

Monarch Tagging

Grade: 2nd **Season:** Aug. 15 – Sept. 30 **Group Size:** 1 class
Time: 1½ hours **Ratio:** 1:5, adults to children



For the Teacher:

Overview	As a large group or class, students will brainstorm questions they have about tagging monarchs. In small groups and partners, they will search for, capture, tag, and release migrating monarchs in the prairie with the help of parent chaperones and PWLC staff. As a small group, they will record their observations on a data sheet and share their results with the larger group. Lastly, they will discuss the results of their investigation.
Subjects Covered	Science, Language Arts
MN Academic Standards Supported	Helps support 18 standards. See sections “2009 Minnesota Academic Standards in Science” and “2010 Minnesota Academic Standards in Language Arts
Skills Used	Investigating, questioning, identifying, exploring, observing, concluding, recommending, team work, following directions, humane treatment of live animals (and other skills depending upon student questions)
Performance Objectives	After completing this activity, students will be better able to... <ul style="list-style-type: none"> • Differentiate between monarch and viceroy butterflies • Differentiate between male and female monarch butterflies • Demonstrate how to humanely capture a live monarch butterfly • Ask questions about monarchs, make careful observations, and seek answers. • Enjoy searching for and/or tagging migrating monarchs!
Vocabulary	Insect, butterfly, monarch, investigation, nectar, migration, Mexico

For the PWLC Instructor:

PWLC Theme	The Prairie Pothole Region
Primary EE Message	The prairie pothole region is valuable and in need of restoration and protection.
Sub-message	Wildlife: The prairie pothole region is home to a variety of resident and migratory wildlife.
PWLC EE Objective	<ul style="list-style-type: none"> • Use scientific methodology to explore the environment (ask questions, hypothesize, collect data, analyze data, form conclusions, make recommendations). • Value and affect the prairie wetlands environment through their stewardship ethic.
Materials	<ul style="list-style-type: none"> • Insect nets, one per two students • Monarch, viceroy, painted lady, and red admiral butterfly photos • Monarch tag visual aid • Monarch tags, data sheets, and clipboards for adult taggers • Clipboards, blank or recycled paper, and pencil, one each per small group • Easel, paper, and markers • Monarch puppet and flower petal necklace
Location	Classroom and nearby prairie areas

Background Information

During this field investigation, students have the opportunity to find and tag monarch

butterflies, an insect species native to prairie wetlands. Using questions generated by students, students also conduct a monarch tagging investigation to attempt to answer some of their questions.

Since 1998, the Prairie Wetlands Learning Center has partnered with the University of Kansas' Monarch Watch program to provide visitors with the opportunity of capturing, tagging, and releasing migrating monarch butterflies. Much of the information provided in this background section comes from the Monarch Watch web site, www.monarchwatch.org.

Monarch Watch is an educational outreach program that engages citizen scientists in large-scale research projects. It involves more than 2,000 schools, nature centers, and other organizations in the United States and Canada, and an estimated 100,000+ students and adults participate in tagging activities each fall. Nearly 4,000 records have been added to the Monarch Watch Tag Recovery database, bringing the total number of records to more than 15,000 for the 1992-2010 monarch tagging seasons. Approximately 2,500 records represent monarchs observed/recovered in the U.S. or Canada and more than 12,500 records represent monarchs recovered at the overwintering sites in Mexico, collectively recognized as a World Heritage Site by the United Nations since 2008. Tagging monarchs began in the 1930s, and it was not until 1975 that the first over-winter site was found in Michoacán, Mexico.

Monarch tagging helps people monitor the success of conservation efforts using real data collected by citizens in many locations. Although it seems like there are plenty of monarchs that gather to migrate each fall (up to 100 million), it might be hard to imagine they face any threat of serious population loss. However, monarch butterflies face a number of threats to their survival along their migration routes, in summer breeding areas, and in their wintering sites. In the U.S. and Canada where monarchs breed, they face direct habitat destruction caused by humans (new roads, housing developments, farming expansion). Monarchs are also impacted negatively by more subtle habitat destruction in the loss of their host plants. Monarch larvae feed exclusively on milkweed, which is considered a noxious weed to some people, and it is often destroyed. In some places across North America, milkweed plants are being severely damaged by ozone. Adult nectar plants and milkweed are also vulnerable to herbicides used by many landscapers, farmers, gardeners, and others. And monarchs themselves can be killed outright by many pesticides and vehicle collisions.

