

# Monarch Tales



## In a Nutshell

Students act out the life cycle of the monarch butterfly to understand the importance of milkweed to the survival of this insect. Students then participate in a milkweed mapping project on the refuge.

**Grade:** 1-3

**Season:** Fall

**Location:** Bloomington Education and Visitor Center, Rapids Lake Education and Visitor Center

## Learning Objectives

After participating in this activity, student will be able to:

- Name the 4 stages of the monarch butterfly: egg, caterpillar, chrysalis, and butterfly.
- Identify the milkweed plant and know that it is the main food source for the monarch caterpillar.
- Describe how monarch caterpillars grow from their first instar to their 5<sup>th</sup> instar, increasing in size with each shed.
- Relate the number of milkweed plants to the monarch butterfly population.
- Explain the importance of habitat conservation to monarch butterflies.
- Give at least one example of another member of the milkweed community.

## Literature Connections

- ***Monarch! Come Play with Me*** by Ba Rea
- ***Monarch and Milkweed*** by Helen Frost and Leonid Gore (book and DVD)
- ***Monarch Butterfly*** by Gail Gibbons
- ***An Extraordinary Life: The Story of a Monarch Butterfly*** by Laurence Pringle

## Pre-Activities

Students act out the life cycle of the monarch butterfly.

## On-site Activities

Students participate in a milkweed mapping project on the refuge. They learn to identify common milkweed plants in various stages of growth and mark their location on maps. They also discover and learn about the many other members of the “milkweed community”.



## Minnesota Valley National Wildlife Refuge

*\*Monarch tagging may be conducted as part of the field trip if refuge staff is available and a monarch is caught by the class.*

### Teacher's Classroom Connection

- The University of Minnesota's Monarch Lab has a variety of lesson plans, activities, etc. to get your students involved with Monarchs. Their website is:
  - <https://monarchlab.org/>
- Raise Monarchs in the classroom for tagging and releasing.
- Send a symbolic Monarch to Mexico. Go to the website below for more information and lessons/activities for teachers to use in their classrooms.
  - <https://www.learner.org/jnorth/sm/index.html>

### Teacher Resources

- ***Milkweed, Monarchs and More: A Field Guide to the Invertebrate Community in the Milkweed Patch*** by Ba Rea, Karen Oberhauser and Michael Quinn
- ***Monarch Magic! Butterfly Activities & Nature Discoveries*** by Lynn Rosenblatt
- ***The Monarch Butterfly: Biology and Conservation*** by Karen Oberhauser
- ***The Monarch Butterfly: Uniting a Continent*** by Karen Oberhauser
- ***La Mariposa monarca: uniendo un continente*** by Karen Oberhauser



## Monarch Tales Pre-Activity

### Materials

- 3 plastic leaves with a piece of velcro attached
- Small Styrofoam balls with velcro attached - *these attach tightly to the leaves...PLEASE take care when removing them after the activity*
- 4 Black body pillow covers
- 1 Green body pillow cover
- Clear plastic shower liner
- Monarch costume wings
- "Milkweed" fake pink hydrangea flowers
- Black pipe cleaner Proboscis – *students SHOULD NOT put this in their mouths...they can hold it near their face while they act out the monarch drinking nectar*
- One large dark sheet that serves as a production "curtain"
- Zip drive with power points and hatching video
- 2 copies of *The Story of the Monarch Life Cycle* (Narrator and Teacher)
- 1 laminated copy with pictures for *The Story of the Monarch Life Cycle*

### Introduction/ Background

(5-7 min)

Discuss the human life cycle with the students. Assist them with listing the stages of human development:

*Infant → Toddler → Preschooler → Child → Pre-teen → Teenager → Young Adult → Adult → Senior*

Next, ask them if they have ever seen a monarch butterfly. Show a picture of a monarch and explain that monarchs, like humans, undergo changes throughout their life. These life changes that are also known as a **metamorphosis**, do not just involve growing bigger or getting older. Organisms that go through metamorphosis are changing their entire body form as they grow into adults. The word *metamorphosis* comes from two Greek words which together mean **new life**.

