U.S. FISH & WILDLIFE SERVICE

February 10, 2023

Western Monarch Butterfly Conservation Recommendations:

Purpose: Section 7(a)(1) of the Endangered Species Act of 1973 (ESA), directs federal agencies to use their authorities to further the purpose of the ESA, by conducting conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary activities that an action agency may undertake to avoid and minimize the adverse effects of a proposed action, implement recovery plans, or to develop information that is useful for the conservation of listed species. The purpose of the following conservation recommendations is to encourage federal agencies to incorporate monarch butterflies into their Environmental Assessments and Biological Assessments associated with Section 7 Biological Opinions, when in consultation with the U.S. Fish & Wildlife Service. These recommendations are organized by habitat zone, so that they may be cut/paste, as applicable and contingent upon project location. There is potential utility for these recommendations beyond Section 7, and they are intended to promote benefits for other pollinators as well.

Background: The western migratory monarch butterfly population has declined by more than 90 percent since the 1980s. An estimated 4.5 million monarchs overwintered on the California coast in the 1980s, whereas in 2022, the population estimate for overwintering monarchs was 335,000 butterflies. The population decline is likely due to multiple stressors across the monarch's range, including the loss and degradation of overwintering habitat; pesticide use, particularly insecticides; loss of breeding and migratory habitat; climate change; parasites and disease. Historically, the majority of western monarchs spent the winter in forested groves near the coast from Mendocino County, California, south into northern Baja California, Mexico. In recent years, monarchs have not clustered in the southern-most or northern-most parts of their overwintering range, and there are year-round residents in some areas of the coast. This resident phenomenon is likely due to a combination of climate change and an abundance of residential-planted non-native, tropical milkweed that is available for monarchs year-round. Migratory western monarchs depart the overwintering sites in mid-winter to early-spring. Throughout the spring and summer, monarchs breed, lay their eggs on milkweed, and migrate across multiple generations within California and other states west of the Rocky Mountains. In an attempt to reverse the severe population decline of western monarch butterflies, and to protect other pollinators as well, we encourage implementation of the conservation recommendations listed below. Please see Figure 1 for suggested areas to focus voluntary conservation actions in California. Western monarch conservation actions outside of California are also important, especially for the larger pollinator community. Recommendations for other western states are addressed in the "All Breeding and Migratory Zones" section of this document.

Please contact Samantha Marcum (samantha_marcum@fws.gov) or Cat Darst (cat_darst@fws.gov) with questions or suggestions on these recommendations.