On their wintering sites, monarchs are even more vulnerable. Along with all monarchs in the eastern U.S., PWLC monarchs migrate to the Transvolcanic Mountains in Mexico, where there are only 11 to 14 known isolated mountaintop wintering sites each year. Each site is a few hectares in size and contains millions of monarch butterflies. This combination - a high concentration of individuals in only a few small sites - makes the possibility of habitat destruction in Mexico very serious. Local people log trees for lumber and use the cleared land for grazing cattle and growing food. Logging opens the forest canopy, making wintering monarchs more vulnerable to freezing. In December 1995, scientists estimate that five to seven million monarchs died after a snowstorm hit

the wintering sites. The large, unbroken forest serves as an umbrella from storms and a blanket from the cold. Even thinning trees in the forest changes the microclimate balance.

This forested microclimate is warm enough so the monarchs typically do not freeze and cool enough to slow their metabolism and conserve energy. In February, air temperatures begin to increase, and monarchs go down the mountains to find humidity, following the direction of creeks. They mate starting in March and then depart for the United States. Generation 1, then, lays eggs in the southern U.S. which hatch, metamorphose, and continue north. Generation 2 arrives in Minnesota, breeds, lays eggs, bringing Generation 3 to life. Generation 3 lays eggs in Minnesota, leading to Generation 4, whose maturity is delayed until spring (diapause). It is Generation 4 which migrates back to Mexico, and the cycle begins anew.

Conservation efforts have been partially successful but have not guaranteed the survival of one of the few migrating insects. Despite the establishment of five sanctuaries in 1985 and the opening of tourist trade, these efforts have not yet assured the continued survival of the wintering monarch population. Providing creative economic alternatives must be part of a successful solution. Here at home, we can help by:

- educating others
- limiting our use of pesticides
- supporting land preservation projects
- visiting the over-wintering sites as eco-tourists (which provides an income source for local Mexicans and incentive to protect forests)
- planting and protecting native nectar plants and milkweed species
- and by capturing and tagging migrating monarchs, weighing only as much as a paper clip, to provide new data for scientists to use.

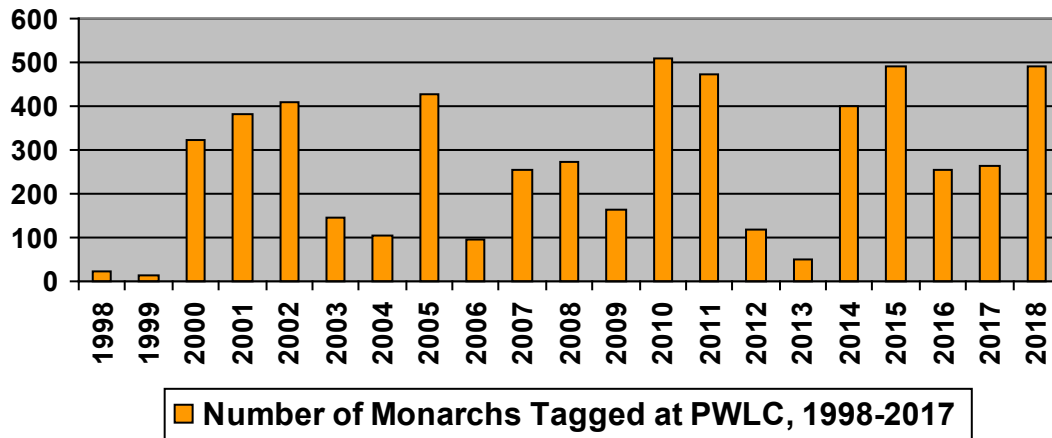
Since 1998 when the PWLC began tagging monarchs:

- People have tagged over 4,524 monarchs here.
- A total of 61 PWLC tags have been recovered from five locations.
 - Serra Chincua, Cerro Pelon, Piedra Herrada and El Rosario, Mexico; over 1,880 miles away from the PWLC.
 - Lidderdale, Iowa, directly south of the PWLC.

The number of monarchs tagged each year varies depending upon the weather and the number of people who participate in tagging at the PWLC. See the charts and graph below for a visual depiction of our monarch tagging data over the years.

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Number Tagged	25	15	322	381	411	146	106	428	94	254	275	162

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	Grand Total
Number Tagged	509	472	120	50	402	492	256	262	491	5,015



We appreciate classes participating in this real-life scientific study!

