GUIDELINES FOR THE PROTECTION OF
MONARCH BUTTERFLY OVERWINTERING SITES
IN CALIFORNIA

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Introduction

The Monarch (Danaus plexippus) is among the best known insects because of its large size, vibrant beauty and migratory habits. Its regular yearly migrations are legendary. Since they are unable to survive freezing weather the animals journey each fall to a limited number of sites possessing optimal environmental conditions on the coastline of California in the United States or in the high mountains of central Mexico. The migratory Monarchs cluster by the thousands or even millions at their overwintering sites and represent one of the greatest natural phenomena on Earth. This spectacle has been occurring for thousands of years; yet because of human interference, it may disappear in the near future unless dramatic and immediate actions are taken.

The Monarch is a member of a largely tropical group known as the Milkweed butterflies, whose scientific name is the Danainae. The caterpillars rely on milkweeds as their sole food source. The plants are crucial to their survival, not only for the nourishment they provide, but also for the chemicals they furnish which render the butterflies poisonous to many birds, one of their major predators. The Monarch's elaborate bird-like migratory behavior enables it to take advantage of this food supply in wide areas of North America.

There are two populations of this butterfly in North America with distinct migration routes and overwintering areas. The first uses a path east of the Rocky Mountains to reach their roosting sites high in the mountains of central Mexico. The second moves south through the Pacific states (e.g. the Great Basin, the Pacific Northwest, the Southwest, and portions of western Canada) to a limited number of sites located primarily along the coast of California.
The range of the roosting sites in western North America extends from northern Mendocino County in California southward as far as the Ensenada region of Baja California, Mexico. The total number of Monarchs overwintering in this area is unknown, but probably numbers around ten million. Each roost varies in size, but the largest documented site contained 171,000 Monarchs. Prior to 1977, it was believed that all roosts were located near the sea coast. Unexpectedly, some very small overwintering sites have recently been found in Bakersfield in the arid southern San Joaquin Valley and in the high desert near Death Valley.

The Monarch has a near worldwide distribution and is in no danger of extinction as a species. However, both the eastern and western populations are extremely vulnerable because of their overwintering strategy. Because the phenomenon of the North American migration could be lost in the near future, the conservation of the Monarch butterfly overwintering sites has been designated a top priority of the IUCN. The IUCN formed in 1948, is a worldwide network of governments, private organizations, scientists and other conservation experts which promotes scientifically based action for the protection of wild living resources. The Monarch is also listed on the international treaty known as the Convention on the Conservation of Migratory Species of Wild Animals (the "Bonn Convention").

Temporary Bivouacs and Permanent Roosts

The annual fall migration protects the Monarchs from frigid northern winters. Freezing weather is fatal to all stages of the butterfly. Clustering behavior commences as the Monarchs are migrating towards their overwintering sites. In the fall (September or October), small numbers of Monarchs begin to cluster at Temporary Bivouacs near the coast. These short term sites are probably the result of locally abundant nectar resources which the butterflies use to build up their internal fat reserves. Many of these colonies disappear in a few weeks, and the larger roosts continue to gain numbers of butterflies during this time. Presumably, with decreasing air temperatures, declining amounts of nectar and shortening day length, the small temporary sites break up and their individuals fly on to join with other butterflies in the larger Permanent Roosts which persist through the winter. Permanent Roosts are defined as those cluster sites which persist past the Winter Solstice and possess environmental conditions which allow the Monarchs to mate prior to their dispersal inland in February or March.
Permanent Roosts are typically located close to the coast usually within 1.5 kilometers of the shoreline. The sites are wooded, generally with tall and short trees as well as an understory of brush. Sometimes a clearing within a larger stand of trees is favored. The localities are well protected from winds by a combination of tree cover and topography. Gullies, canyons and lee sides of hills with good tree cover are likely areas. Clusters form from about three meters from the ground to twenty-five meters or more. There is often a stream or pond which supplies drinking water for the Monarchs, although the butterflies may also utilize morning dew. Frequently, flowering plants are found in or near the roost site and serve as a source of nectar. Adults flying on sunny days in midwinter are a sign that a colony is near by. In good weather, individuals may be seen flying short distances (up to 1 kilometer) for water or nectar, or they may simply rest on trees and shrubs in the sun, warming up to fly.

Destruction of the overwintering sites

The mild environmental conditions at the Permanent Roosts provide temperatures cool enough to keep the butterflies from using up internal fat reserves needed for the spring remigration, yet warm enough to keep them from freezing. Relatively few localities in coastal California possess these requirements. Unfortunately, a number of these sites have been eliminated and others are threatened with destruction due to both intentional and unintentional human actions.

A variety of events, primarily real estate and agricultural development, have destroyed overwintering sites in California. As houses, apartments and other structures have been built in a number of roost areas, they have forced the Monarchs to abandon the localities. Other roosts have been eliminated when the cluster trees were cleared and thinned for aesthetic reasons. The disappearance in both cases is due to alteration in the precise climatic conditions required by the overwintering Monarchs. Even though some sites are located on public land, such as military bases, nature reserves and federal, state and local parks, responsible officials are often unaware of the overwintering populations. This is because the roosts are occupied only in the fall, winter and early spring, and even if they are present, the clustered butterflies may easily be overlooked.