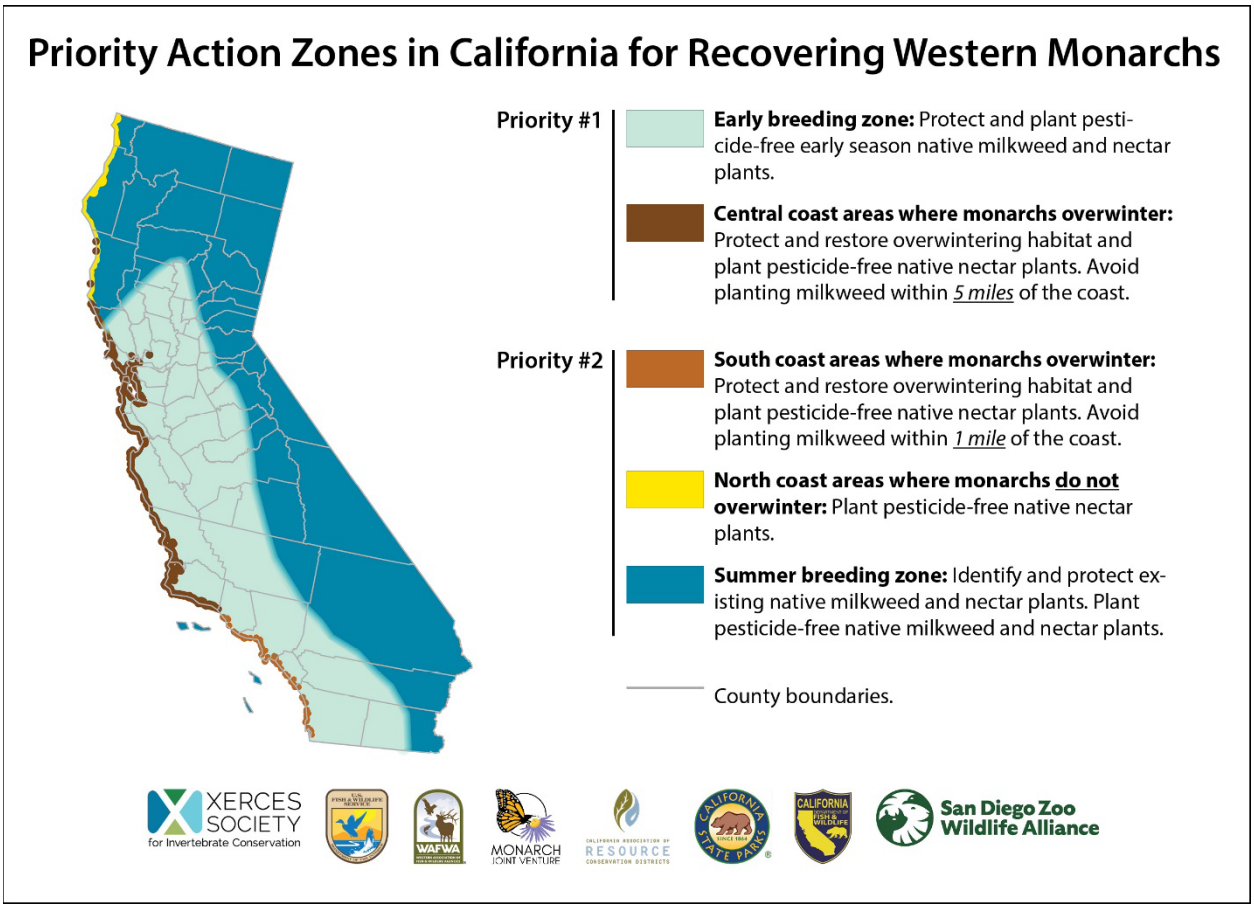

Figure 1. Priority Monarch Habitat Restoration Areas in California.

Coastal California Overwintering Habitat: Western monarchs migrate to the California coast, and cluster in a specific set of forested tree groves during the fall and winter each year. Overwintering sites provide protection from inclement weather and possess suitable vegetation and microclimate conditions for monarchs (e.g., roosting/clustering trees, wind protection, dappled sunlight, nectar sources, water and/or dew for hydration, high humidity, and an absence of freezing temperatures). Overwintering sites consist of a core zone (cluster area), shelter zone (wind protection and outer site boundaries surrounding core zone) and support zone (area within 500 feet of an overwintering site that provides nectar, hydration, and microclimate protection). In the overwintering zone of the coast (i.e., within five miles of the coast from Mendocino County south through Santa Barbara County, and within one mile of the coast from Ventura County south through San Diego County), we recommend the following:

1. Protect, manage, enhance and restore monarch butterfly overwintering sites (Find an Overwintering Site) and surrounding habitat.
2. Use only native, insecticide-free plants for habitat restoration and enhancement actions. If plants are grown via contract, use grow specifications that limit pesticide residues.

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3. Conduct overwintering site habitat assessments and develop and implement long-term management plans. Management plan actions may include, but are not limited to:

    a. Enhance habitat within overwintering sites and within 500 feet (support zone) of sites by planting tree species where monarchs are known to cluster (e.g., Monterey pine *(Pinus radiata)*, Monterey cypress *(Cupressus macrocarpa)*, Coast redwood *(Sequoia sempervirens)*, coast live oak *(Quercus agrifolia),* Douglas fir *(Pseudotsuga menzesii),* Torrey pine (*Pinus torreyana*), western sycamore *(Platanus racemosa),* bishop pine *(Pinus muricata)*, as appropriate for location.

    b. Avoid the removal of living trees or shrubs within 500 feet of overwintering sites, except for specific grove enhancement purposes (e.g., if select thinning is recommended to benefit monarchs), and/or for human safety concerns substantiated by a hazard tree assessment. Dead or fallen trees may be removed, chipped, or pile burned within the overwintering site outside of the overwintering season in order to reduce disease and fuels buildup.

