

Meeting New Neighbors: How to Study Your Butterfly Waystation

K-12th Grade

Duration 20-30 minutes (data

Location

Nature Gardens at NHM, or garden at home/school

Supplies

- Butterfly garden
- Field Journal
- Pencil
- Clipboard (optional)

Standards

NGSS: K-ESS3-1 & 2, 1-LS1-1, 3-ESS2-1, 3-LS1-1, 3-LS4-2, MS-LS1-4, MS-LS2-1, 2 & 4, MS-LS2-5, HS-LS2-1, 2, 6 & 8

SEPs: 1, 2, 3, 4, 5

CCCs: Patterns, Stability & Change, Cause & Effect

ELA: W.K.7, W.2.6, W.2.8, W.3.2, W.3.8, SL.3.4, WHST.6-8-1, WHST.6-8-2, SL.8.1, SL.8.4, WHST.9-12.2, WHST.9-12.7

Mathematics: MP.2, MP.4, MP.5, K.CC.A, K.MD.B.3, 3.MD.B.3, 6.SP.B.4, 6.SP.B.5, HSS-ID.A.1, HSS-IC.A.1, HSS-IC.B.6, HSN.Q.A.1

Concepts

- Journals are tools researchers use to record and communicate observations and ideas.
- Ecosystems are communities of organisms and their physical environments
- Living organisms and their physical environments are both dependent on and essential to each other for the overall health of the ecosystem

Objectives

- Students will observe and record observations about the miniature ecosystem of the butterfly waystation
- Students will learn firsthand about the interactions between organisms in an ecosystem
- Students will practice long-term data gathering and analysis

Outline

- 1. Students will spend half of a determined data collection period simply observing, journaling, and drawing what they see.
- 2. Halfway through the designated time period, students will produce charts or graphs representing the information they've collected.
- 3. Students will evaluate the quality of the data they've collected and make a plan for moving forward with better data collection.
- 4. Students will implement changes for the last half of the observation period.
- 5. Students will interpret and share the data they've collected.



Initial Observations

Introduce students to the idea of an <u>outdoor classroom</u> and explain that they'll be science journaling at a butterfly waystation (if you haven't built your butterfly waystation yet, <u>start here</u>, or use an available nature space like your schoolyard or backyard to observe butterfly habitats).

Journals are a tool essential to many kinds of scientists (biologists, chemists, geologists, botanists, paleontologists, and more!) who use them to record observations, data, questions, stories, and ideas about what they notice and experience. Entries are often referenced over and over to review data, ask questions, and re-think ideas or conclusions. You can craft your own field journal, or **download and print a field journal for your students here.**

At your Butterfly Waystation or in a garden, your students will be using journals to record information about the ecosystem they are observing. We'll be asking students to record and draw the different life forms they observe, noting any changes from previous data collection, and describing any interactions between life forms, such as caterpillars eating leaves, insects eating other insects, and changes in life cycle stages in the organisms. In each journaling session:

RECORD THE BASICS

Each session, make sure to record the date, the time of day, and the weather conditions (including temperature). This information will be useful in determining patterns in the data later, so make sure to save each data sheet or field journal entry.

DRAW WHAT YOU SEE

Students can draw the garden as a whole or focus in on specific organisms that they are interested in. Scientific drawings do not need to be beautiful or perfect representations, but are sketches that communicate what is noticed about something we are observing. Encourage students to draw large pictures so they can fit in more detail and focus on drawing what they actually see. Include labels, scale (if possible), colors, etc. If it's helpful, set timers for five- to ten-minute drawing sessions, with one-minute warnings. <u>Resources for teaching scientific illustration can be found here.</u>

DESCRIBE WHAT HAPPENS

They can also describe in writing what they're seeing (in lieu of or in addition to sketching). If a monarch butterfly chases another butterfly away from a plant, that's a useful note about territorial behavior. But even if students don't know the name of what's happening, just writing down a description of what happened is enough to help categorize it later. Some question prompts that might be helpful while walking around include:

How are the insects using the plants? How are insects behaving towards members of the same species? What about members of different species? Which animal seems to be benefiting (getting the good stuff) from the interaction? Which animal seems to be losing out because of the interaction? What insects do you see the most of?

