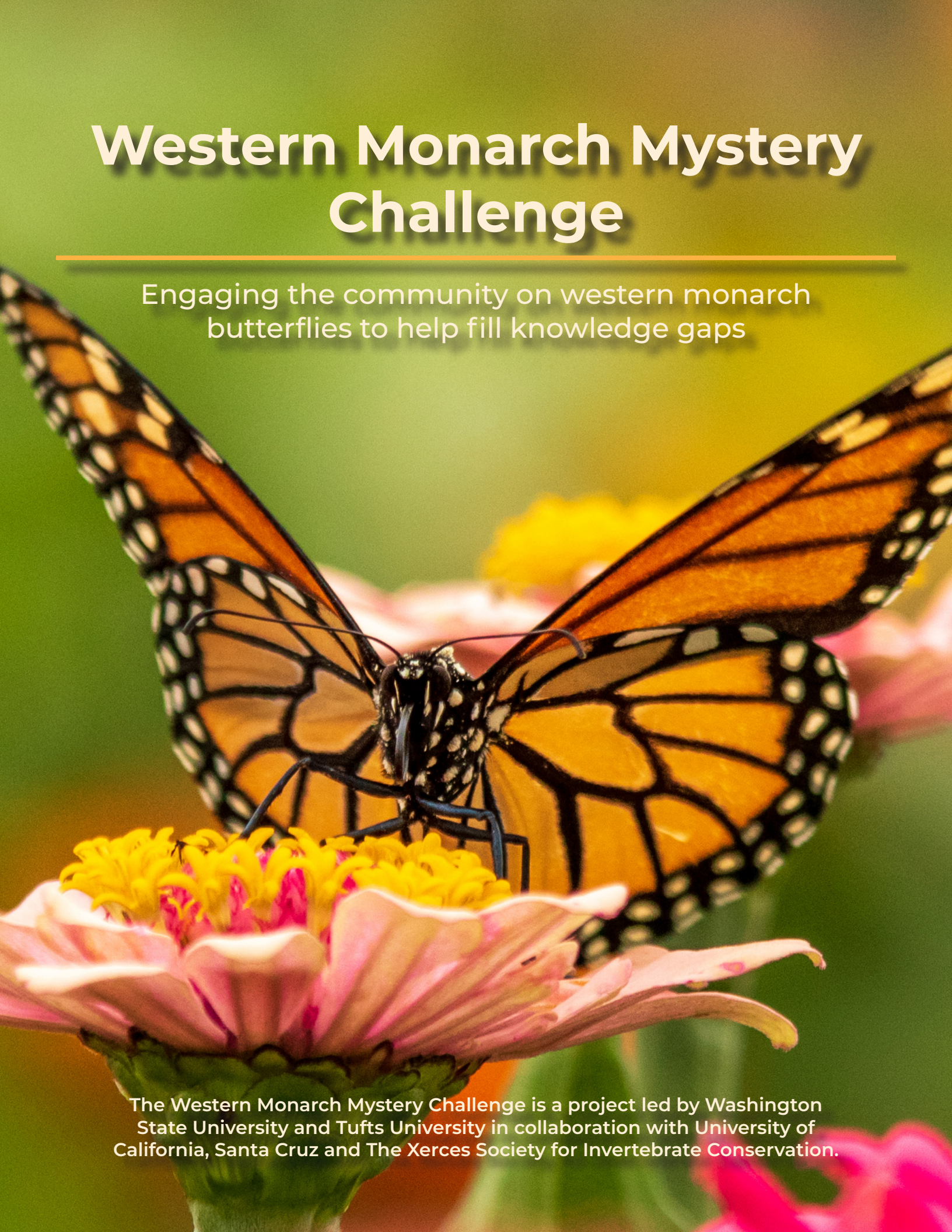
