Young Naturalists

by Christine Petersen

Winging It

The phenomenal life and fragile future of the monarch butterfly.

Even if I live to be 100, I'll never forget the first time I saw a monarch butterfly.

It was a late summer morning, soon before I started second grade. I'd been complaining about the heat, but my great-grandmother just chuckled and handed me a large metal bowl. "Let's pick some tomatoes for lunch, hon," she said.

So out we went, to the vegetable garden that filled the backyard. Around its edges stood a border of sunflowers easily twice my height. And at the center of one plate-sized flower was the most spectacular butterfly imaginable, with wings the color of flames. "What is it, Granny?" I asked in a stunned whisper. Looking up from the tomato plants, she replied, "A wanderer. Some call them monarchs."

Perhaps you've been lucky enough to watch these big, beautiful butterflies gliding over parks, fields, and roads. At certain times of year, monarchs can be found throughout Minnesota, as well as most of the United States and southern Canada.

What's so special about monarchs? For me, it's the fact that they're familiar and mysterious at the same time—easy to spot, but leading complex lives that continue to challenge the understanding of scientists and naturalists who study and protect them.

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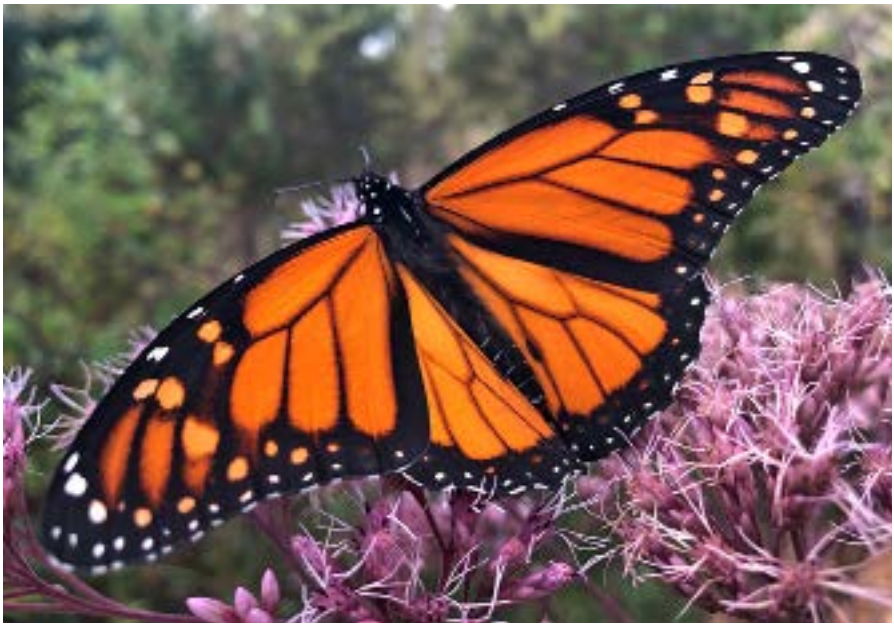

Gentle Beauties

Ask someone to describe a monarch and they'll probably mention the big orange wings, boldly marked with black stripes and white spots. With a wingspan up to 4½ inches, monarchs are large, showy insects.

Unlike some insects, monarchs don't sting or bite. And they are wonderfully easy to observe. A monarch's flight often appears to be leisurely, and it frequently stops to feed or warm up in the sun. If you're patient, you can sneak quite close. That's a great way to see how perfectly suited a butterfly's body is for its way of life.

From the Top. It makes sense to start your butterfly observations from the top: at the head. A pair of antennae are located here. So are two large eyes, each with many lenses that are sensitive to more colors than we can see. These structures help a butterfly spot and smell its plant food.

Peek under its head to locate its straw-like *proboscis*, which is coiled up most of the time. When a butterfly wants to feed on sweet, energy-rich nectar, it unrolls the proboscis and dips deep into a flower.

While the butterfly feeds, dusty *pollen* brushes onto its head, body, wings, or long legs. Later, if it visits another flower of the same kind, pollen may fall onto that blossom, *pollinating* the plant to help it make seeds that will be the monarch's food next year.

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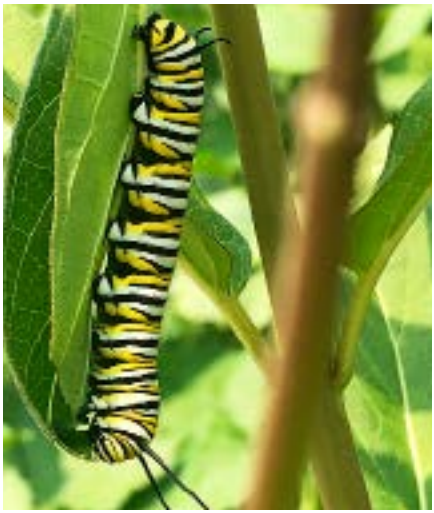
The Milkweed Effect

Monarch butterflies aren't usually picky eaters. You might spot them feeding on wildflowers, garden blossoms, or even certain kinds of flowering trees and shrubs.