Ask students if they can name any other animals that go through metamorphosis as they become an adult. Answers could include:

- ✓ Salamanders
- ✓ Toads
- ✓ Frogs
- ✓ Some insects

**“Re-enacted” Story of the Monarch Life Cycle**  
(35 min)

Explain to students that you are going to tell them the ***Story of the Monarch Life Cycle*** using pictures to illustrate each stage a monarch goes through on its way to becoming an adult.

This story can be presented in two ways:

- **Option 1** uses laminated pictures to illustrate each life stage while only reading the story printed on the back of the pictures.
- **Option 2** includes a narrated theatrical play involving student volunteers to act out the metamorphosis of a monarch butterfly through 6 scenes.

If doing option 2, tell the class that you will need volunteers to assist in this theatrical production. Explain each job as described below:

- **Narrator (played by the refuge staff):** Sets the “stage” for each scene
- **Casting Director (played by the classroom teacher):** Selects the actors needed for each scene.
- **Set Operators (Two student volunteers):** Close and open the production curtain between scenes. They will open the curtain when they hear the word “*action*” and close the curtain when they hear the word “*cut.*”
- **Actors (Student volunteers):** Students will be selected to act out each scene. The casting director will select a new set of actors before each scene. They should listen to the narrator for clues on how they should act out the scene.

## The Story of the Monarch Life Cycle

### Scene 1: Adult and Milkweed

#### CASTING DIRECTOR:

- Select three student volunteers to come up in front of the class to hold the artificial “milkweed” plants.
- Select one student volunteer to put on the monarch wings and flutter around the milkweed.

#### NARRATOR:

**“ACTION”:** “Before a monarch even has a chance to begin its life, there must be milkweed. There are hundreds of different kinds of milkweed. Milkweed is critical to the survival of the monarch because it is the only place a female monarch will lay her eggs and it is the only thing the monarch caterpillar will eat. It is commonly believed that milkweed protects the monarch because it contains a toxin that makes it distasteful to predators (the monarch’s bright colors are a warning).”

**“CUT”**

## The Story of the Monarch Life Cycle

### Scene 2: Egg

#### CASTING DIRECTOR:

Hand your volunteer “monarch butterfly” a styrofoam “egg” and direct them to attach it to the bottom of the plastic “milkweed” leaf (where the Velcro is attached).

#### NARRATOR:

**“ACTION”:** “Once a female monarch butterfly finds a milkweed plant, she lays a single egg on it and the 1<sup>st</sup> stage of life for a new monarch begins. Monarchs lay their eggs on the underside of the milkweed leaf to protect them from weather and predators. Monarchs only lay one egg per leaf and between 100 and 300 eggs in their lifetime.”

**“CUT”**

## The Story of the Monarch Life Cycle

### Scene 3: Instar(s)

#### CASTING DIRECTOR:

- Select up to four students (ranging from shortest to tallest) to become instars and act out “shedding” their exoskeleton.
- Have the smallest student climb into the body pillow feet first. This will be the first instar. Ask him/her to leave his/her head out of the cover so he/she can hear and see what is happening.
- After the first “instar” student molts, eats its exoskeleton, and nibbles on the milkweed as directed by the narrator, send him/her back to his/her seat in the audience. This is the signal for the next taller “instar” to begin its molt, etc.

#### NARRATOR:

**“ACTION”:** Because monarchs are insects, they wear their skeleton on the outside of their body, this is called an exoskeleton. As they grow bigger and bigger, the exoskeleton gets tighter and tighter until it is time for the monarch to shed its skin, or molt. Each time the caterpillar sheds, it eats its old skin before snacking on more milkweed leaves.

The life stages between molts are called instars. Monarchs go through five instars. Each caterpillar here represents a different instar.

## The Story of the Monarch Life Cycle

### Scene 4: Chrysalis

#### CASTING DIRECTOR:

- Select another volunteer to represent the “chrysalis”. Direct them to climb into green pillow case feet first.
- Next direct them to climb into the black body pillow feet first completely hiding the green color underneath.

#### NARRATOR:

**“ACTION”:** Once the monarch caterpillar reaches its 5<sup>th</sup> instar, it’s time for the metamorphosis to begin. The monarch finds a good place to transform and spins a silk pad where it will hang upside-down shed its skin one last time. Underneath its caterpillar skin, a green chrysalis has formed. Now the monarch is in the 3<sup>rd</sup> stage of its life cycle. The monarch hangs protected and motionless in its chrysalis for 8 to 15 days.