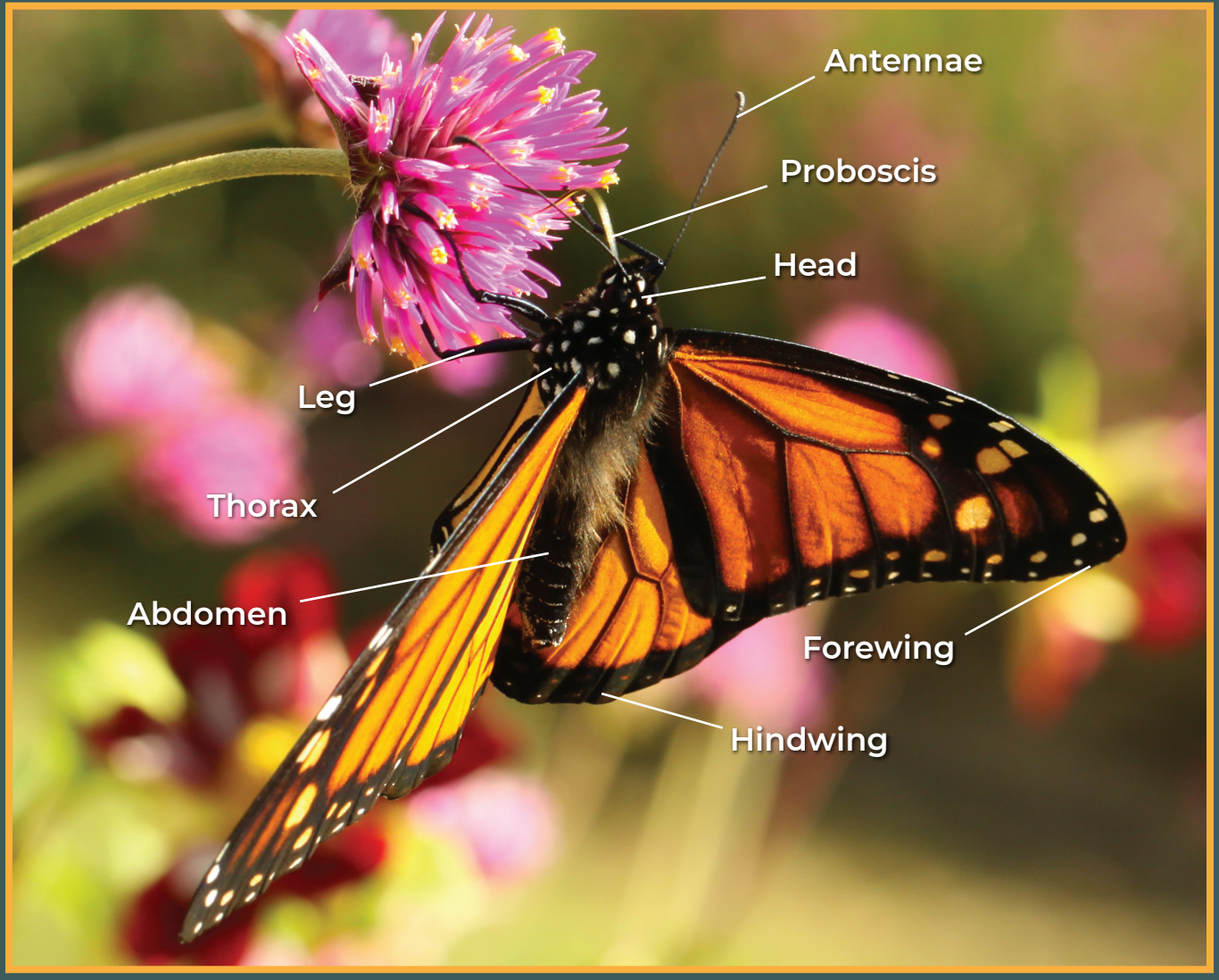
Western Monarch Mystery Challenge