Teacher Preparation

- We highly recommend conducting one or more of the suggested extensions before your visit in order to integrate this field investigation into the classroom study of animal life, insects, migration, life cycles, adaptations, or other topics. We believe such integration enhances student motivation for learning in other curricular areas. Please see section, “Teacher-Led Extensions/Adaptations/Assessment Ideas.”
- To maximize outdoor classroom time at the PWLC, teachers may
 - Conduct steps 2 and 3 in the section “Field Investigation Procedure” at school. Upon arrival at the PWLC, teachers may provide PWLC staff with a written list of what students know and wonder for quick review before heading out into the prairie.
 - Organize students into small groups at school, each led by one chaperone, and everyone wearing nametags.
- Please help save paper. Bring your students’ science notebooks or journals to record their field data and discoveries in. You may wish to print, photocopy, and tape the last page of this lesson to the cover of the notebook, and attach a pencil to each notebook with string or yarn. If science notebooks are not available, please inform the PWLC staff that you will need paper and clipboards when booking your date.

PWLC Preparation

PWLC staff purchase and provide monarch tags in advance for the class to use. Also, organize materials.

Field Investigation Procedure

1. In the center, welcome students, teachers, and chaperones to the Prairie Wetlands Learning Center. Review rules for the trail.

2. Ask students what they already know about monarchs and tagging them.
3. As you facilitate discussion, ask the teacher to record any questions students have about monarchs on an easel or white board. What do they wonder about them? What do they hope to find out by tagging monarchs today? What might they predict they will discover?
4. Distribute one clipboard, data sheet, and one pencil to each chaperone to carry for their small group. Set up a sample data sheet on the easel or white board for the chaperones to copy down on their clip board. Set-up of the data sheet should be directly related to the students' unanswered questions. For example, you may divide the sheet into quadrants. In one quadrant you might record the total number of monarchs found; in another, the number of males and females observed. In the third quadrant, you might record the colors of the flower monarchs were observed using. The last quadrant might include discoveries, new questions, weather observations, or surprises.
5. Explain to students that they also have the opportunity to be scientists and search for monarchs to tag. Ask them why people tag monarchs.
6. Demonstrate how students should carry the nets upright, not over their shoulders where a sudden turn could accidentally hit another person with the hoop or handle. They should not use it as a walking stick. Students will work in pairs with each pair sharing one net.
7. With two student volunteers and props, demonstrate the best technique for capturing a monarch butterfly. They should wait until a monarch has landed on a plant and not chase flying monarchs as often depicted in cartoons. Approaching the monarch with the net turned for a narrow profile is less threatening than approaching the net turned for a wide view or fully extended. To do this, demonstrate how to pull the end of the net along the handle and how to gently but quickly extend it at the last second over the top the plant, capturing the monarch. Show them how to close the net with one hand below the monarch and pull the net off the plant.
8. Encourage them to protect the plants as nectar source for monarch when capturing them. They should try their best only to capture monarchs as other butterflies are frail and may be harmed by being caught in the nets.
9. Once students capture a monarch, their group should locate the PWLC staff person for tagging. Try to round up as many students as possible to observe the first monarch being tagged, in case no others are captured. The staff person will carefully remove the monarch from the net, record data about the monarch, tag it, and help the student who caught it to release it.
10. Students may walk off trail to search for monarchs, but they must stay with their partner and their chaperone. They must also stay somewhat close to the PWLC staff person because that person has the tags. Teachers experienced in tagging may also carry tags and use them. Students should try to avoid areas with a lot of thistles which tear nets and scratch skin. Provide chaperones with visual landmarks to use as boundaries. Tell chaperones how much time they will have to search for and tag monarchs and ask them to observe the time on their watches.
11. Distribute the nets. Allow students as much time as possible to find, capture,

and tag monarchs. They should record their observations on the data sheet for their small group.

12. Meet back at the amphitheater or classroom at the appointed time. Collect the empty nets.
13. To wrap-up, ask each group to share their results with the rest of the class. Tabulate a class total of monarchs captured and other results using the data sheets and unanswered questions as a guide. If the class caught no monarchs, discuss why this happened. Was it related to weather conditions? To protocol? What suggestions would they have for doing this differently next time? Would the results be the same? Do they think monarchs and the prairie are important? If so, why? How can they be a friend to monarchs and the prairie?
14. Collect the clipboards and pencils. Teachers may collect the data sheets to bring back to school for further use. Thank everyone for coming and for their help! They are all citizen scientists making a difference for monarchs!

