



MONARCH JOINT VENTURE

Partnering across the U.S. to conserve the monarch migration

www.monarchjointventure.org

The Monarch Joint Venture is a partnership of federal and state agencies, non-governmental organizations, and academic programs that are working together to protect the monarch migration across the lower 48 United States.

PARTNERS

U.S. Forest Service
U.S. Fish and Wildlife Service
U.S. Geological Survey
Bureau of Land Management
Natural Resources Conservation Service
Iowa Department of Natural Resources
Cibola Nature Center
Cincinnati Nature Center
Green Schools Alliance
Journey North
Lady Bird Johnson Wildflower Center
Loudoun Wildlife Conservancy
Monarch Alert
Monarch Butterfly Fund
Monarch Health
Monarch Lab
Monarch Watch
National Wildlife Federation
North American Butterfly Association
Pacific Grove Museum of Natural History
Pheasants Forever and Quail Forever
Pollinator Partnership
Southwest Monarch Study
Tallgrass Prairie Center
Wild Ones: Native Plants, Natural Landscapes
The Xerces Society for Invertebrate Conservation

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Monarch Citizen Science

Volunteer contributions to understanding an iconic insect

Citizen Science

There is a long history of public participation in science. Prior to the late 19th century, most scientific research was conducted by untrained, yet passionate, citizens. Today, we use the term *citizen scientist* to describe volunteers who collect data for research but who are not professional scientists.

Citizen science and monarch monitoring have been closely tied together for years. Starting in the 1950s, Dr. Fred Urquhart's "Insect Migration Association" involved hundreds of volunteers in a search of the then mysterious overwintering grounds of migrating monarchs. This tagging project allowed Urquhart to track the flights of individual butterflies, and ultimately led to the 1975 discovery that monarchs from the northern U.S. and southern Canada were overwintering in central Mexico.

Public involvement in monarch citizen science programs has been growing since 1990. Several citizen science programs focus on different aspects of monarch biology, including migration, population dispersal, parasites, and overwintering. Countless hours spent by thousands of dedicated volunteers have allowed scientists to answer basic questions about how and when monarchs use available habitat, how their numbers change within and among years, how environmental perturbations affect these changes, and how monarch populations are responding to contemporary global change and conservation efforts.

Citizen Science Contributions

Citizen scientists make large-scale studies possible by providing data, time, and other resources at continental scales over several years. The importance of their contributions is reflected in many ways:

- 17% of peer-reviewed publications that focused on monarchs since 1940 have used data from citizen science projects. (Oberhauser and Ries, in press). Many project websites provide summaries of project findings and publications, raw data, and other information.



- Since 2000, two-thirds of papers on field-based research outside of the Mexican Reserve (where only scientists with permits are allowed) used citizen science data. (Oberhauser and Ries, in press)
- Citizen science volunteers engage in many actions that have important conservation outcomes, from teaching others to improving and creating habitat.
- Data generated by citizen scientists allow researchers to answer questions that could never be considered using traditional academic research methods.

Links and Resources

Monarch Citizen Science:

www.monarchjointventure.org/get-involved/study-monarchs-citizen-science-opportunities

Citizen Science Central:

www.birds.cornell.edu/citscitoolkit/projects/find

Resources:

Oberhauser, K. S., and L. Ries. In Press. A Citizen-Army for Science: Quantifying Contributions of Citizen Scientists to our Understanding of Monarch Butterfly Biology. *Bioscience*.

Oberhauser, K.S., L. Ries, S. Altizer, R. Batalden, J. Kudell-Ekstrum, M. Garland, E. Howard, S. Jepsen, J. Lovett, M. Monroe, G. Morris, E. Rendón-Salinas, R. G. Rubino, A. Ryan, O. R. Taylor, R. Treviño, F. Villablanca, and D. Walton. 2015. Contributions to Monarch Biology and Conservation through Citizen Science: 70 Years and Counting. pp 13-30 in K.S. Oberhauser, K. Nail, and S. Altizer, eds., *Monarchs in a Changing World: Biology and Conservation of an Iconic Butterfly*, Cornell University Press, Ithaca, NY.

Tracking the Migration

Since Fred Urquhart's tagging success, researchers and citizen scientists have continued tracking the migration by reporting their observations of migrating monarchs and tagging.