Engaging the community on western monarch butterflies to help fill knowledge gaps



The Western Monarch Mystery Challenge is a project led by Washington State University and Tufts University in collaboration with University of California, Santa Cruz and The Xerces Society for Invertebrate Conservation.



Western Migratory Monarch Vocabulary

Catalog: a list of records, items, or data.

Community Scientist: members of the public who are not trained scientists but are helping collect data.

Crowd Sourced: a data collection model that obtains input from multiple, often public, sources.

Data: a collection of facts, statistics, or information used for analysis.

Habitat: the natural environment of an organism (plant, animal, or fungus).

Insecticides/Pesticides: a substance or chemical used for eliminating unwanted organisms; often harmful to non "pests".

Life Cycle: a series of stages that make up the course of an organism's life span.

Migratory: to pass periodically or seasonally from one region to another.

Nectar: the juice of a flowering plant that attracts insects.

Overwintering Site: a site or location where an organism spends the winter.

Species: basic category of biological classification made up of related individuals which are able to breed with one another.

Traits: distinguishing characteristics or qualities

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Western Monarch Butterflies:
A Vulnerable Migratory Population in Decline


IMAGE SOURCE: XERCES SOCIETY & CANDACE FALLON

Along the California coast a butterfly mystery has scientists stumped. **Migratory** monarch butterflies are experiencing a severe population crash and face possible extinction. During the mid-1980s the migratory population of the western monarch was 8-10 million butterflies. In the late 1990s, after a noticeable drop in monarch numbers at the **overwintering sites**, along the central coast of California, scientists began collecting **data** to learn more about them. This data collection started yearly counts known as the Western Monarch Thanksgiving Count. Based on these counts, scientists documented a steady population decline with fewer than 300,000 butterflies counted by 2017. By the following year the numbers crashed to less than 30,000 butterflies. This was followed by a further decline with fewer than 2,000 butterflies counted in November 2020.

Scientists have identified several causes for the steady population decline over the last 50 years including loss of overwintering **habitat**, loss of breeding habitat, increased use of **pesticides** (particularly glyphosate and neonicotinoid **insecticides**), and climate change. Despite these threats, scientists believe recovery is possible and are working on identifying next steps to help western migratory monarchs bounce back. Two scientists leading the team investigating the mystery of population recovery are Cheryl Schultz, a professor with the School of Biological Sciences at Washington State University and Elizabeth Crone, a professor of Biology at Tufts University.

Schultz and Crone's team of scientists have developed the Western Monarch Mystery Challenge project which is aimed at solving the mystery of how this amazing butterfly can be brought back from the brink of extinction. Lilianne de la Espriella, the team's Communications Coordinator, explains that right now the focus is on "what monarchs need in early spring" to help the population recover. Schultz acknowledges that "there are big gaps in our knowledge about monarch biology and behavior." To help fill these knowledge gaps the Monarch Mystery team is calling on the public to help with observations, field research, and data collection.