Weather Alternatives

Field investigations take place rain or shine. Everyone should dress appropriately for the weather. In the event of unsafe weather (lightning, high winds) or pouring rain, everyone must come indoors. PWLC staff makes every effort to make your travel worthwhile despite the weather and prepare indoor, age-appropriate activities. PWLC staff welcomes teacher input into these plans. Some possible alternatives might include:

- Go outside for a very short amount of time, even if only under the deck to view the prairie, wildflowers monarchs use, or to search for caterpillars.
- Tour the exhibit area and watch prairie wetlands videos with the objective of observing monarchs in the prairie in summer or fall.
- Read a story or watch a video on associated topics. The MN Monarch Watch video is an excellent choice. The following books would be appropriate: [A Monarch Butterfly's Life](#) by John Himmelman; [Starting Life, Butterfly](#) by Claire Llewellyn and Simon Mendez.
- Use a display board and corresponding insect body part visuals to help student differentiate between moths and butterflies. Sing the Insect Song (head, thorax, abdomen, etc.).
- Use the monarch floor puzzles or poster to help illustrate the life cycle of monarchs.
- Using creative movement, dramatize the life cycle of a monarch. Then make butterfly books depicting the life cycle of monarchs.
- Provide photos of monarchs, viceroys, red admirals, and painted ladies for students to make sketches, comparing and contrasting key features.

Teacher-Led Extensions/Adaptations/Assessment Ideas

- To maximize outdoor classroom time at the PWLC, teachers may conduct steps 2 and 3 in the section "Field Investigation Procedure" at school. Upon arrival at the PWLC, teachers may provide PWLC staff with a written list of what students know and wonder for quick review before completing the remaining steps.

- Answer remaining questions that require further research using the Internet, library, or other sources of information. If you need assistance from PWLC staff, please let us know. We would be glad to assist you.
- Plant, care for, and observe milkweed and monarch nectar source flowers at school.
- Raise monarch caterpillars in class and release them in your pollinator garden at school. Be aware of proper timing to avoid late release and death!
- Graph PWLC monarch tagging data. See section, “Background Information,” at the beginning of this lesson plan. Use the graph to figure out the years with the highest and lowest numbers of monarchs tagged. Discuss why we catch a different number of monarchs each year and not the exact same number.
- Study the life cycle of monarchs using story books such as Becoming Butterflies by Anne Rockwell. Other suggested titles are listed below in the Reference section.
- Integrate your study of monarch migration with geography, culture, and economics in social studies. For example, create or examine maps showing the locations of the PWLC; your school; Lidderdale, Iowa; and Sierra Chincua, Cerro Pelon, and El Rosario, Mexico. Search the Internet for images of these locations.
- Follow monarch migration on <http://www.learner.org/jnorth/monarch/index.html> and add your class’ discoveries! When do you see your first monarch? Your last one? Your first egg, caterpillar, or chrysalis?
- Observe monarchs at their wintering sites in Mexico. Visit Monarch Live! A Distance Learning Adventure, <http://monarch.pwnet.org/>
- Find out more about tagging monarchs. Visit Monarch Watch, Kansas Biological Survey, University of Kansas, www.monarchwatch.org

2009 Minnesota Academic Standards in Science

This lesson helps support the following state standards.

Strand 1 THE NATURE OF SCIENCE AND ENGINEERING

Substrand 1 The Practice of Science

Standard 2 Scientific inquiry is a set of interrelated processes incorporating multiple approaches that are used to pose questions about the natural world and investigate phenomena.

Benchmark 1 Raise questions about the natural world and seek answers by making careful observations, noting what happens when you interact with an object, and sharing the answers with others.

Strand 4 LIFE SCIENCE

Substrand 1 Structure and Function in Living Systems

Standard 1 Living things are diverse with many different observable characteristics.

Benchmark 1 Describe and sort plants into groups in many ways, according to their physical characteristics and behaviors.

Substrand 2 Interdependence Among Living Systems

Standard 1 Natural systems have many components that interact to maintain the

system

Benchmark 1 Recognize that plants need space, water, nutrients and air, and that they fulfill these needs in different ways.

Substrand 3 Evolution in Living Systems

Standard 1 Plants and animals undergo a series of orderly changes during their life cycles.

Benchmark 1 Describe the characteristics of plants at different stages of their life cycles.

2010 Minnesota Academic Standards in Language Arts

Strand READING

Substrand Reading Informational Text K-5

Standard 3 Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Benchmark 2.2.3.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.

Standard 4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

Benchmark 2.2.4.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.

Standard 5 Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

Benchmark 2.2.5.5 Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.

