

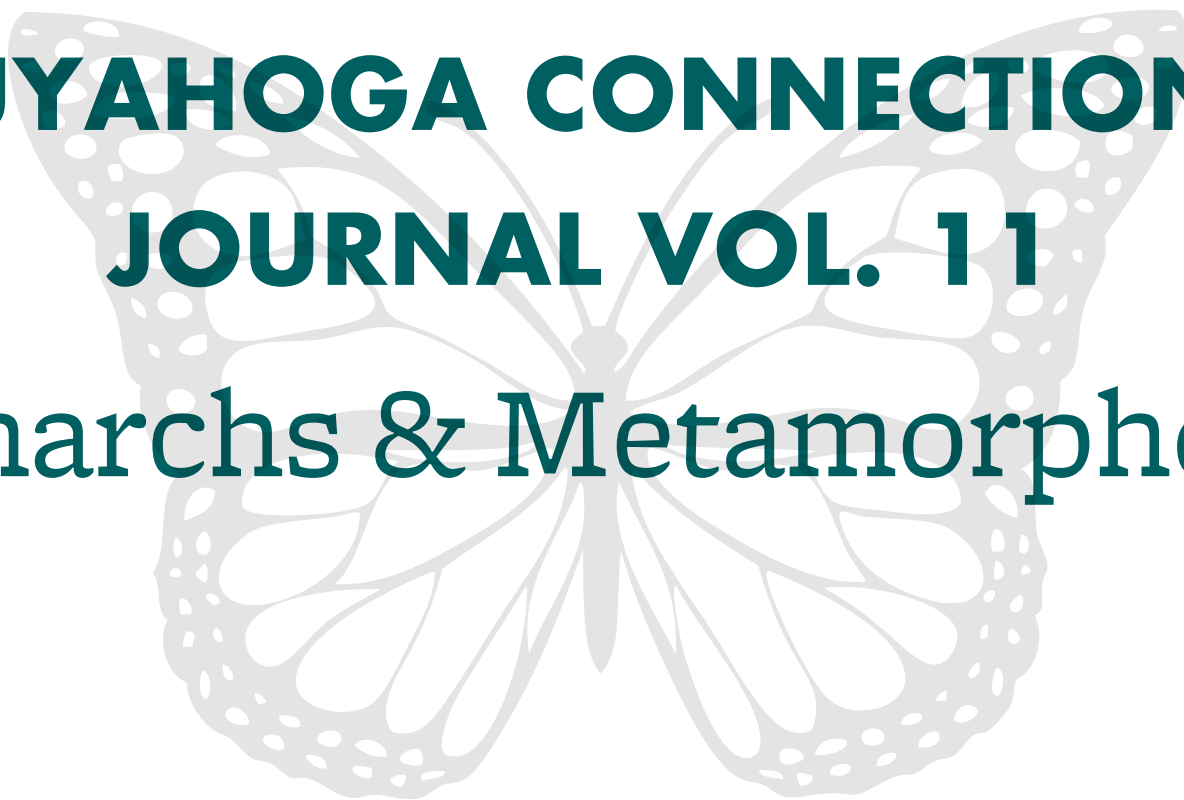
CONSERVANCY

FOR CUYAHOGA VALLEY NATIONAL PARK

— CUYAHOGA CONNECTIONS —

JOURNAL VOL. 11

Monarchs & Metamorphosis



Vocabulary

Look for these words throughout our journal!

Translucent - See-through.

Molt - When an animal sheds its skin or outer shell as it grows.

Larva - The immature, wingless, feeding stage of an insect that goes through complete metamorphosis.

Pupa - An insect in the nonfeeding stage of development between the larva and adult/imago. In this stage, it typically goes through a complete transformation within a protective cocoon or hardened case.

Imago - An adult insect.

Toxicity - Degree of being poisonous.

Aposematism - A defense mechanism in which an animal is brightly colored to warn predators of their toxicity.

Müllerian co-mimicry - When two or more animals/ plants, often foul-tasting and that share common predators, have come to mimic (copy) each other's poison-warning signals. This helps both species because predators can learn to avoid all of them after only making the mistake of eating one of them.

Phenotype - Visual characteristics or traits.

ex. Nivosus Phenotype - white instead of orange coloration of some Hawaiian monarchs

Migration - Seasonal movement of animals from one region to another.

