

Bio/Diversity Project Migration and Changes in Species Abundance

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Grade Level: 7th grade

Common Core Standard:	<p><i>Strand 2, Concept 1: Identify individual, cultural, and technological contributions to scientific knowledge.</i></p> <ul style="list-style-type: none"> • <i>PO 1. Identify how diverse people and/or cultures, past and present, have made important contributions to scientific innovations.</i> <p><i>Strand 4, Concept 3: Analyze the relationships among various organisms and their environment.</i></p> <ul style="list-style-type: none"> • <i>PO 3. Analyze the interactions of living organisms with their ecosystems:</i> <ul style="list-style-type: none"> ○ <i>limiting factors</i> ○ <i>carrying capacity</i> • <i>PO 5. Predict how environmental factors (e.g., floods, droughts, temperature changes) affect survival rates in living organisms.</i>
Content Objective: Science	<ul style="list-style-type: none"> • <i>Students will be able to name two limiting factors of monarch butterflies in North America.</i> • <i>Students will be able to predict how environmental factors might affect monarch survival rates and therefore their species abundance.</i>

Vocabulary	Materials
<ul style="list-style-type: none"> • Aposematic (or warning coloration) • Environmental factors • Limiting factors • Populations • Species 	<ul style="list-style-type: none"> • Paper for sun, clouds, Canada, and Mexico • Paper and cups for flowers • Rope • Monarch butterfly cut-outs • Tape <p style="text-align: center;"><i>See the attached Monarch Migration Game for additional details.</i></p>

Seasonality: (If more specificity is required, please note date/time range under the season)

Highlight what season your lesson would be most suited to. When working with the natural world, it is important to keep this in mind for your planning! Some activities are possible for a brief window of time where others may be appropriate during any time of year.

Monsoons July-Sept.	Autumn Oct.-Nov. (migration time)	Winter Dec.- Feb.	Spring Mar.-Apr. (migration time)	Dry Summer May-June
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Guiding Questions:

- What factors do butterflies, a type of insect, need in order to survive year to year?
- What is complete metamorphosis in butterflies?

**Engagement/Introductory Activity:**

“Scientist of the Day” PowerPoint Presentation (optional): Katy Prudic is a University of Arizona Post-Doctoral Fellow who is a Lepidopterist, butterfly and moth specialist. She co-founded and co-directs the eButterfly Project, a citizen science on-line identity site that uses crowd sourcing to identify uploaded pictures of butterflies.

Exploratory Activity:

1. Discuss the following guiding questions with the class. Then, using their new knowledge about aposematic coloring, have each student color in a butterfly of their own:
 - What color are Monarch butterflies?
 - What animals prey on butterflies?
 - What is aposematic or warning coloring?
 - How does color help them to escape predation?
2. Monarch Migration Game: Students will learn about challenges faced by Monarch Butterflies as they migrate to Mexico. These challenges include adverse weather conditions, finding enough to eat, and facing predators. Use the directions listed below, and *see the attached Monarch Migration Game for additional details*.

Students will attempt to fly from Canada to Mexico.

The leader raises the sun and, at times, clouds to indicate daytime flying; they lower the sun behind their back and count down from 5 to indicate that the butterflies must get to a roosting site for the night. Another leader will read situation cards as the Monarchs are flying.

1. Set up a playing field with Canada on one site and Mexico on the other.
2. Outline a large lake with rope as a water hazard.
3. Place small cups around the field with petals and sepals to represent flowers as nectar sources.
4. Tell students that they are monarch butterflies about to begin their journey from Canada to Mexico using the following rules:
 - a. Students must hop instead of walking, along with flapping their arms as “wings” – practice this first
 - b. Students will need to visit a nectar flower every day
 - c. They can only fly when the sun is out
 - d. When the sun sets, they must get to a roosting tree within 5 seconds; they must also get to a roosting tree when a cloud covers the sun (this means rain, and butterflies can’t fly in the rain); leader shows the sun and the clouds and is in charge of when the sun will set
 - e. Tell students that they can fly over the water hazard, but that if the sun sets or goes behind the clouds, they still have to get to a roost in 5 seconds; if they are still over the water, they drown
 - f. At the beginning of each new day – sun rise – they must wait at their roost for the reading of a situation card – see the situation cards in the attached *Monarch Migration Game*
 - g. Students who die (don’t make it to the roost at night or during rain) become taggers and can “tag out” the surviving monarch butterflies – they might represent predators, flying hazards, human impact, etc.
 - h. Students begin in Canada
 - i. Day 1: Adult raises sun and reads one situation card to the students; the situations tell the weather conditions and how the students can fly for the day
 - j. The game continues until all of the students have either died or reached Mexico

Explain:

- What was realistic about the game?
- What hazards did the monarchs face in their migrations?
- What other hazards might the monarchs face in real life?



Extension Activity/Questions:

The monarch game was an example of the migration of a single species, and demonstrated a variety of factors that affected the species' abundance during its journey.

- How might other species' abundance be affected?
- Can you name another local species that migrates?
- Can you name another local species that is affected by climate?
- What about species that are affected by human development?

Evaluation Activity:

Ask for students to name limiting factors and environmental hazards faced by monarchs at the end of the lesson.