But when a female is ready to lay her eggs, she is very picky. She must find a specific group of plants: the *milkweeds*, which are named for the milky white sap in their stems and leaves. Here in Minnesota, we have 14 different species of milkweed. A mother monarch lays her eggs on milkweed because it's the only thing her young can eat.

A Life of Changes

Among some insects, such as grasshoppers, young look like small versions of the adult. Butterflies have a different life strategy. They pass through three stages—*egg*, *larva*, and *pupa*—before becoming winged adults. Monarchs in each stage look so different that they might be mistaken for separate species.



The Monarch Nursery. Especially if it's been a long winter, or if you live up north, milkweed sprouts might be just a few inches tall when monarchs show up in May or June. But that's OK. Little plants have tender leaves that are easy to chew, and that's just what monarchs need in their *larval*, or caterpillar, stage.

A female monarch flies far and wide in search of milkweed. Whenever she spots a promising plant, she drops down and stomps on one of its leaves. Her slender feet have structures like taste buds. If the female tastes milkweed's unique, acidic flavor, she lays a tiny, football-shaped egg, usually on the underside of a leaf.

A lot of milkweed is needed: one plant for each of her several hundred eggs, providing plenty of food as they grow.

Small But Mighty. A new monarch larva is so small and pale that it's almost invisible. But it eats and eats, growing larger every day. Unlike adult monarchs that sip nectar, the caterpillar has strong jaws for chomping leaves. Its eyesight is weak, so it relies on smell, taste, and touch to find food and move around.

Every couple of days, the larva outgrows its hard outer skin. That *exoskeleton*—found on all insects—is like flexible armor, protecting the soft and vulnerable body within. The growing caterpillar must *molt* several times, replacing a too-small skin with a larger one.

Milkweed sickens most animals if they eat it. Why aren't monarchs affected?

Over thousands of years, the species has evolved so it can eat and even use the plant's toxins. A monarch caterpillar's little body stores these chemicals. As it eats more milkweed, yellow, black, and white stripes appear on its exoskeleton, and the larva begins to taste bitter to predators.

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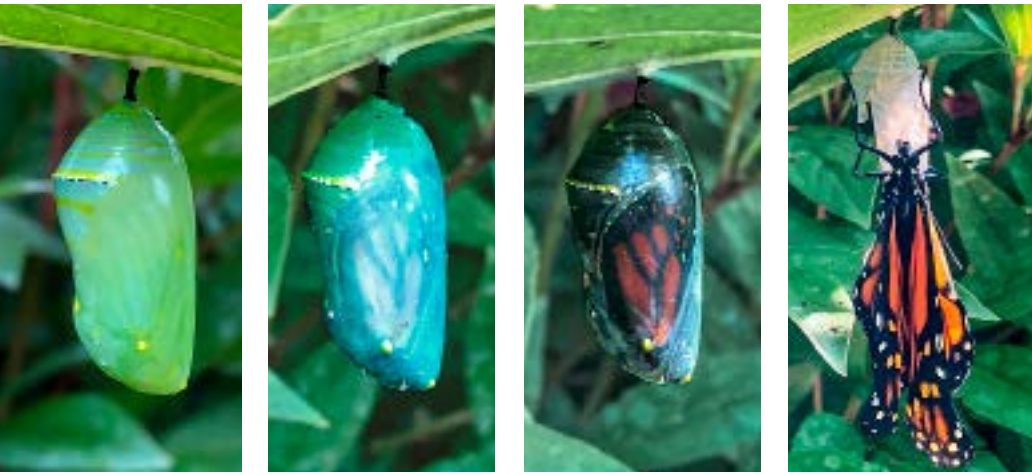

A monarch caterpillar transforms into a butterfly inside an exoskeleton called a chrysalis, which hangs suspended from a twig, leaf, or other hard surface.

Change, Change, and Change again

Within less than two weeks, the larva's big milkweed meals have caused it to grow several inches. Now the caterpillar stops eating, climbs off its milkweed plant, and finds a twig or other hard surface to hang from.

Hanging Out. For 24 hours or so, nothing seems to happen. But inside the larva, amazing changes are going on. Parts of its body that were inactive have begun to grow. The caterpillar is entering its *pupa* life stage.