Roosting - Settling or gathering together to rest or sleep.

Phenomenon - A remarkable person, thing, or event.

Thermals - A rising column of warm air, caused by the uneven heating of the earth or sea by the sun.

Entomologist - A person who studies or is an expert in insects.

Conservation - Preservation, protection, or restoration of the natural environment and of wildlife.

Citizen science project - Activities sponsored by a wide variety of organizations so non-scientists can meaningfully contribute to scientific research.

Mortality - The number of deaths in a given area or period, or from a particular cause.

Indigenous - Individuals who are native to an area.

What is METAMORPHOSIS?

Metamorphosis is a process by which animals go through extreme, rapid physical changes some time after birth. Metamorphosis can change an organism's entire body, such as a change in the animal's number of legs, how it eats, or how it breathes.

How does a MONARCH change throughout its life?

1. A monarch starts as a white egg no bigger than the dot of a pencil on a milkweed plant. After three to six days, the egg will turn grey before hatching a tiny caterpillar two to six millimeters in length.



2. When it first hatches, the caterpillar is pale green and slightly translucent with eight pairs of legs. It will first eat the egg shell before munching on the milkweed leaves.



3. As it grows, yellow, white, and black stripes appear, with two pairs of black antennae-like tentacles at either end of its body. The caterpillar will molt—or shed its skin—five times as it gets bigger and bigger. After ten to fourteen days, it will reach about 2¾ inches in length.



↪ This is the larval stage of the monarch's life. ↩

Monarch Metamorphosis (continued)

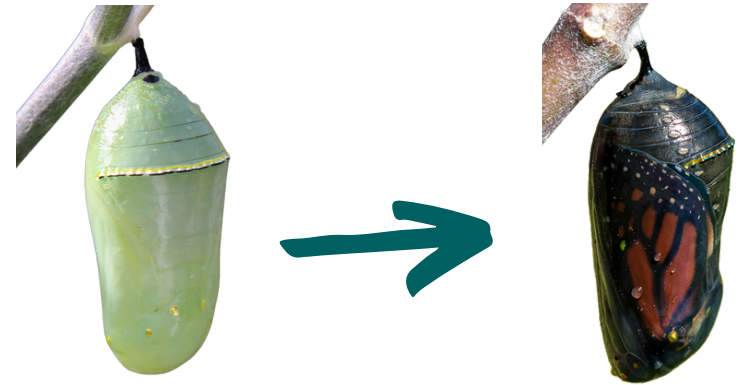
How does a MONARCH change throughout its life?

4. Once the caterpillar is fully grown, it will leave the milkweed plant to find a safe place to pupate, sometimes 20-30 feet away. It will then create a silk pad, which it will hang from upside down in a J-shape for about one full day until its skin looks wrinkly.

5. The caterpillar will then shed its skin one last time to reveal underneath a green chrysalis. This chrysalis is the pupal stage of the monarch's life. The chrysalis is jade-green in color, with a golden line at the top that looks like a zipper.

6. Over the course of 10-14 days, the monarch will transform into a butterfly within the chrysalis. The chrysalis will turn translucent the day before the butterfly emerges. The butterfly is the imago stage of the monarch's life. The new butterfly will hang from its chrysalis for about an hour while its body and wings enlarge and dry until it is ready to fly. The butterfly will have orange and black wings, a black body with white spots, six legs, antennae, and mouthparts that will sip nectar from various late-blooming wildflowers.

7. Depending on the time of year it is born, the butterfly will either mate within 5-7 days to create eggs for the next generation of monarchs, or migrate south to Mexico for the winter and wait to mate until the spring.



Monarch Metamorphosis

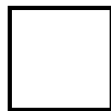
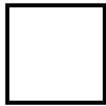
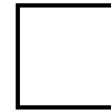
How does a MONARCH change throughout its life?

Test your knowledge! Number the different stages of the monarch life cycle in the correct order.