Journey North: This simple, online reporting project engages thousands of children and adults.

- Volunteers report sightings during the spring and fall migrations through the project's website. Spring reports include first monarch, first milkweed, first monarch egg, and first monarch larva. Fall reports include adult sightings, peak migration events, roosting monarchs, and breeding monarchs.
- Data are aggregated and used to develop real-time maps of spring and fall migration fronts.



www.learner.org/jnorth/monarch

Monarch Watch: With over 1 million butterflies tagged and approximately 16,000 recovered tags, the Monarch Watch volunteer tagging program helps us understand the eastern monarch fall migration to Mexico. Tagging and recovery data provide information on the dynamics of the migration.



- Volunteers order circular, lightweight stickers that they place carefully on the wings of monarchs. Some monarchs are captured as adults and tagged, others are captured as eggs or larvae and then the adult butterfly is tagged and released.
- A unique ID number on each tag is used to keep track of information associated with each butterfly, tagger, and recovery.

www.monarchwatch.org

Many smaller, more localized, citizen science programs have been implemented throughout the country, including:

Southwest Monarch Study: Based in the desert southwest, this program provides both tagging and monitoring of monarch habitats in Arizona, New Mexico, Nevada, Utah, western Colorado and the California deserts. Data collected from this project help us to understand the migration, breeding, and overwintering strategies of monarchs in the southwest U.S. Visit www.swmonarchs.org for more information.

Programs like the **Cape May Migration Monitoring Project** (New Jersey) and the **Peninsula Point Migration Monitoring Project** (Michigan) conduct regimented counts of all monarchs they see during a fixed period of time. These, and many other local monitoring programs, are vital sources of information about the state of the monarch migration and population in varying locations.

In addition to monarch based monitoring programs, several general butterfly monitoring programs collect data via counts, transects, and opportunistic sightings. The **North American Butterfly Association** (NABA) has the largest and longest-running butterfly monitoring program in North America. **Butterfly Monitoring Networks** (BMNs) conduct butterfly surveys in specific locations, repeating measurements year after year. Additionally, online Lepidoptera reporting sites include **Butterflies and Moths of North America** and **eButterfly**.

Overwintering Site Management (Western)

Western monarchs migrate from states west of the Rocky Mountains to many sites along the coast of California. Citizen science volunteers help to track the movement and health of the western overwintering population by participating in programs such as:

Western Monarch Count: The Xerces Society for Invertebrate Conservation provides an opportunity for citizen scientists to aid in counting western overwintering monarchs. The primary volunteer opportunity is the Western Monarch Thanksgiving Count. For three weeks around the Thanksgiving holiday, volunteers visit overwintering sites and conduct counts to estimate the number of monarchs using the sites and to evaluate the condition of the habitat. Collectively, this project helps to provide an accurate estimate of the western monarch population size.



www.westernmonarchcount.org

Additionally, citizen scientists help **Monarch Alert** study western overwintering population characteristics. Volunteers tag monarchs at select California overwintering sites to help track movement between sites during the overwintering season. Visit www.monarchalert.calpoly.edu for more information.

Monitoring Eggs, Larvae, and Natural Enemies

Monarch Larva Monitoring Project: This project helps researchers understand factors that affect monarch reproduction and development during the breeding season, determining how populations vary in time and space.



- Volunteers from across North America observe and report monarch eggs and larvae on milkweed plants.
- Numerous activities provide different opportunities, depending on volunteer interests and time commitment.
- Activities include recording weekly monarch density, rainfall tracking, comparing characteristics of milkweed plants with and without monarchs, measuring rates of attack by parasitoids (tachinid flies), and reporting single or anecdotal observations of monarchs or milkweed plants during the breeding season.

www.mlmp.org

Monarch Health: The spread of a protozoan parasite of monarch butterflies, *Ophryocystis elektroscirrha* (OE), is tracked with the help of citizen scientists participating in Project Monarch Health.



- Volunteers receive a parasite sampling kit from Monarch Health before capturing wild monarchs to sample. Samples can be from wild caught adults, or adults that have been collected as larvae and raised in captivity.
- To sample for the parasite, volunteers gently squeeze a small piece of tape around the abdomen of the butterfly. These scale samples are preserved on a note card, which is sent to Monarch Health for analysis.

www.monarchparasites.org



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