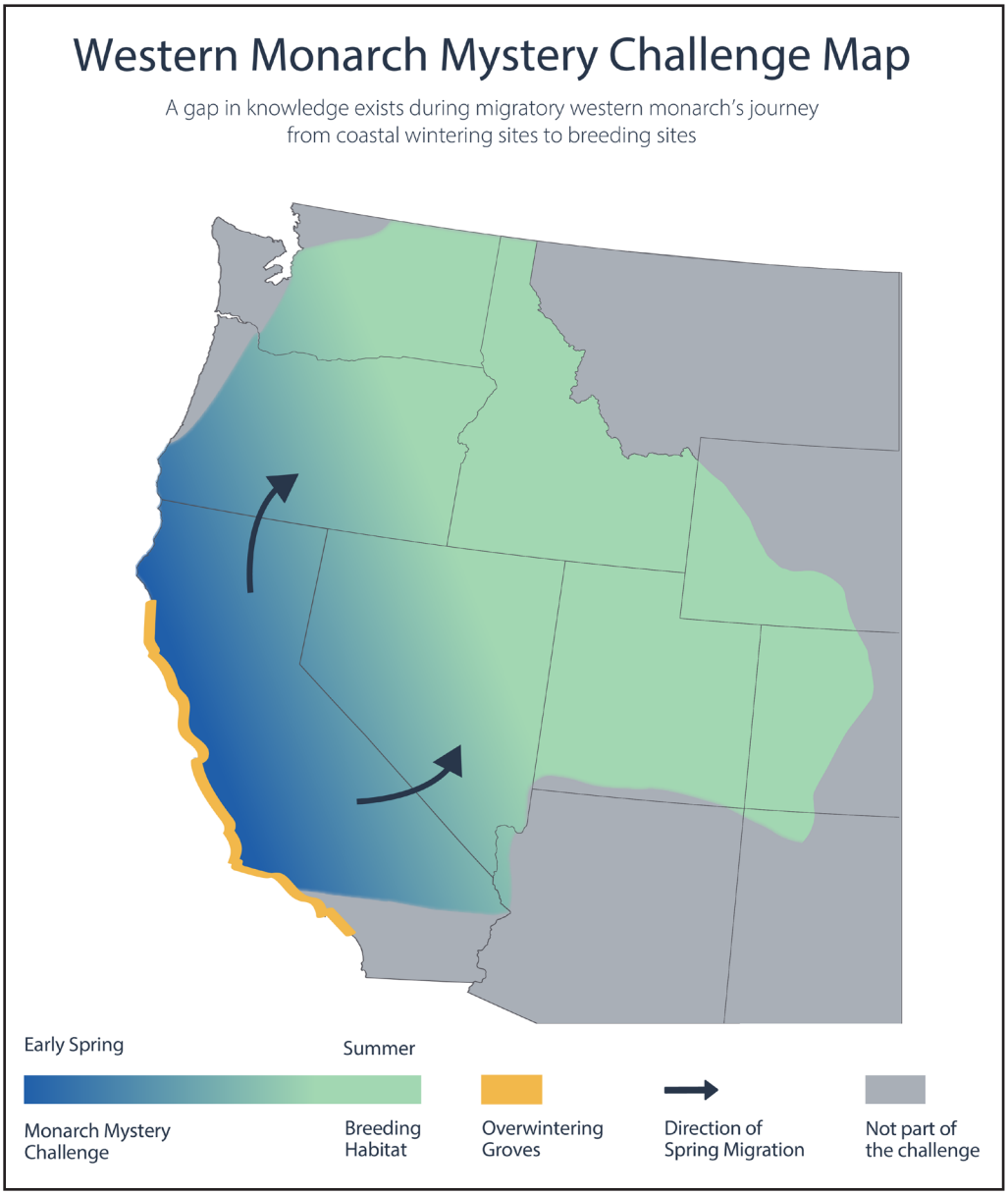
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Are You the Key to Monarch Recovery?

Have you ever wanted to work with real life scientists? Or maybe you dream of becoming a scientists yourself? Well now is your chance! The Western Monarch Mystery Challenge team has turned to the public to **crowd source** data. Crowd sourced data has been vital to advances in technology like mapping apps and streaming services but now it could be the key to solving the monarch mystery. But what does the team mean when they talk about using crowd sourcing for their research and data collection?

In the case of the Monarch Mystery team and the Western Monarch Mystery Challenge project, crowd sourced data means empowering individuals to become **community scientists**. People working with the Monarch Mystery team as community scientists will be collecting data about monarchs and their habitat by taking photos. These photos will then be sent in to the Monarch Mystery team who will use them to analyze data that could solve the mystery behind recovering the western migratory monarch population.

Look at the map below. The colored sections of the map represent the area the Monarch Mystery team is studying. Part of the data collection problem is that this area is so large the team cannot cover it on their own. Recognizing that "breeding and migrating habitats are only a few of the gaps in our knowledge of western monarchs," Schultz explains, the team "especially needs observations of monarch biology in places where human populations are low ... and at times of year when monarch butterflies are sparse." The Monarch Mystery team is urging "volunteers across the West to collect monarch observations, especially in the early spring (February–April), the period in which monarchs typically leave the overwintering sites." By taking photos of adult monarchs and submitting them to the Monarch Mystery team with the date and location, individuals will be playing an important role in helping to solve the monarch mystery.