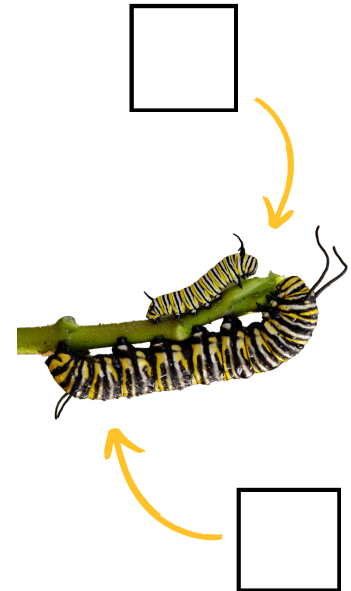
Answers located in the Answer Key at the end of the journal.



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Adaptations

Physical

Toxicity - The milkweed that caterpillars eat help make them poisonous to predators. They remain toxic as butterflies. This means that if predators eat monarchs, they will vomit.

Aposematism - Monarchs' bright orange colors warn of their toxicity so that predators avoid them.

Nivoseus Phenotype - Monarchs were brought to Hawaii on milkweed in the mid-1800s. In the 1960s, a white coloration of the butterflies was discovered. Scientists hypothesize that the white morph helps them camouflage with white Crown flowers, which bloom on Hawaiian trees and are in the milkweed family.



Behavioral

Two-Way Migration - Monarchs can't survive cold temperatures, so they fly to warmer places in the winter. They are the only butterfly known to make a two-way migration. To help find their way, they use the Earth's magnetism. They also use air currents & thermals to help push them along.

Roosting - When resting, monarchs cluster together to stay warm, often choosing coniferous trees with needles because they hold more warmth.



Monarch or Viceroy?

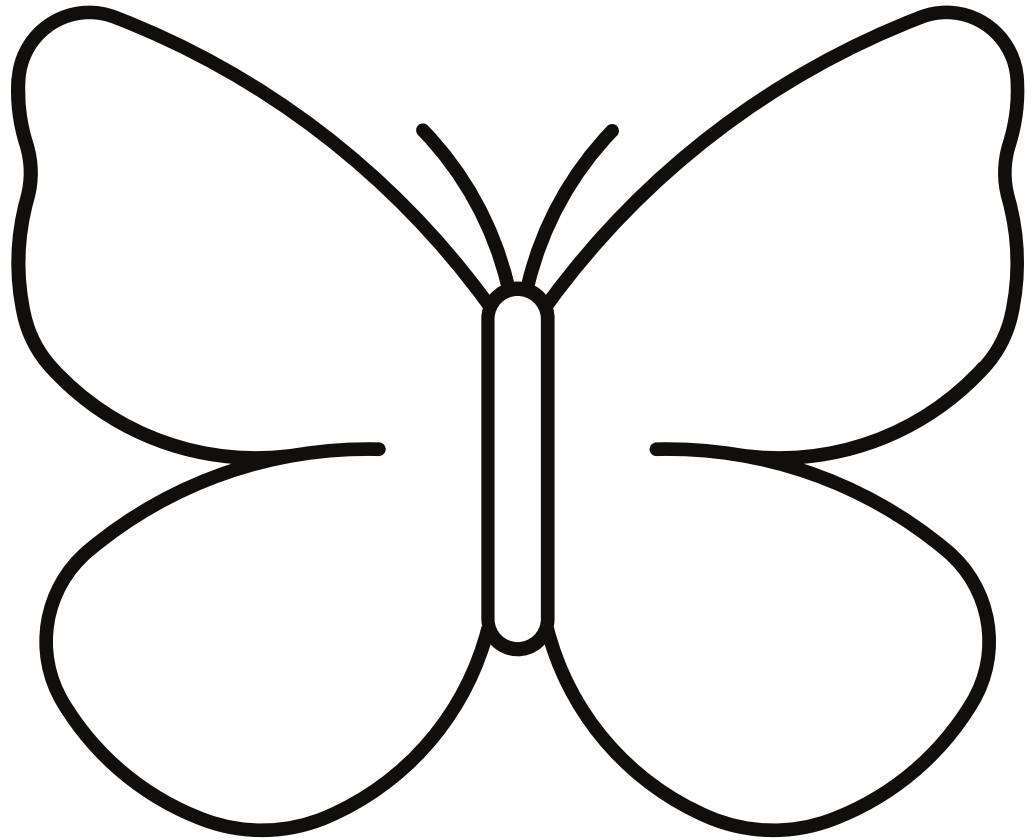
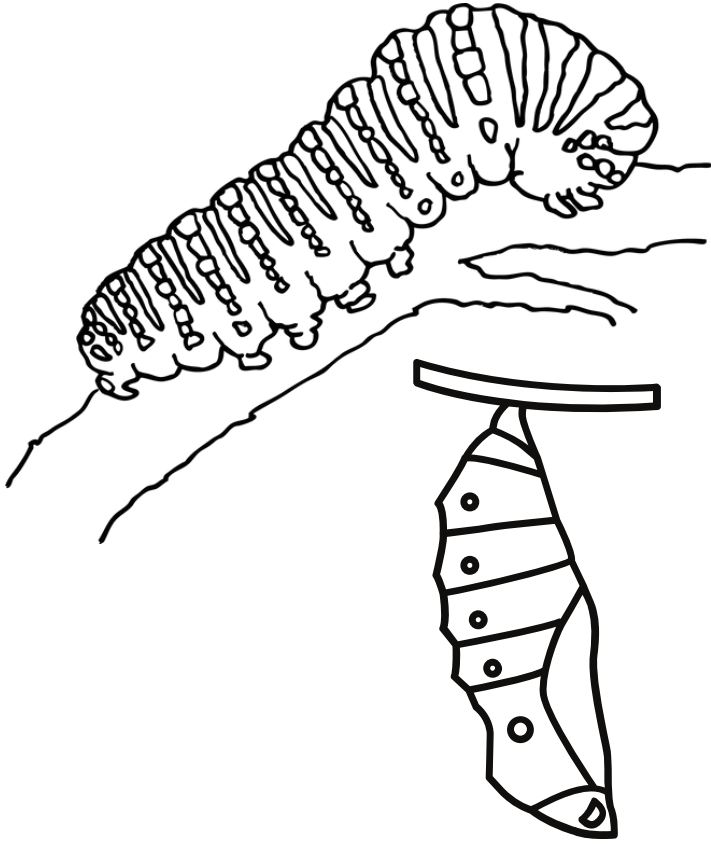
Monarch and viceroy butterflies have very similar colorations in order to warn predators of their toxicity, a type of defense known as aposematism. Since the butterflies contain different toxins that are poisonous to different animals, their mimicry actually helps both species because more predators avoid them. This type of evolution is called Müllerian co-mimicry.