    c. Reduce fuel loads and minimize the risk of catastrophic wildfire within overwintering habitat through selective thinning of small diameter (8" or less) trees in the support zone and, in some instances, the shelter zone of overwintering sites. The risks and benefits of fuels management should be assessed on a case-by-case basis for each site.

    d. Conduct management activities (e.g., tree trimming, mowing, burning and grazing) in monarch overwintering sites from March 1-September 30 (outside of estimated timeframe when monarchs are likely present), in coordination with a monarch biologist. Planting trees, shrubs, and forbs (without use of heavy machinery) for restoration is acceptable during the overwintering season.

    e. Enhance nectar sources by planting fall/winter/early spring blooming native forbs, shrubs, or trees within overwintering sites and within five miles of the coast (Nectar Planting Lists).

4. Protect monarchs, other pollinators, and their habitats from pesticides, including insecticides, fungicides and herbicides. Specific recommendations may vary by site.

    a. Avoid the use pesticides within 500 feet of overwintering sites, particularly when monarchs may be present.

    b. Use non-chemical weed and pest prevention and management methods, and monitor pest pressure to minimize reliance on pesticides for managing insects, mites, weeds, and diseases (Cal-IPC Non-chemical BMPs).

    c. If pesticides are used in or adjacent to overwintering habitat, then conduct applications from March 1-September 30, when possible, and adhere to the following guidance to lessen potentially harmful effects:

i. Avoid the use of neonicotinoids or other systemic insecticides, including coated seeds, any time of the year in monarch habitat due to their ecosystem persistence, systemic nature, and toxicity (Xerces Systemic Insecticides List).

ii. Avoid insecticides that target lepidopterans, including biological pesticides (IRAC Lepidoptera Insecticide Mode of Action Classification).

iii. If herbicides are used, apply when plants are more responsive to treatment and when monarchs and other pollinators are less likely to be nectaring on the plants.

iv. Avoid pesticide application to blooming plants when monarchs may be present.

v. Use targeted application methods, avoid large-scale broadcast applications and take precautions to limit off-site movement of pesticides (e.g., drift from wind and discharge from surface water flows).

vi. Protect habitat areas from pesticide drift with a pesticide-free spatial buffer and/or evergreen vegetative buffer of trees with flowers that are not attractive to pollinators. The appropriate width of monarch and pollinator habitat spatial buffers depends on several factors, including weather and wind conditions, but at a minimum, the habitat should be at least 40 feet from ground-based pesticide applications, 60 feet from air-blast sprayers, and 200 feet from aerial applications or any systemic insecticide applications or plants grown from treated seeds.

vii. If pesticides are used for vector control treatments (e.g., mosquitoes), avoid treatment unless monitoring indicates that the species and numbers exceed a public health threshold. For any mosquito treatments, first employ prevention steps such as reducing standing water. Where possible, draw mosquitoes away from sensitive sites (e.g., using dry ice traps) to limit treatment effects in sensitive habitat areas.

5. To assist in maintaining normal migration behavior, do not plant any type of milkweed at or adjacent to overwintering sites.

   a. To minimize the spread of the pathogen *Ophryocystis elektroscirrha* (OE), and to encourage natural monarch migration, do not plant non-native tropical milkweed (*Asclepias curassavica*) anywhere. OE is able to build up on tropical milkweed, because these plants are evergreen, and they do not die back in the winter. OE can be lethal to monarchs.

   b. Remove tropical milkweed and replace with native nectar plants (Nectar Planting Lists).

6. To contribute to regional and population-level assessments, monitor monarchs and assess conditions of overwintering sites during Thanksgiving and New Year's counts. When possible, report when monarchs arrive and depart the overwintering sites each year (Western Monarch Count).

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7. To provide benefits for monarchs and other pollinators anywhere along the coast, install a mosaic of native nectar plants that bloom throughout the year (Nectar Planting Lists).