Halfway-Point: Data Analysis

Halfway through the data collection period (that day, weeks, months, or a whole school year later), ask students to collect and review all of their data sheets or journal entries. Then, ask them to create graphs, tables, or other figures representing what they observed.

ELEMENTARY SCHOOL

For younger students, ask each student to draw the number of different insects they observed. For Grades 2-5, have students create their own bar graph of the number of different organisms they observed. It's okay if they didn't set out to count this information each time; they should just represent the number of organisms they drew or took notes on. After each student has their bar graph, choose one observation date and compile the information into a class bar graph showing the number of organisms observed on that date. Invite discussion about the data. What's going on at our butterfly waystation? For upper elementary, consider how we might improve data: If 30 students saw a butterfly on one day, does that mean there were 30 butterflies in the garden? Why or why not? How could they avoid that problem in the future? What are some things they should do to get better information?

Meeting New Neighbors

MIDDLE/HIGH SCHOOL

For older students, ask students to choose what kind of data they'd like to represent in a chart or graph based on what they're most interested in about their observations. Some options might include graphing the frequency of different types of behavioral interactions, changes observed in behavior or frequency on sunny days vs. cloudy days, or changes in appearance of organisms over time.

Then, ask students to write up a one-to-two-page plan for further investigation of the topic. What problems or issues can they identify with their current data? Are there any gaps or causal links they would need to fill in or establish in order to learn more? How would they fix those problems in future observations? Did this data bring up any other questions they'd like to explore? If so, how would they find out the answer?

Students can do their own research and learn more about our entomologists (people who study insects) and the butterflies they study on NHM's YouTube channel:

- Meet a Scientist: NHM Entomologist Elizabeth Long
- How to Help Monarchs
- Species Spotlight: California Ringlet Butterfly

Final Observations

For your last observations, ask students to adjust their journaling techniques to allow them to get better data. If they wished they had made a point to count each organism during every observation, they should do that. If they needed measurements on plant growth, they should make sure to record that going forward. It may be helpful to create a data sheet with clearly defined spaces for the information they want to collect, or to take time to make appropriate fields on each page of a journal.

At the end of the data collection period, ask students to create graphs again using the second half of their data, and evaluate the results of the changes they made in their collection techniques.

Reflection

An important skill set in learning to collect data is data literacy, or being able to understand and communicate findings effectively. Develop a clear research question with your class. What did our findings tell us about the ecosystem of our butterfly waystation or nature garden? Using our data, what might we expect to happen next year around the same time?

Depending on the grade level, you can ask your students to:

- Draw what they think their waystation or garden might look like tomorrow, next week, next month, or next year. Invite students to illustrate specific species of butterflies they think they will find based on their data, or guess the number of different organisms that might be living in the garden ecosystem in future studies.
- Write their responses to a KWL chart about butterflies: What do I know? What do I want to know? What did I learn?
- Use the CER framework: develop a **claim** that answers your class's research question, build on **evidence** from their data, and use **reasoning** to support their claim.
- Write a short summary of their findings and pair-share with their neighbor, or present to the class for feedback.
- Engineer a plan for future development of the butterfly waystation based on evidence from your data. *Ex. We counted more monarch butterflies after we planted milkweed in the SE corner of our garden. Next year, we will plant two 2x2' plots of milkweed, one in the SE corner and one in the NE corner, to see if we increase the number of monarchs in our garden.*

Possible Extensions

- Build a bee hotel and practice similar observation skills and documentation
- Set your own tracking station to record activity of other animals
- Contribute to community science projects by uploading pictures of organisms in their garden to iNaturalist.