Can you tell which butterflies are monarchs and which are viceroys in these photos?



Build Your Own Caterpillar & Butterfly

Directions: Color the images below however you would like, then complete the sentences about your creation!



My caterpillar grows on _____ and eats _____.

The chrysalis looks _____.

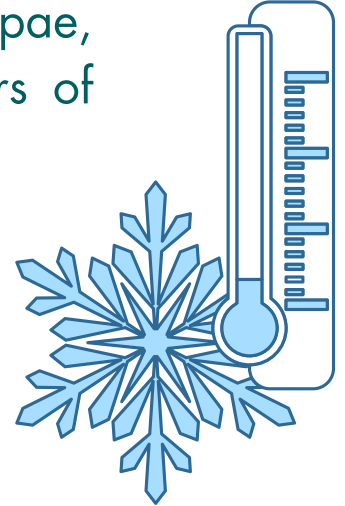
As a defense against predators, my butterfly

My butterfly is special because _____.

Monarch Journey

The annual migration of North America's monarch butterfly is a unique and amazing phenomenon. The monarch is the only butterfly known to make a two-way migration as birds do. Unlike other butterflies that can overwinter as larvae, pupae, or even as adults in some species, monarchs cannot survive the cold winters of northern climates.

Each fall, millions of monarch butterflies leave their summer breeding grounds in the northeastern U.S. and Canada and travel upwards of 3,000 miles to reach overwintering grounds in southwestern Mexico.



Using environmental cues, the monarchs know when it is time to travel south for the winter. Monarchs use a combination of air currents and thermals to travel long distances. Let's learn more about their journey and where they call home in winter!



Monarch Watch

The discovery of the monarch butterfly migration started in the 1930s by [entomologists](#).

Monarch Watch was launched in 1992. It is a nonprofit education, [conservation](#), and research program based at the University of Kansas that focuses on the monarch butterfly, its habitat, and its spectacular fall migration.



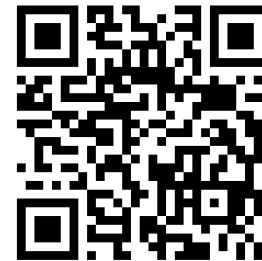
Click on the QR code to learn more about the history of the Monarch's migration discovery.