Standard 6 Assess how point of view or purpose shapes the content and style of a text.

Benchmark 2.2.6.6 Identify the main purpose of a text, including what the author wants to answer, explain, or describe.

Strand READING FOUNDATIONAL SKILLS

Substrand Reading Foundational Skills K-5

Standard None

Benchmark 2.3.0.4 Read with sufficient accuracy and fluency to support comprehension.

a. Read grade-level text with purpose and understanding to promote oral and silent reading fluency.

c. Use context and other cues (e.g., phonics, word recognition skills, prior knowledge) to confirm or self-correct word recognition and understanding, rereading as necessary.

Strand WRITING

Substrand Writing K-5

Standard Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

Benchmark 2.6.7.7 Participate in shared research and writing projects

- (e.g., read a number of books on a single topic to produce a report; record science observations).
- Standard** Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
- Benchmark 2.6.8.8** Recall information from experiences or gather information from provided sources to answer a question.
- Strand** SPEAKING, VIEWING, LISTENING, AND MEDIA LITERACY
- Substrand** Speaking, Viewing, Listening and Media Literacy K-5
- Standard 1** Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- Benchmark 2.8.1.1** Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.
- a. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
- c. Ask for clarification and further explanation as needed about the topics and texts under discussion.
- d. Cooperate for productive group discussion.
- e. Follow two- and three-step oral directions.
- Standard 2** Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- Benchmark 2.8.2.2** Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.
- Standard 3** Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
- Benchmark 2.8.3.3** Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issues.
- Standard 4** Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
- Benchmark 2.8.4.4** Tell a story or recount an experience with appropriate facts and relevant, descriptive details, avoid plagiarism by identifying sources, and speak audibly in coherent sentences.
- Standard 6** Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.
- Benchmark 2.8.6.6** Produce complete sentences when appropriate to task and situation in order to provide requested detail or clarification.
- Strand** LANGUAGE
- Substrand** Language K-5
- Standard 5** Demonstrate understanding of figurative language, word relationships and nuances in word meanings.

Benchmark 2.10.5.5 Demonstrate understanding of word relationships and nuances in word meanings to develop word consciousness.

a. Identify real-life connections between words and their use (e.g., describe foods that are spicy or juicy).

b. Distinguish shades of meaning among closely related verbs (e.g., toss, throw, hurl) and closely related adjectives (e.g., thin, slender, skinny, scrawny).

Standard 6 Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

Benchmark 2.10.6.6 Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using adjectives and adverbs to describe (e.g., When other kids are happy that makes me happy).

RESOURCES

Books and Web Sites for Adults:

- Monarch Butterfly Royal Mail, a Manual for the Environmental Educator by Proteccion de la Fauna Mexicana (Profauna A.C.)
- Nature's Partners: Pollinators, Plants, and You, A Pollinator Protection Education Project by Richard C. Ponzio, Ph.D and Ella R. Madsen, M.S.
- The Monarch Butterfly, Biology and Conservation, Karen S. Oberhauser and Michelle J. Solensky, editors
- Journey North, Monarch Butterfly, <http://www.learner.org/jnorth/monarch/index.html>
- "Monarch Live! Community Conservation in Mexico" A Distance Learning Adventure, <http://monarch.pwnet.org/>
- Monarch Watch, Kansas Biological Survey, University of Kansas, Dedicated to Education, Conservation, and Research, www.monarchwatch.org

Books and Web Sites for Children:

- A Monarch Butterfly's Life by John Himmelman
- Becoming Butterflies by Anne Rockwell
- Caterpillars, Bugs, and Butterflies by Mel Boring, page 31
- Creepy, Crawly Caterpillars by Margery Facklam, pp. 26-27
- Butterfly by Claire Llewellyn
- Butterfly Count by Sneed B. Collard III
- Insectigations, 40 Hands-On Activities to Explore the Insect World by Cindy Blobaum, pages 5 and 107
- Madalynn the Monarch Butterfly and Her Quest to Michoacan by Mary Baca Haque (translated in Spanish as well)
- Starting Life, Butterfly by Claire Llewellyn and Simon Mendez

Credits

This field investigation was developed and written by Prairie Wetlands Learning Center Staff, U.S. Fish and Wildlife Service. Thanks to Prairie Science Class naturalist Tia Thysell for reviewing this lesson plan. Thanks to the following teachers for reviewing this lesson plan: Renee Larsen, Adams Elementary, Fergus Falls; Gay Eckberg, West Central Area Schools; and Deborah Strege, licensed teacher, Fergus Falls.