**“CUT”**

## The Story of the Monarch Life Cycle

### Scene 5: Emerging Adult

#### CASTING DIRECTOR:

- Direct the “chrysalis” student to take off the green pillow case.
- Select one volunteer to put on the butterfly wings and the black body pillow case. Wrap the student in the plastic shower curtain liner.

#### NARRATOR:

**“ACTION”:** The day before the metamorphosis is complete, the pigmentation, or color, on their wings develops and can be seen through the chrysalis. When the monarch is ready, it will break out of its chrysalis and begin the 4<sup>th</sup> stage of its life cycle, the adult, or butterfly, stage. Remove the plastic and let the new “adult” pump its wings until it is ready to “fly” around the room.

When it emerges, its wings are wet and very delicate. It must sit still and pump blood into its wings and let them dry out in the sun. After an hour or two the monarch butterfly is ready to fly!

**“CUT”**

## The Story of the Monarch Life Cycle

### Scene 6: Feeding Adult

#### CASTING DIRECTOR:

- Select 3 volunteers to hold the artificial milkweed plants (leaves and flowers).
- Give the monarch butterfly a pipe cleaner proboscis.

#### NARRATOR:

**“ACTION”**: In addition to its new wings, the monarch also has a new way of eating. Instead of having a sharp mouth part for cutting and chewing leaves, the monarch butterfly has a proboscis which it uses like a straw to drink nectar from flowers. Hand the adult butterfly a proboscis in order to “feed” on nectar from the milkweed flowers.

**“CUT”**

## Minnesota Valley National Wildlife Refuge

### **Wrap-up** **(5-10 min)**

Review with students the life cycle of the monarch butterfly using the new vocabulary presented. Can they name each stage of life the caterpillar goes through from egg, growing and shedding as five instars, into a chrysalis, and finally hatching into the adult butterfly?

After the review, show students the time-lapsed video, *Monarch Hatching*, which was created by refuge staff. Use the narrative below to describe how this video came about.

1. In late July of 2011, refuge staff found monarch caterpillars on milkweed plants growing on the Rapids Lake Unit of Minnesota Valley National Wildlife Refuge. A total of 7 caterpillars were collected that day, two of which were still in egg form. The one in the video was a newly hatched 1<sup>st</sup> instar.
2. This first instar spent 21 days (3-weeks) eating and growing. Staff added fresh milkweed to the insect's enclosure daily. On the 22<sup>nd</sup> day the caterpillar, now a 5<sup>th</sup> stage instar, moved off the milkweed leaves, crawled to the top of the enclosure, and attached himself by spinning a silk pad. Within 24 hours the process of creating its chrysalis was complete. Staff was not in the office to see the actual transformation. They returned to find the instar now hanging from the top of the enclosure.
3. The monarch caterpillar was in the green chrysalis form for one week before the outer shell of the chrysalis became clear and the orange and black body and wings on the developing butterfly could be seen. At this point, staff set-up a video camera and waited for the butterfly to emerge.
4. The entire process; hatch out of the chrysalis, pumping body fluid into the wings, and hanging until the wings dried, took 60 minutes. A black pheromone patch (a dark black dot) appeared on each hind wing, the mark of a male butterfly. The butterfly was released the same day.

## Monarch Tales On-site Activities

### Materials

- Fall peak monarch migration map by latitude
- Monarch life cycle magnets
- Laminated milkweed seeds
- Milkweed life cycle booklet
- Milkweed examples - fresh and/or dried (*not in bin – cut close to field trip*)
- Monarch tags (laminated example to pass around)
- Monarch butterfly finger puppet
- Monarch migration power point **OR** laminated booklet
- Milkweed maps (specific to Bloomington or Rapids Lake)
- *Milkweed, Monarchs and More* book by Ba Rea, Karen Oberhauser, Michael Quinn (1 per table)

*\*\* Depending on availability, monarch tagging can be conducted in conjunction with the hike. If included in the field trip, the following will also be needed:*

- One butterfly (aerial) net per team
- Current monarch tags for staff to tag Monarch butterflies
- Male vs. Female monarch pictures
- Monarch vs. Viceroy butterfly pictures

### Introduction

**(30 min)**

Welcome the students to the refuge. Inform them that during their field trip, they will be learning more about monarch butterfly habitat, monarch butterfly migration, and help biologists record the location of critical butterfly habitat on the refuge.