We now know through these discoveries that monarchs can travel between 50-100 miles a day. It can take up to two months to complete their journey. Monarchs in Eastern North America have a second home in the Sierra Madre Mountains of Mexico.

Monarch Tagging Project

The Monarch Watch Tagging Program is a large-scale [citizen science project](#) that was initiated in 1992 to help understand the direction of the monarch's spectacular fall migration through mark and recapture.

Tagging helps answer questions about the origins of monarchs that reach Mexico, the timing and pace of the migration, [mortality](#) during the migration, and changes in the area where the species can be found. It also shows that the monarch's chance of reaching Mexico is related to its location, size, and when it begins its journey.



Click on the QR code to learn more about tagging and how to request your own tagging kit!



Monarch Festivals in Mexico



The monarch's arrival in Mexico is a breathtaking phenomenon that also carries strong cultural significance. Like clockwork, migrating monarchs arrive in Mexico the same time of year, every year. Their arrival occurs at the same time as Día de Muertos (Day of the Dead), which is observed in Mexican culture between November 1st and 2nd.

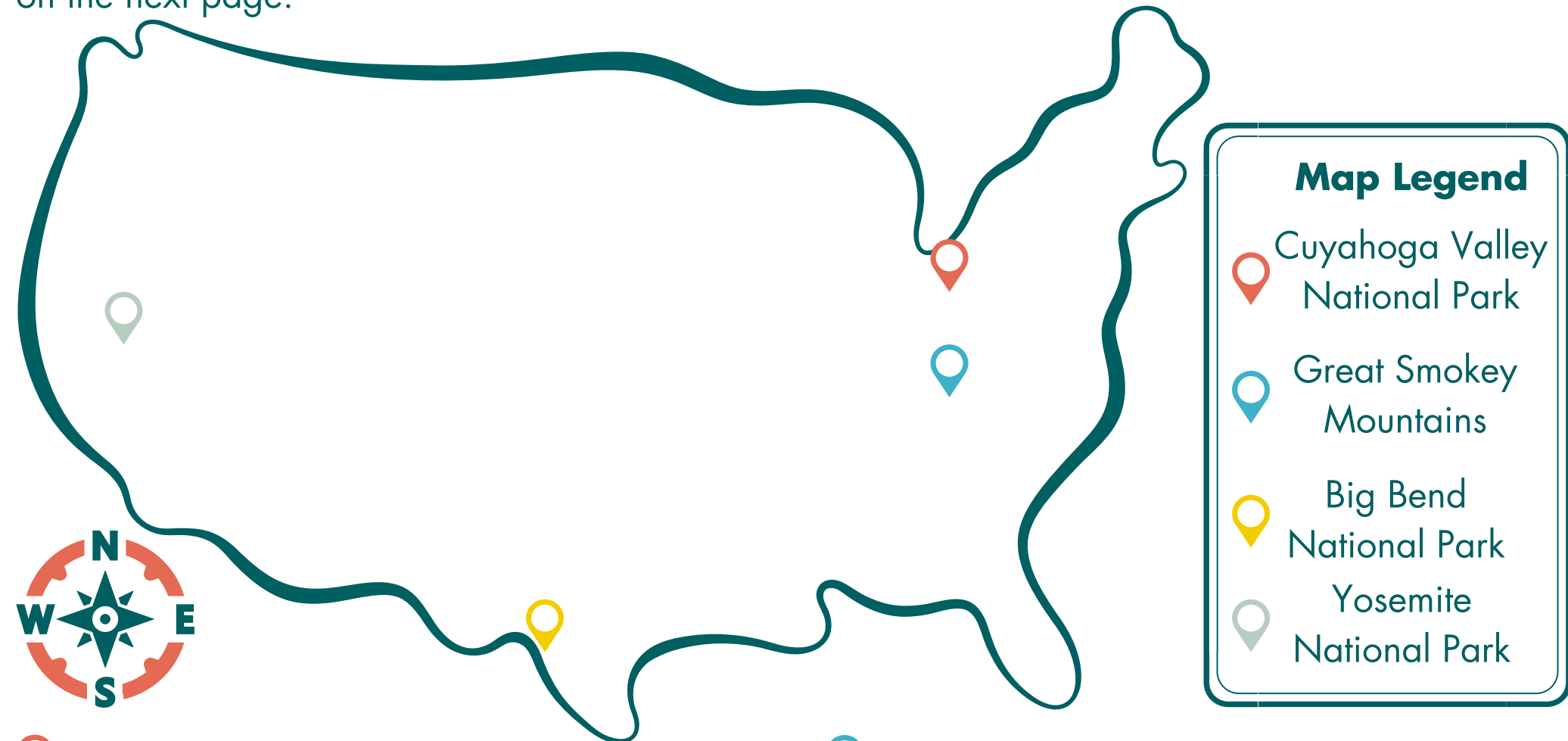
For people in the state of Michoacán and the State of Mexico, monarchs hold a special place in their traditions. Monarchs represent the souls of their ancestors returning to visit them for Día de Muertos. This belief comes from the Purépecha, as well as the Mazahua, two indigenous peoples of the area. The Purépecha have tracked the monarch's return to Mexico for centuries. The arrival of the butterfly, known as "la parakata" in Purépecha, meant that it was time for the corn harvest. The "parakatas" were also believed to be the souls of the dead visiting for the night of Día de Muertos. The crowd of monarchs flying overhead have continued to be an important connection between the living and the dead.

