science projects in which to get involved covering nearly all aspects of monarch biology, including phenology, parasitoids, disease, and migration.

Monarch Larva Monitoring Project collects long-term data on monarch caterpillars and milkweed habitat to better understand how and why monarch populations vary in time and space. www.mlmp.org

Project Monarch Health tracks the presence and spread of monarch parasites. www.monarchparasites.org

If you live in the West:

Western Monarch Milkweed Mapper is an interactive website where you can help answer research questions about monarchs in the western states by submitting observations of milkweeds and monarchs. www.monarchmilkweedmapper.org

Xerces' **Western Monarch Thanksgiving Count** is a long-running effort to track the number of monarchs that overwinter in coastal California. For three weeks each year, volunteers fan out along the California coast to count monarchs and report on the condition of the groves in which they shelter. Join the count at www.westernmonarchcount.org.

Check out www.xerces.org/monarchs to learn more about monarch conservation.



Established in 1971, the Xerces Society is at the forefront of invertebrate protection, harnessing the knowledge of scientists and the enthusiasm of citizens to implement conservation programs worldwide. The Society uses advocacy, education, and applied research to promote invertebrate conservation.

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The Xerces Society's work to protect monarchs has been made possible with generous support from Ceres Trust, CS Fund, Disney Conservation Fund, The Dudley Foundation, The Edward Gorey Charitable Trust, Endangered Species Chocolate, LLC, Hind Foundation, J.Crew, The New-Land Foundation, Inc., Turner Foundation, Inc., The White Pine Fund, Whole Systems Foundation, and Xerces Society members. Thank you.

Monarchs in the Landscape

The seasonal movement of monarchs connects all landscapes. These butterflies will seek out habitat along roadsides, the edges of farm fields, prairies, meadows, and even city gardens. The butterflies that leave the overwintering sites soon breed and die, with successive generations moving north until they reach southern Canada, the limit of milkweed growth. Along the way, the adults feed on nectar-rich flowers and lay eggs on milkweed.

Each butterfly passes from egg to caterpillar, feeding on milkweed (which provides it with protective chemicals) and shedding its skin four times as it grows. The caterpillar then forms a milky-green chrysalis for its transformation into an orange-and-black adult, which continues flying northward. This cycle repeats three or four times until, at summer's end, adults from the last generation reverse course and begin their journey to the protective forests of Mexico or California.

What Monarchs Need

Monarchs need four basic things:

- milkweed to feed caterpillars,
- nectar plants to fuel breeding and migration,
- forests to overwinter, and
- protection from pesticides.

Creating Monarch Habitat

As the caterpillars' host plant, milkweed is essential for monarchs, but habitat should support all stages of the butterfly's life cycle. The adults need nectar to fuel them during spring migration and breeding, and to build up stores of fat which sustain them during the fall migration and winter. Monarch habitat should include native flowers that bloom when monarchs are in your area, typically spring through fall.

When planting milkweed, always select species that are native to your region. We do not recommend planting the nonnative tropical milkweed because it can interrupt monarchs' natural cycle and spread disease. Milkweed does not naturally occur in all areas of the U.S., including coastal regions of northern California and the Pacific Northwest. In such regions, instead of milkweed, we recommend planting native wildflower species to provide nectar for monarchs. We also recommend that special care be taken in natural areas to ensure that milkweed is only planted where it historically occurred.

Ensure that any habitat you create is safe from pesticides. Even pesticide applications on adjacent land can contaminate habitat.

Managing Monarch Habitat

Careful management that protects existing habitat is as important as creating new habitat. You can even adopt some of these practices in your own backyard.

Mowing and Fire. These are widely used and valuable management tools for maintaining wildflower- and milkweed-rich landscapes. To avoid harming eggs and caterpillars, burn and mow sites which contain milkweed early in the season before monarchs arrive or in the fall, after monarchs have departed. Leave at least 1/3 of a site unburned or unmown, if possible, to avoid removing all plant resources in a single year.

Grazing. Some milkweed species can be toxic to livestock, but are typically avoided if sufficient forage is available. Avoid planting or encouraging milkweed in pastures that will be harvested for hay; dried milkweed is harder for livestock to distinguish than fresh milkweed. Over-grazing can lead to the trampling or destruction of habitat. Consider early- or late-season

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