Begin the lesson by reviewing each part of the life cycle using the butterfly life cycle magnets, asking student volunteers to come up to the board and show the class the correct order of the metamorphosis. Stress the importance of milkweed to the monarch at all stages of the plant's life cycle.

Use the fresh, dried and/or photo examples of milkweed in each of its stages (growth, flowering, seeding). Pass around the laminated milkweed seeds. Ask students if they can tell how the seeds are spread. (**Wind** – the white “floss” of the seed, called ‘coma’, creates a parachute for the seed to disperse by wind; **Water** – the coma is waterproof and can float in water)

*\*\* If students did not have the chance to see the monarch hatching video in the pre-activity, show them before (or after) they go outside (~2 min. long)*

### **Milkweed Survey**

**(45 min)**

Explain to students that they will help refuge biologists track changes in monarch habitat on the refuge. They will be assigned a habitat plot and asked to count the number of milkweed plants they find. Pass out their journal page. Review with the students the types of information they should collect for their assigned habitat plot. Emphasize that some plots may have less milkweed than others, which is good information for the biologists to know. Review the stages of the milkweed plant using the photo flip book of the milkweed life cycle so that students and leaders can easily identify milkweed plants when they find them.

Divide the class into teams so that each team has an adult leader. Provide each adult with a milkweed plot map, a clipboard with a wet erase marker, a journal page, and the group leader guidelines. Also provide a copy of *Milkweed, Monarchs and More* to identify and record other insects they find that are a part of the milkweed plant community.

*\*\*\* Depending on availability, monarch tagging can be conducted by staff in conjunction with the hike. If monarchs have been spotted in the area, instruct students how to properly collect their monarch butterfly. Use the net in a gentle, but quick sweeping motion in the air. When a monarch is caught, turn the net upside down on the ground, holding the bottom point toward the sky to coax the butterfly to move deeper into the net and grasp the net material far below the butterfly with one hand to prevent escape. A second person gets a refuge staff's attention to tag the monarch butterfly. The refuge staff places a butterfly tag on the hind wing of the monarch and the butterfly is placed on the hand of the person who caught it, before it is released into the air.*

**Discussion:** When students return, give them time to share their discoveries. Which plots had the highest number of milkweed plants? Which had the lowest number of milkweed plants? What might be the reason for these differences? Did students find other members of the milkweed community?

### **Wrap Up**

**(45 min)**

Encourage the students to watch the monarch life cycle in their community. When do the first monarchs arrive again in Minnesota? Where are the adults feeding? Where do you find monarch caterpillars? Keeping track of the answers to questions like these is called **Phenology**, *the observation of nature's patterns and rhythms through the seasons*. Comparisons from year to year can help scientists determine how changes in the environment affect these natural cycles of plants (the milkweed) and animals (the monarch).

Next, introduce the fascinating cycle of monarch migration using the PowerPoint.

**Slide 1: Insect Migrators?**

Some Minnesota insects hibernate, but most lay eggs and die with the first hard freeze. Monarchs are unique in that they are the only butterfly in North America and one of the only insects (besides the green darner dragonfly) that migrate.

**Why do monarchs migrate?** Monarchs, like all other insects are cold-blooded and are must rely on the sun to warm their body temperature. They cannot fly when the temperatures drop, even if blooming plants are still available. Secondly, as the fall season goes on there are fewer and fewer blooming plants carrying the nectar they feed upon.

**Slide 2: Fall Migration Map**

Every fall in Minnesota, beginning in late September, monarch butterflies begin to fly south. It's about 2,000 miles from the Twin Cities to the Oyamel (o.ja'mel) fir forests where the monarch butterflies spend their winters hibernating. If you were to take the trip with the monarch butterflies on foot (no planes, cars, or bikes) it would take more than a month to get there and that's if you never stopped to rest! That's a long journey!