Breeding and Migratory Habitat: Monarch butterflies breed and migrate across multiple generations each year throughout the western U.S. The early breeding zone (i.e., Priority 1 in Figure 1) is an area in California where monarchs likely breed and/or lay their eggs on milkweed after departing the overwintering sites in mid-winter to early spring each year. Early-emerging milkweed species are an important resource for monarchs in the early breeding zone and may be associated with the population trends of western monarchs: these plants are essential to create the next generation of migratory butterflies. For monarch breeding and migratory habitat, we recommend the following:

Priority 1 Zone:

1. Enhance and maintain habitat in the early breeding zone of California, by identifying and protecting existing habitat, planting native, insecticide-free milkweed, including early-emerging species (e.g., *Asclepias vestita, A. californica, A. cordifolia, A. erosa*), and planting native nectar plants that are available to monarchs in late winter, spring and fall (January-April, August-October) (Nectar Planting Lists; Milkweed Seed Finder).

For All Breeding and Migratory Zones:

2. Use only native, insecticide-free plants for habitat restoration and enhancement actions. If plants are grown via contract, use grow specifications that limit harmful pesticide residues.

3. Enhance and maintain habitat in the Priority 2 zone of California (Figure 1, above) and in other western States, by identifying and protecting existing habitat, and planting milkweed species and flowering plants that are appropriate for the location (Nectar Planting Lists; Milkweed Seed Finder).

4. Conduct management activities such as mowing, burning and grazing in monarch breeding and migratory habitat outside of the estimated timeframe when monarchs are likely present, as is feasible (Figure 2, Recommended Management Timing Map, below).

5. Protect monarchs, other pollinators, and their habitats from pesticides, including insecticides, fungicides and herbicides.

    a. Use non-chemical pest prevention and management methods and monitor pest pressure to minimize reliance on pesticides for managing insects, mites, weeds, and diseases. For example, employ non-chemical weed control techniques, when feasible (Cal-IPC Non-chemical BMPs).

    b. If pesticides are used in monarch habitat, lessen their potential for harm by adhering to the following guidance:

i. Avoid the use of neonicotinoids or other systemic insecticides, including coated seeds, any time of the year in monarch habitat due to their ecosystem persistence, systemic nature, and toxicity (Xerces Systemic Insecticides List).

ii. Avoid the application of pesticides on milkweed plants and define buffer zones to protect habitat from nearby areas where pesticides are applied (See ix, below).

iii. Avoid the application of pesticides on blooming plants when adult monarchs may be present, when feasible (Figure 2, Recommended Management Timing Map, below).

iv. Conduct applications outside of the time period when monarchs are expected to be present (Figure 2, Recommended Management Timing Map, below).

v. Avoid insecticides that target lepidopterans, including biological pesticides (IRAC Lepidoptera Insecticide Mode of Action Classification).

vi. Avoid the use of strobilurin fungicides on milkweeds.

vii. If herbicides are used, apply when plants are more responsive to treatment, and when monarchs and other pollinators are less likely to be nectaring on the plants.

viii. Use targeted application methods, avoid large-scale broadcast applications, and take precautions to limit off-site movement (e.g., wind drift, discharge from surface water flows).

ix. Protect habitat areas from pesticide drift with a pesticide-free spatial buffer and/or evergreen vegetative buffer of trees with flowers that are not attractive to pollinators. The appropriate width of monarch and pollinator habitat spatial buffers depends on several factors, including weather and wind conditions, but at a minimum, the habitat should be at least 40 feet from ground-based pesticide applications, 60 feet from air-blast sprayers, and 200 feet from aerial applications or any systemic insecticide applications or plants grown from treated seeds.

x. If pesticides are used for vector control treatments (e.g., mosquitoes), avoid treatment unless monitoring indicates that the species and numbers exceed a public health threshold. For any mosquito treatments, first employ prevention steps such as reducing standing water. Where possible, draw mosquitoes away from sensitive sites (e.g., using dry ice traps) to limit treatment effects in sensitive habitat areas.

6. To minimize the spread of the pathogen *Ophryocystis elektroscirrha* (OE), do not plant non-native tropical milkweed (*Asclepias curassavica*) anywhere. OE can build up on tropical milkweed and infect monarchs, because these plants are evergreen and do not die back in the winter. OE can be lethal to monarchs.

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7. Remove tropical milkweed and replace with native milkweed and nectar plants appropriate for the location (Nectar Planting Lists; Milkweed Seed Finder).

