Danaus plexippus (Monarch Butterfly)

Steve Cary,

Taxonomy

- **Class**: Insecta
- **Order**: Lepidoptera
- **Family**: Nymphalidae
- **Genus**: Danaus
- **Scientific Name**: Danaus plexippus (Linnaeus, 1758)
- **Common Name**: Monarch Butterfly
- **Synonyms**:
- **Taxonomic Name Source**:Pelham, J.P. 2023. A catalogue of the butterflies of the United States and Canada. Revised 15 February 2023. http://butterfliesofamerica.com/US-Can-Cat.htm

Agency Status

- **NMDGF**:
- **Federal Status**:
- **BLM Sensitive**:
- **USFS**:
- **IUCN Red List**: Least Concern
- **Nature Serve Global**: G4
- **NHNM State**: S3
- **NM Endemic**:NO

Description

The Monarch is likely the most widely recognized butterfly in North America, owing to its large size, bright colors, and phenomenal migratory behavior. Above, it is bright orange with black veins. The margins of the wings are black and the apical regions are decorated with a double row of small white spots. Below the colors are similar as above, though they are paler. Males have a black scent pad near the hindwing anal angle (Cary and Toliver 2024).

Habitat and Ecology

Monarchs in the eastern migratory population overwinter in large colonies within Oyamel Fir (*Abies religiosa*) forests of central Mexico (Brower *et al.* 2004, Vidal and Rendón-Salinas 2014), while western monarchs overwinter in forested groves along the coast of California. In both cases, butterflies come out of reproductive diapause in the early spring. Mating then takes place before monarchs begin dispersing to their summer breeding areas (Jepsen *et al.* 2015). From Mexico, butterflies head north, looking for tender milkweed plants to lay their eggs on. After several generations, they

eventually reach southern Canada and the northeastern United States by midsummer (Malcom *et al.* 1993). From coastal California, summer breeding areas are as far flung as the interior parts of the West including Nevada, Idaho, Oregon, Washington, Utah, Arizona, and even British Columbia (Dingle *et al.* 2005, Jepsen *et al.* 2015, Pyle 2015).

Monarchs prefer open habitats including native prairies, weedy fields, meadows, marshes and roadsides (Opler and Wright 1999). Adults feed on the flowers of their larval host plant, milkweed (Asclepias spp.), as well as many other types of flowers, especially composites, plants in the family Asteraceae (Opler and Wright 1999, Brock 2008). Males are often seen patrolling open areas to search for females during the breeding season (Opler and Wright 1999). Monarch larvae feed on milkweeds (*Asclepias* spp.) and other plants in the Apocynaceae family (Opler and Wright 1999, Brock 2008), sequestering cardenolide secondary compounds from the milkweed sap. This makes them distasteful to predators as larvae and adults (Jones and Agrawal 2016).

Geographic Range:

The Monarch Butterfly is primarily distributed throughout the Americas, from southern Canada, through the United States, Mexico, the Caribbean, and Central America, to South America, north of the Amazon Basin (Opler and Wright 1999). In North America, this species undergoes an iconic annual migration: every year, millions of Monarchs travel from overwintering sites in Central Mexico and coastal California, to summer breeding grounds throughout the United States and Canada (Urquhart and Urquhart 1978). By the late summer and fall, after several generations, individuals embark on the return journey, travelling distances up to 4,000 km (Brower 1996). However, in much of its neotropical range within the Americas and elsewhere, this species does not participate in continental scale migrations and can be found year-round as a resident (Opler and Wright 1999). Monarchs are also found in many other parts of the world, including Europe (mostly southern Spain, Portugal, the Azores and the Canary Islands), Australia, New Zealand, many Pacific Islands, including Hawai'i, Taiwan and the Philippines (Opler and Wright 1999, Neves *et al.* 2001, Smith *et al.* 2005). In most cases, it is hypothesized that occasional vagrants, often blown in by big weather events, eventually became established (Clarke and Zalucki 2004).

There are at least two subspecies of *Danaus plexippus* currently recognized: *D. p. plexippus* is the migratory subspecies found in the United States, Canada, Mexico, the Canary Islands, Madeira, the Azores, Bermuda and numerous Pacific islands including Hawai'i, Australia and New Zealand; *D. p. megalippe* is the non-migratory subspecies found in southern Florida and throughout the Caribbean, Central America, and South America north of the Amazon Drainage (Smith *et al.* 2005).

Conservation Considerations:

This iconic butterfly receives a remarkable amount of conservation attention. For example, over 85 federal and state agencies, non-governmental organizations, businesses and academic programs collaborate on monarch conservation projects, such as habitat restoration, milkweed planting, and community science data collection (Monarch Joint Venture 2024). In Mexico, the primary overwintering sites have been protected since 1975 (Center for Biological Diversity *et al.* 2014). Most recently, the Mexican government set aside 56,259 hectares of forest, running in a belt along the border of Michoacán and Estado Mexico, to form the Monarch Butterfly Biosphere Reserve (MBBR), which remains in place today (Vidal and Rendón-Salinas 2014). In 2008, the MBBR became a UNESCO World Heritage Site. Canada has also taken steps to protect Monarchs, including listing it as a species of special concern under the Species at Risk Act in 2003 (Shahani *et al.* 2015). In the United States, the species has been petitioned for protections under the Endangered Species Act (The Center for Biological Diversity *et al.* 2014). In 2021, the US Fish and Wildlife Service (USFWS) announced that listing the monarch was "warranted but precluded by higher priority actions". As of December of 2024, the USFWS proposed to list the species as threatened. A final ruling will be issues in March of 2025, after a public

comment period has been carried out.