Use the monarch butterfly finger puppet (have the students give it a name) to help illustrate how long the journey is. "Fly" the monarch along the migration map from Minnesota to Mexico and as you fly, discuss the types of obstacles that monarchs might encounter on their journey. Have the students brainstorm a list on the white board. Things to include might be **weather** (monarchs can't fly when it's raining, too windy, too cold, or too hot); **food and rest-stops** (discuss habitat loss); **predators** (birds, spiders, mice, cats, etc.); and **humans** (cars, pesticides, insect collectors, towers, buildings, etc.).

**Slide 3: Fall Migration Timeline**

Scientists have been tracking monarch butterfly migration over the years and know roughly when their migration starts and how long it takes to complete the journey south. Monarch butterfly migration is triggered by several natural cycles including length of daylight and temperatures.

The length of daylight is determined by the tilt of the earth in relation to its orbit around the sun. This path does not change from year to year. The amount of sun we have today is the same amount we will have next year on this date.

Temperature, however, can be change a lot from year to year. It is affected by many weather events like winds, rainfall, and ocean currents, to name a few. This year's fall might be mild with warmer than normal temperature or monarch butterflies might get surprised by early snowfall.

**Slide 4: Winter Rest**

**What do monarchs do in their winter habitat?**

Once the monarch butterflies reach Mexico, they are surrounded by millions and millions of other migrating monarchs butterflies which cluster together all over the Oyamel fir trees high up in the mountains. The monarchs use the fat that they have stored up on their journey south to nourish them as they hibernate through the winter.

The Oyamel fir forests are very important for the monarch butterflies during the winter because they provide the perfect habitat. The trees and shrubs protect them from snow, wind, and predators. The climate is not too warm and not too cold. The fog and clouds provide moisture for the monarchs to drink. Without these special roosting sites, the monarch butterflies could not survive.

**Slide 5: Spring Migration Map**

As winter ends, the days grow longer and warmer. It's time to start the cycle over again, to make the trip back north to find milkweed and lay eggs. Use the butterfly/caterpillar finger puppet to help illustrate spring migration.

As the monarch butterfly makes its way north again in March, it may encounter some of the same obstacles as in the fall. Now, on the journey north, instead of spending her time sipping nectar to store up fat, the monarch butterflies mate and lay eggs on milkweed plants. Soon, the monarch butterfly that has made the long journey dies and the eggs that were laid, begin to hatch. These new monarch butterflies go through their life cycle and continue north and lay even more eggs along the way. These monarch butterflies have a much shorter life span of about 3-5 weeks compared to the 9 month lifespan of their parents. It will be their children and grandchildren (our original monarch butterfly's great- and great-great-grandchildren) that will make the journey to Mexico again in the fall.

**Slide 6: Tagged Monarch**

How do these great grandchildren of our original monarchs know their way back to Minnesota? Scientists are not yet sure. Monarch tagging is one way that scientists learn more everyday about this mystery. Show students the example of tags and where they are placed on an adult monarch butterfly.

These tags don't bother the monarchs, just like wearing jewelry does not bother most of us. The tags have an identification number that is connected to the area they were caught. It also includes an address to contact should they be recaptured or found dead.

All of the data collected helps scientists answer questions not only about monarch life cycles and migration, but also about habitat loss and climate change. Tracking the monarchs helps us understand more about what's happening in the environment.

**Management Connections: Monitoring the Monarchs**

Ask what they think is the number one threat to monarch populations. Discuss their answers and explain how habitat loss is making it more and more difficult for the monarchs to survive their long journey to and from Mexico. New homes, roads, and agricultural fields transform the natural landscape and make less space for the monarch to find food, water, and shelter.

In Mexico, the Oyamel fir trees where the monarch butterflies roost are very valuable as lumber and are being cut down. So, not only are the monarchs losing the trees they roost on, but there are fewer trees in the surrounding forest to protect them from threats like wind, snow, and rain. Sanctuaries have been set up to help protect the monarch butterfly roosting sites.

Here in their summer, milkweed is getting harder and harder to find. Planting butterfly gardens, restoring native prairie is critical to ensuring populations can find the food they need to survive and reproduce. The US Fish and Wildlife Service's current initiative is to work with other cities and states along the I-90 corridor to create a connected path of habitat (flowers for nectar and milkweed for laying eggs) for monarch butterflies as they migrate. The goal of this initiative is to provide food for the monarch butterflies throughout their migration to Mexico.