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Becoming a Community Scientist


IMAGE SOURCE: CHERYL SCHULTZ




IMAGE SOURCE: XERCES SOCIETY & STEPHANIE MCKNIGHT

Becoming a community scientist for the Western Monarch Mystery Challenge project is fun and easy. With the permission of a parent or guardian over the age of 18, start taking photos within the migration and breeding area (the blue and green sections of the map on the previous page). While the Monarch Mystery team is primarily looking for photos of adult monarchs, photos of milkweed plants, monarch eggs, caterpillars, and chrysalises are also greatly appreciated. Do not worry about your photos being long distance, or blurry. All photos help build up a **catalog** of data for scientists to use in their research. What is most important is a record of the monarch sighting including the date and location!

Getting your data and sightings to the Monarch Mystery team is simple, just email the photo directly to the team at MonarchMystery@wsu.edu, along with the date and location the photo was taken. Or to record your data on the go upload your photos using iNaturalist, a fun app that helps scientists around the world crowd source data. To use iNaturalist follow these simple steps after downloading the app and creating an account:

1) Take a photo of any living organism, such as an adult monarch butterfly.

2) Upload the photos to iNaturalist.

3) Add notes to your photos and talk to other users about their research.

All of the data submitted by community scientists will be put in a database, the Western Monarch Milkweed Mapper, that everyone in the community can access. The Monarch Mystery team welcomes the community to directly submit photos to this database as another option: https://www.monarchmilkweedmapper.org/.



IMAGE SOURCE: WWW.INATURALIST.ORG/

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Know Your Butterflies:

Identifying Western Monarch Butterflies

Christopher Jason, the Monarch Mystery team member who looks at all the photo submissions from community scientists, describes the **traits** to look for when identifying for monarchs. “Monarchs are orange butterflies with prominent black veins on their wings” he explains. “The wings are also outlined with black borders and it has white spots on all its four wings.” But this description could apply to other butterflies, not just monarchs.

Though monarchs are highly iconic it is still easy to mix them up with other types of butterflies. But the team encourages all community scientists to send a photograph of the butterfly even if you are not sure it is a monarch. It is better to send a photo that is not of a monarch than to miss out on sending good data.

On this page you can practice identifying monarch butterflies. At the left you will see five photos of butterflies whose pictures are regularly sent to the Monarch Mystery team as a monarch sighting. One of the photos is indeed a monarch, while four are not. **Can you tell the difference between these butterflies?**

The monarch butterfly is the first (top) photo. The other four (from top to bottom) are a Western tiger swallowtail, Gulf fritillary, California tortoiseshell, and Painted lady. Seeing all these butterflies together, it is easy to understand how they could be mistaken for one another.

Activity

- Make a list of 5-10 traits that describe monarch butterflies like their color, wing shape, and markings (use Jason’s description above as a guide).
- Write each trait on a different note card.
- Then using the photos on this page, or photos of other butterflies you find, determine if they are monarchs using each of the individual characteristics you wrote on the cards.
- In what way are monarchs similar to other butterflies? In what ways are they different?
- This exercise will help you become a better community scientists!

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More Than Butterflies

Monarchs require milkweed sources throughout their habitats and at every stage of their **life cycle**. Female monarchs lay their eggs only on milkweed plants. Before transforming into monarch butterflies, milkweed plants are the only food caterpillars will eat. As adults monarchs eat the **nectar** produced by milkweed flowers.