During the celebrations and parades associated with Día de Muertos, many people dress in attire to honor monarch butterflies and the end of their 3,000 mile journey.



How far do monarchs travel?

Every fall, in early October, huge clouds of monarch butterflies make the 3,000-mile trek south where they live in hibernation for six to eight months. Then, in February or March, the entire cycle starts all over again. Get an idea of how far 3,000 miles is by solving some simple math questions on the next page.



Cuyahoga Valley National Park (CVNP) to the Great Smoky Mountains = 525 miles

Great Smoky Mountains to Big Bend = 1,460 miles

Big Bend to Yosemite National Park = 1,400 miles



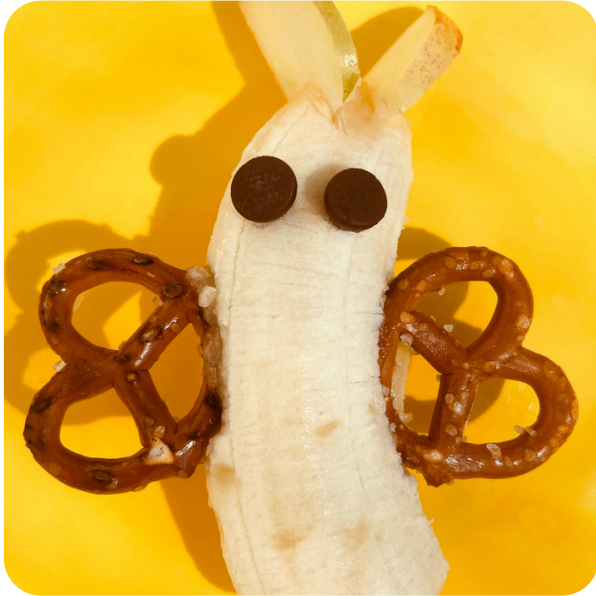
1. How many miles total would it take for a monarch to travel from CVNP to Big Bend but stopping at the Great Smoky Mountains along the way?
2. How many miles would it be if a monarch flew from CVNP to the Great Smoky Mountains and back to CVNP?
3. How many miles would it take for a monarch to travel from the Great Smoky Mountains to Yosemite but stopped at Big Bend on the way?
4. How many miles total would it take for a monarch to travel from CVNP, to the Great Smoky Mountains, to Big Bend, to Yosemite?
5. With the The United States having a horizontal width of approximately 2,680 miles, is this more or less, than the distance monarchs travel for their migration?



Answers located in the Answer Key at the end of the journal.

Butterfly Food Crafts

Butterfly shaped food can be fun! Whether you are planning a party, or a teaching moment on insects, we've got some food to support you. Here are a few butterfly foods that are also healthy! These activities can help kids learn new words, simple math, time-management and communication skills.



Banana Butterfly

1. Peel and cut banana in half.
2. Place twisted pretzels on each side of banana.
3. Use raisins (or other dried fruit), mini chocolate chips, sprinkles, etc. for the eyes.
4. Place small sections of apples on top for antenna's!