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Important considerations in protecting and managing
Temporary Bivouacs and Permanent Roosts

1. Land use planners should exercise caution from February to September in processing development plans which would affect sites possessing the characteristics of overwintering habitats, as little evidence of the Monarchs may remain during this time.

2. Development in or near roost sites must be carefully designed so it does not adversely affect the Monarchs. The butterflies are extraordinarily sensitive to changes in microclimate and other environmental factors.

3. Construction in the vicinity of a Monarch roost should be planned so that it occurs only during the months in which the butterflies are not in residence. Roost sites that are developed should be carefully monitored to assess the effect on the Monarchs.

4. Clearing, thinning and pruning of all vegetation should be avoided or carefully managed in and around roost sites. The trees and underbrush provide a "thermal blanket" which protects the butterflies from high wind, freezing, storms and high temperatures.

The thinning of the vegetation cover or alteration of the topographic characteristics should not be undertaken, even at a distance from the site if it will alter the environmental conditions at the roost.

5. The source of drinking water used by the Monarchs should be protected. The water, preferably with seeps, sand bars or substrates which allow the Monarchs to alight and drink in full sunlight, may be supplied by a natural stream or lake or it may come from human sources, such as grass lawns in urban areas. The butterflies are also able to utilize morning dew formed on grass or other vegetation.

6. The nectar plants used by the Monarchs should be protected. Flowers provide a food source which supplements the internal fat reserves of the butterflies during the winter months. Nectaring plants commonly used by the Monarch include gum trees (Eucalyptus), Coyote bush (Baccharis), Wild Mustard (Brassica), Bottlebrush (Callistemon) and a number of other native and introduced flowering species.
7. Application of insecticides, herbicides or other toxic chemicals should be prohibited in and around roost sites.

8. Smoke from fireplace chimneys and campfires should be prohibited in and around roost sites. This pollution source adversely effects Monarchs. Smoke from wood fires causes the butterflies to drop "en masse" to the ground where they may freeze to death, get stepped on by people or be eaten by predators.

The presence of overwintering Monarchs should be considered prior to the issuance of any controlled burning permits during the months when the butterflies are in residence.

9. Public access to the Monarch overwintering sites is desirable; however, great care must be exercised to avoid disturbance of the trees and vegetational understory. Visitors must be informed of the uniqueness and fragility of the Monarchs in order to discourage thoughtless harrassment.

The theme "take nothing but pictures, leave nothing but footprints" should prevail within the roost sites. Specifically there should be no collecting of any flowers, plants or animals, no hunting or littering within this area. Taking of souvenir Monarchs should be expressly prohibited. Visitors, when inside the roost should be required to stay on predesignated and maintained trails. Tourism, camping, picnicking and parking should be carefully designed and controlled.

Serious efforts should be made to provide docent/naturalist tours and interpretive signs.

10. It is important to note that although a number of locations may appear to possess optimal conditions for overwintering Monarchs, apparently similar sites are not necessarily equivalent. This may be due to natural environmental conditions, disturbances caused by humans, or for reasons not fully understood at this time.

Some Permanent Roosts may not have all the "requirements" which characterize an optimal site; but may nevertheless be used regularly by the Monarchs.

The population size at one site may vary considerably from year to year. For example, a Permanent Roost may have ten thousand Monarchs one winter, none the next, and several hundred in the third season.
Additionally, whether a site has a Temporary Bivouac or a Permanent Roost may vary from year to year, depending on environmental, ecological and other conditions.

Blue Gum (*Eucalyptus globulus*), River Gum (*Eucalyptus camaldulensis*), Monterey Pine (*Pinus radiata*), and Monterey Cypress (*Cupressus macrocarpa*) are commonly used for clustering by the Monarchs, although a large variety of native and introduced trees are used.

**Conclusion**

The conservation and management of the western North American overwintering roosts of the Monarch butterfly involves the protection of a migration system which stretches thousands of miles from dry inland deserts and high mountains to the fog shrouded coastline of California. This massive annual movement of Monarchs is an event comparable to the immense mammal migration of the Serengeti Plains. The migration of this butterfly is vulnerable because the overwintering roosts are often located on sites coveted for other human uses. Even slight alterations in the precise climatic requirements of the Monarchs may render the roost unsuitable for these animals. The task of saving this phenomenon involves areas of the world undergoing rapid environmental change due to a growing human population. It involves habitat preservation where real estate values are skyrocketing. These challenges make it clear the overwintering roosts of the Monarch will be saved only through increased knowledge of the ecology and migratory behavior of the butterfly and especially through greater awareness of the need for protection by government officials and the public.

Land use planners, government officials and developers are cautioned that the Monarch butterfly is a dynamic organism. An expert should be consulted before any action is taken which may affect a site this animal is suspected to use. For more information contact: The Monarch Project, 10 Southwest Ash Street, Portland, Oregon 97204.
SUMMER RANGE AND OVERWINTERING ROOST SITES OF THE MONARCH BUTTERFLY IN NORTH AMERICA