After this rest period, the young monarch molts one last time. Its new exoskeleton is lime green and bag-shaped, with a scattering of gold spots. Look closely at this *chrysalis* and you might see the pale outline of colorless wings inside. Six legs are tucked in there, too, folded against the abdomen. The head, at the bottom of the chrysalis, is being rebuilt to hold adult eyes, antennae, and proboscis.

All Grown Up. Another week or so passes quietly, until suddenly the green chrysalis begins to turn orange and black. When it's ready, the monarch—now an adult—kicks its way free. At first, its wings are moist, crumpled, and small. The butterfly hangs there, twisting gently side to side. Fluid is flowing from its abdomen to fill thin, hollow tubes that give the four wings their delicate but sturdy shape.

A few hours later, the wings have dried and the adult can fly away. If the season is still spring or summer, it will feed, find a mate, lay eggs (if it's female), and die after about a month.

By contrast, adult monarchs emerging in late summer and fall don't breed: They fly away. Where do they go, and why do they leave? For a long time, these were the biggest monarch mysteries of all.

Where Do They Go?

In the 1930s, Canadian biologist Fred Urquhart became curious about monarchs. Urquhart began to net butterflies, placing a small tag on each one's wing before setting it free. He asked friends and fellow biologists across North America to help.

Over the years, some of these tags were found and returned. Marking them on a big map, Urquhart and his wife, Norah, looked for a pattern among the sightings.

Slowly, it became clear that monarchs fly south in autumn. Where they go seems to depend on where they started. Most monarchs born west of the Rocky Mountains fly to the California coastline, where people have long reported them in winter. East of the Rockies, monarchs head south into Texas. But from there … well, these millions and millions of eastern monarchs just seemed to disappear.

An American couple, Kenneth and Catalina Brugger, volunteered to continue the search into Mexico. They puttered along remote roads on a rickety motorcycle, stopping to ask if local people had seen big, orange-and-black butterflies. The Bruggers eventually reported thrilling news: They had tracked down the monarchs' hidden winter home.

From Minnesota to Mexico. Another big discovery about monarchs started with a butterfly from Minnesota.

In the summer of 1975, school naturalist Jim Gilbert and two of his students spent a morning at the Minnesota Landscape Arboretum, west of Minneapolis. They caught about 100 monarchs, attached a tiny identification tag to each one, and released them.

The following January, Fred and Norah Urquhart were in a quiet mountain forest north of Mexico City, watching an incredible scene: multitudes of monarchs clinging to tree trunks and branches like a living blanket.

One monarch is as light as a feather—but many together may weigh enough to break a tree limb. And that's just what happened. A branch crashed to the ground near where Fred Urquhart sat, and among the fallen butterflies was a flash of white. It was an ID tag.

Checking his records, Urquhart learned where that butterfly came from. It was one of the monarchs released a few months ago in Minnesota, marked PS 397. This tiny creature had survived a migration of more than 1,750 miles. It proved that monarchs travel vast distances to winter in the mountains of Mexico.