While the IUCN Red List status is Least Concern at the species level, this listing takes into consideration both subspecies, *Danaus plexippus plexippus* and *D. p. megalipe* (Walker *et al.* 2022). The migratory subspecies, *Danaus plexippus plexippus* is listed as Vulnerable on the IUCN Red List of Threatened Species (IUCN Standards and Petitions Committee 2023). This is the only subspecies found in the U.S. and Canada, so while the species as a whole may not be at high risk of extinction currently, the migration and the therefore the occurrence of Monarchs across North America, is vulnerable to extinction.

Threats:

The main threats to the Monarch are degradation of breeding habitat, loss of overwintering habitat, and climate change associated increases in severe weather events (The Center for Biological Diversity *et al.* 2014, Shahani *et al.* 2015, Crone *et al.* 2019).

In summer breeding areas, increased agricultural intensification and associated declines in milkweed host plants and nectar sources is considered the primary driver of past declines (Pleasants and Oberhauser 2013, Flockhart *et al.* 2015). Milkweed losses have been driven by an increased use of glyphosate herbicides within croplands, resulting from expanded use of herbicide resistant genetically modified (GM) corn and soybean crops (Pleasants and Oberhauser 2013, Flockhart *et al.* 2015). Other threats to milkweed include loss of croplands, mowing and herbicide spraying in rights of way, and urban development (Borders and Lee-Mader 2014).

At overwintering sites in Mexico and California, habitat loss and forest fragmentation are problematic (Brower *et al.* 2002). In Mexico, suitable overwintering habitat is often degraded as a result of commercial logging (legal and illegal), conversion for agriculture and pastures, charcoal production, and controlled burns (Brower *et al.* 2002). In California, the main driver of habitat loss is urban development and a lack of proactive management (Jepsen and Black 2015). Since 1985, at least 76 overwintering sites have been lost and many additional sites have been degraded due to wildfire, minor tree trimming or removal, drought, tree pests, and mismanagement (Sakai and Calvert 1991, Pelton *et al.* 2016, Pelton 2020).

Severe weather and climate change have also been suggested as threats for the Monarch. Severe weather events, which are increasing in frequency, have been known to create massive fluctuations in the numbers of overwintering Monarchs. For example, a particularly cold, wet storm in 2002 killed as many as 500 million butterflies (Brower *et al.* 2007). Warmer fall and winter temperatures are also problematic, as they may deplete lipid reserves and expedite reproductive development, leading to early departures from overwintering areas (Oberhauser and Petersen 2003). Habitat suitability models predict overwintering sites in Mexico and California will become less suitable in the coming years (Fisher *et al.* 2018, Oberhauser and Petersen 2003). Lastly, increased incidence of drought is also likely to adversely impact monarchs. Availability of floral resources along autumn migration routes is critical to fall migration success and is positively correlated with abundance at over wintering sites in both Mexico and California (Stevens and Frey 2010, Saunders *et al.* 2019).

Other noted threats include parasites and pathogens and increased insecticide use. The native protozoan parasite *Ophryocistis elektroscirrha* (OE) has increased in incidence since the 1990s. Infected individuals are known to have lower fecundity (Altizer 2001, Thogmartin *et al.* 2017). Increased insecticide use has been implicated in declines of butterfly populations (Gilburn *et al.* 2015, Forister *et al.* 2016). In exposure trials conducted on Monarch larvae in the

field, neonicotinoid (clothianidin) exposure caused sublethal and lethal effects, such as slower development, lower body mass, and caused higher mortality rates (Pecenka and Lundgren 2015).

Population:

Annual monitoring takes place for the eastern and western migratory populations at over wintering sites in California and Mexico. Long term declines for both populations have been reported (Brower *et al.* 2011, Semmens *et al.* 2016, Schultz *et al.* 2017). The most drastic declines for the eastern migratory population were seen from 1996 to 2014, when the population declined by 84% (Semmens *et al.* 2016). In the last 10 years, declines have slowed, and the population has more or less stabilized. However, the population remains much lower than historic levels and is therefore vulnerable to stochastic threats, such as drought along the migration cooridors or sever winter weather in overwintering areas.

For the western migratory population, an estimated population size of 3 to 10 million in the 1980s, has declined to less than 1,914 individuals in the winter season of 2020–2021, a decline of 99.9% (Pelton and Knight 2021, Howard 2024). Since 2021, the numbers have recovered slightly, with a total of 233,394 butterflies counted in the 2023-2024 winter season (Howard 2024).

Despite reliable data for the migratory subspecies, total population size estimates are unknown at the species level, because there is little population data available for the non-migratory subspecies *D. p. megalippe*, which occupies a substantial portion of the total range from the Caribbean south, through Central America, to northern portions of South America (Walker *et al.* 2022).

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More Information