At the right you will see photos of five different types of milkweed. The first four photos are of milkweed species that are native to California and grow naturally in monarch habitats (image source: Stephanie McKnight & The Xerces Society):

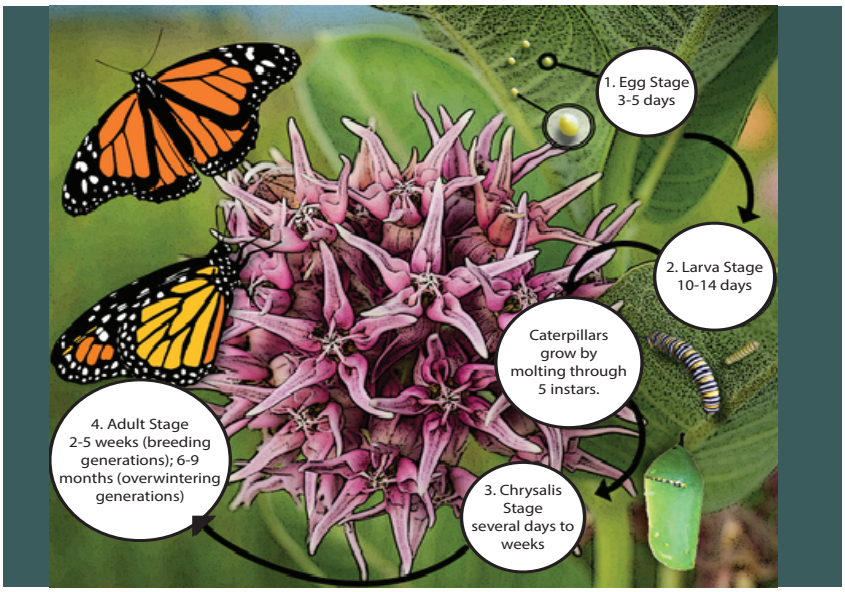
- Heart Leaf milkweed (*Asclepias cordifolia*)
- Woollypod milkweed (*Asclepias eriocarpa*)
- Narrow-leaved milkweed (*Asclepias fascicularis*)
- Showy milkweed (*Asclepias speciosa*).

These are all great species to plant in your garden to attract butterflies. The last photo is a variety which is not native to California:

- Tropical milkweed (*Asclepias curassavica*)

Though popular, Tropical milkweed is associated with diseases that can harm monarchs. Native plants are preferable for gardeners who would like to help monarchs.

The Monarch Mystery team hypothesizes that learning more about where and how much milkweed monarchs need in early spring could be key to their recovery. We encourage you, as community scientists to send in photos of milkweed plants found within the Challenge area.













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Western Monarch Mystery Challenge

For more information about the Western Monarch Mystery Challenge, visit:

@MonarchMystery

@WesternMonarchMystery

@WMonarchMystery

https://labs.wsu.edu/conservation-biology/western-monarch-mystery-challenge/

For more information on the western monarch, visit:

https://xerces.org/western-monarch-call-to-action

https://www.westernmonarchcount.org

https://www.monarchmilkweedmapper.org

For more information on monarch conservation across North America, visit:

https://monarchjointventure.org

https://wafwa.org/

Rubber Duck Lab

This PDF was written and designed by Rubber Duck Lab, a nonprofit organization promoting equitable access to project-based learning, 21st century skill development, and new technologies through active exploration, collaboration, and creativity; online, in the classroom, and within the community.

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How are you celebrating Western Monarch butterflies?

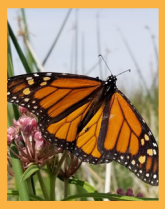












Share your butterfly experiences

on Facebook @monarchmystery













Save the Monarchs. One observation at a time.





Join the Community

People are helping scientists learn about the western migratory monarch population by sharing photos of these butterflies during the spring (February - April). You too can join the cause and become part of something big as a community scientist and monarch advocate.

Three Ways to Participate

Sign Up	Contact Us	Use The App
monarchmilkweedmapper.org	MonarchMystery@wsu.edu	inaturalist.org/projects

Stay informed about the latest Western Monarch news, research, and developments at:
labs.wsu.edu/conservation-biology/western-monarch-mystery-challenge

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