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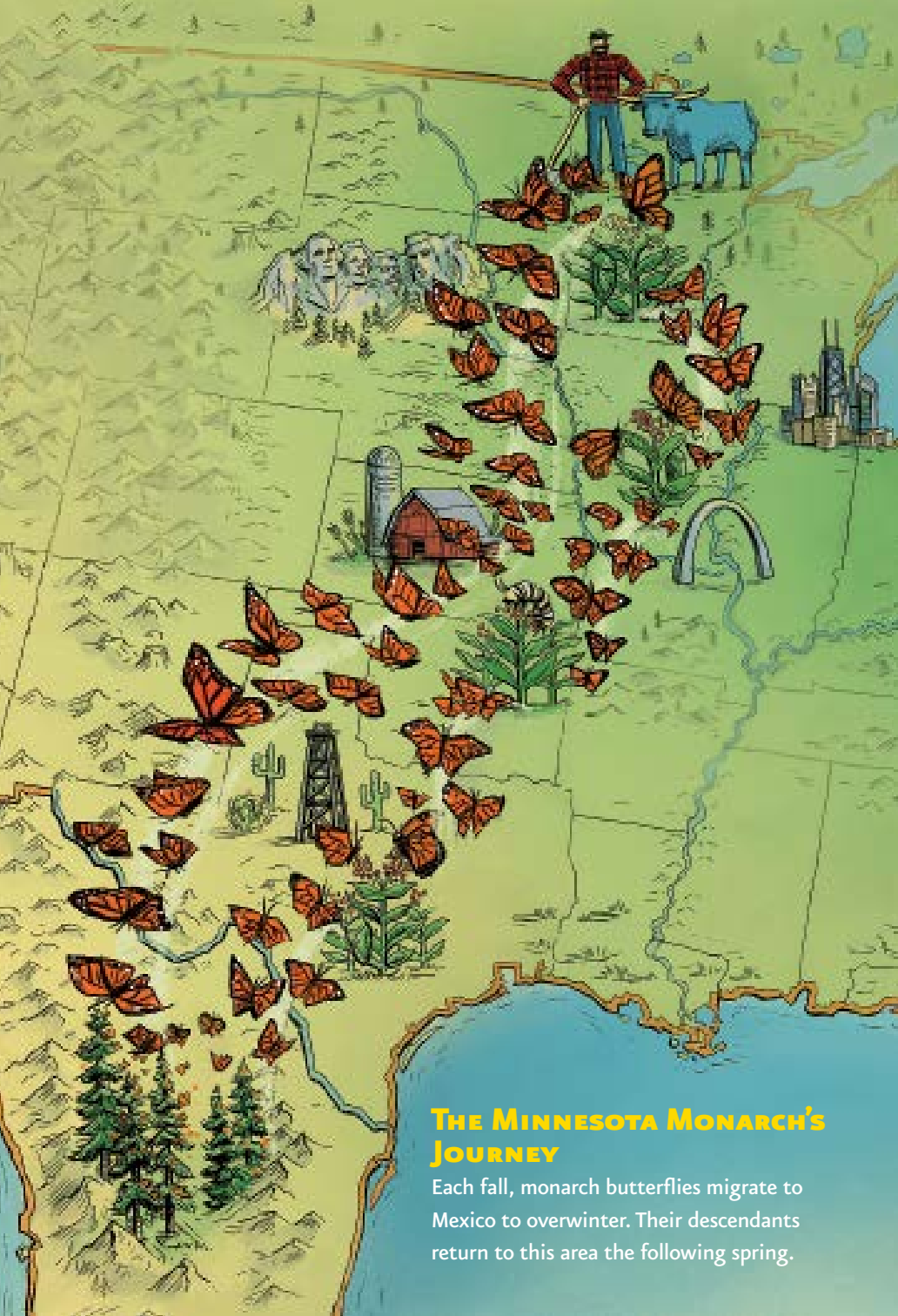

The Minnesota Monarch's Journey

Each fall, monarch butterflies migrate to Mexico to overwinter. Their descendants return to this area the following spring.

Time to Leave

Milkweed is fresh and tender in spring and early summer. But July and August bring heat, and sometimes drought. Milkweed leaves become too dry and tough for little caterpillars to chew. This change, combined with shorter and cooler days, tells a monarch the breeding season is over. So off they go, on that great journey toward the mountains of Mexico.

Finding Their Way. How does a monarch find its way to a distant place it's never seen? Scientists are still working to answer that difficult question. The butterfly seems to have an instinct to migrate. It probably uses the position of the sun to know which way is south. And perhaps monarchs can also feel changes in the planet's magnetic field.

In early spring, if a monarch has survived its long winter in Mexico, it mates and flies northward into Texas or nearby. After eggs are laid, the butterfly's life ends. But its eggs will hatch, grow up, and migrate a few hundred miles farther north. These butterflies, too, will lay eggs and die. It is usually their offspring—the year's third generation of monarchs—that return to Minnesota. They arrive just in time to enjoy the new spring crop of milkweed.

Teachers resources. Find a Teachers Guide and other resources for this and other Young Naturalists stories at *mndnr.gov/young_naturalists*.

Monarchs gather on trees at The Nature Conservancy's Bluestem Prairie Preserve in northwestern Minnesota.

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Bad News, Good News

Since the 1990s, monarch populations have changed. Experts and everyday people notice fewer monarchs throughout the breeding areas. Winter counts in Mexico and California confirm this decline.

One reason is that more people need more land—for farms, roads, and towns—which means less habitat for monarchs. Another is that we've used chemicals to control unwanted insects and plants. Sadly, some of those products can harm monarchs or their plant foods. There may be other reasons for the monarch decline that we don't fully understand.

In 2024, the United States government agreed to consider protecting monarchs as a "threatened species" under a federal law called the Endangered Species Act. That could encourage people to plant more milkweed and nectar flowers that the butterfly needs during all its life stages. High-quality monarch *habitat* could also be protected in areas that already offer those important resources.

Meanwhile, the Mexican government and others are working to reduce logging and other threats in the mountain forests where monarchs shelter every winter.

Each of us can help monarchs, too! If you have a yard or a natural area at home, plant milkweed and a mix of Minnesota's many wonderful native wildflowers. Don't have a yard? Encourage your teachers to add milkweed and wildflowers outside the school building. Every little action helps—including just stopping to watch these marvelous creatures live their lives in nature. n