8. Report milkweed and monarch observations from all life stages, including breeding butterflies, to the Western Monarch Milkweed Mapper or via the project portal in the iNaturalist smartphone app.

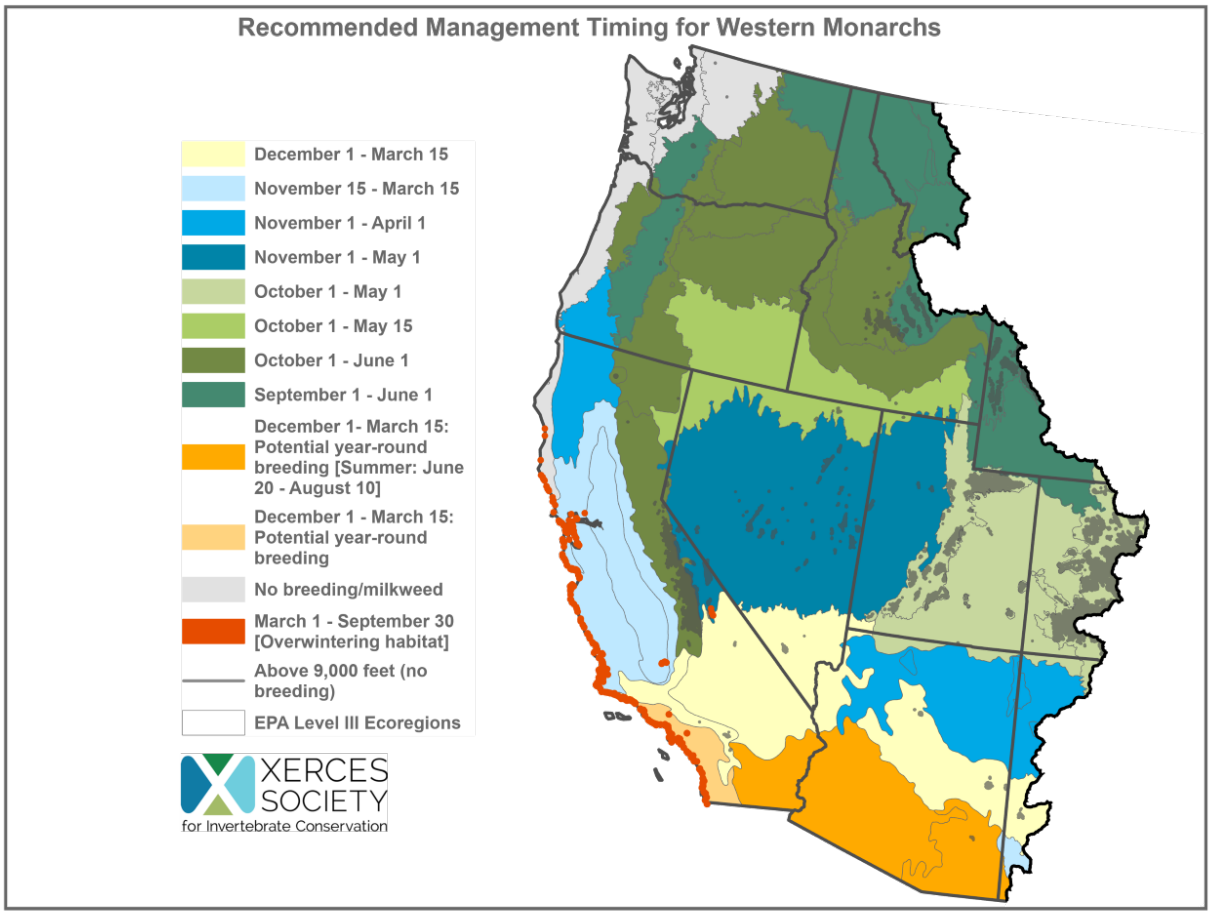

Figure 2. Recommended management windows in the western U.S. by zone.

Notes: The management timing windows illustrated in Figure 2 represent approximate recommendations of timeframes to conduct management actions. These timeframes are based upon the best available current information and may be updated in the future. Each year and site is different, so when possible, please consider surveying milkweed plants for the early life stages of monarchs prior to burning, mowing, grazing or applying pesticides.

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