Celery Butterfly

1. Wash and cut celery into thirds.
2. Fill middle with peanut butter, cream cheese, or hummus.
3. Place twisted pretzels in the middle of the celery.
4. Use peas, raisins, or mini chocolate chips for eyes!



Apple Butterfly

1. Wash and cut apple into small slices.
2. Spread peanut butter (or pb alternative) unto cracker.
3. Place apple wings in the middle, leaving a gap.
4. Fill the small gap between the apples with your favorite jelly or jam!

OUR CHALLENGE:

Be a Monarch Hero!

Challenge yourself to do one or more of these monarch-related activities this month! Visit our Cuyahoga Connections webpage for more details, including links to resources.

- View the monarch migration close to Lake Erie shores.
- Visit a butterfly garden in Cleveland or Akron.
- Plant monarch-friendly plants, such as milkweed and other late-blooming flowers for migrating monarchs.



"White Snakeroot, [purple] Ironweed, and Goldenrod are essential to the survival of the monarch butterfly population." -Cleveland Metroparks



- Certify your garden as a Butterfly Garden with the North American Butterfly Association (certification sign: middle).
- Certify your garden as a Wildlife Habitat with the National Wildlife Federation (logo: left).
- Register your site for the Million Pollinator Garden Challenge (logo: right).
- Attend a monarch tagging or educational insect program with your local park district.
- Buy a monarch tagging kit and join the citizen science tagging project yourself!

Answer Key

Page 5: Life Cycle

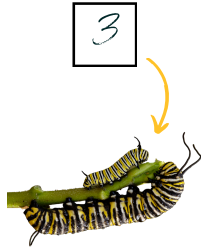
Egg: #1
Larva: #2-5
Pupa: #6, #7
Imago: #8, #9



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2



4



5



6



7



8



9

Photos: Canva

Pages 13-14: How far do monarch's travel?

- 1,985 miles
- 1,050 miles
- 1,860 miles
- 3,385 miles
- Less miles

Page 7:



Differences:

- Viceroy's have a black line that cuts across their hindwings and have brighter colors than monarchs.
- Viceroy's are slightly smaller than monarchs.
- Viceroy's fly quickly and erratically, whereas monarchs float in a "flap, flap, glide" manner.
- Viceroy's' host plant is willow, while monarchs' is milkweed. They look very different as caterpillars.
- Viceroy's do not migrate.

Photos: Canva 18

Bibliography

Vocabulary Definitions (Pages 1-2)

Dictionary.com

Wikipedia.com (Mullerian co-mimicry)

Metamorphosis (Pages 3-4)

Metamorphosis Definition, Biology Dictionary

<https://biologydictionary.net/metamorphosis/>

Monarch Life Cycle, Metamorphosis, Stages of Development

<http://www.monarchs-and-milkweed.com/Monarch%20Life%20Cycle>

Monarch Caterpillar Stages With Pictures & Facts: 5 Larval Stage

Instars <https://www.activewild.com/monarch-caterpillar-stages/>

Adaptations (Page 6)

What Are Some Adaptations of Monarch Butterflies?

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Monarch Adaptations to the Crown (Flower)

<http://wingswormsandwonder.com/monarch-adaptation-crow-flower/>

Hawaiian Monarchs

<http://www.explorebiodiversity.com/Hawaii/BiodiversityForgotten/Wildlife/Invertebrates/Insects/Monarchs.htm>

Viceroy vs. Monarch Differences (Pages 7, 18)

Monarch or Viceroy?

<https://journeynorth.org/tm/monarch/Viceroy1.html>

Monarch Journey (Page 9)

Monarch Butterflies Migrate 3,000 Miles

<https://on.natgeo.com/3jtlp9>

Monarch Watch (Page 10)

Monarch Butterfly Migration and Overwintering

www.fs.fed.us/wildflowers/pollinators/Monarch_Butterfly/migration/index.shtml

The Discovery of the Monarch Butterfly Migration

<https://www.nathab.com/know-before-you-go/mexico-central-america/monarch-butterfly-migration/monarch-guide/the-discovery/>

Monarch Tagging Project (Page 11)

Monarch Watch Monarch Tagging Project

<https://www.monarchwatch.org/tagging/>