NATIONAL GEOGRAPHIC

RESOURCE LIBRARY | LESSON

Mapping Migratory Routes

Students learn about how and why animals migrate and then take a deep dive into the migratory patterns of species that are impacted in a certain geographic area. After researching three specific migratory animals, students map their migratory routes on their game boards. Students consider how to design their game to highlight conflicts between human development and animal migration, and receive peer feedback on their initial game boards. This lesson is part of the Interrupted Migrations unit.

GRADES

6, 7, 8

SUBJECTS

Conservation, Geography, Social Studies, Storytelling

CONTENTS

3 Activities

In collaboration with

educurious
learning that connects

ACTIVITY 1: MEET MIGRATORY ANIMALS | 50 MINS

DIRECTIONS

***Interrupted Migrations* Unit Driving Question:** *How can human activities help or hinder animal migrations?*

***Mapping Migratory Routes* Lesson Driving Question:** *How do migratory animals move throughout the world?*

1. Introduce students to different types of animal migration.

- Set the stage for this activity by explaining to students that there are different types of animal migration. In the *Intersecting Actions* activity, students learned about elk migration. Animals migrate for different reasons, across different distances, to different places. Learning about different types of migration will contribute to better game designs.
- With students in their unit working groups, distribute a copy of the *Animal Migration Vocabulary* handout and scissors to each group. Have students work together in their groups to cut out the squares and match each vocabulary word to its definition.
    - Provide support to students in identifying root words and using context clues to understand the definitions.

2. Engage students in a matching activity to learn key animal migration concepts.

- Distribute the *Match the Animal to its Type of Migration* handout to each student. Have students read through the directions and work together in their groups to match each animal in the second column to the migration type in the first column.
    - After students have completed the handout, review the answers as a class: (1. c; 2. f; 3. b; 4. h; 5. g; 6. e; 7. d; 8. a) and answer any lingering questions.
- Ask students: *How could human activity interfere with one of these types of migrations?*
    - Have students use their completed *Human Impact Cards* from the *Mapping Human Interruptions to Migration* lesson and discuss with their group members. Discuss students' answers as a class.

3. Guide students to brainstorm why animals migrate by connecting animals' basic needs to migration.

- Have students use the matching exercise from Step 2 to think about different types of migration. Ask: *What are some reasons animals migrate from one place to another?*

[Possible answers: *food, reproduction (breeding/nesting areas), climate (needs warmer or cooler climate depending on seasons)*].

    - Record responses on a chart paper for students to refer back to later in the unit.

- Debrief the activity by discussing as a class how what they have learned so far in this unit will inform their board game creation. Ask: *Your unit project is to create a board game about animal migration. What have you learned so far that will help you to create your game?* (Possible answers: board game base map, human impact cards)
- Explain that the next step is for students to include migratory animals in their board game and that they will use aspects of migration discussed in this activity, such as type and motivating factors, related to the migratory animals in their game.

Tip

Step 1: Before students begin the *Animal Migration Vocabulary* handout, you may want to pre-teach some key vocabulary. Key terms might include altitude or altitudinal, latitude or latitudinal, irruption or irruptive.

Informal Assessment

Match the Animal to its Type of Migration: Students apply new vocabulary to descriptions of migratory behavior.

OBJECTIVES

Subjects & Disciplines

- Conservation
  Geography
  Social Studies

Learning Objectives

Students will:

- Identify the reasons that animals migrate.

Teaching Approach

- Project-based learning

Teaching Methods

- Brainstorming
- Multimedia instruction
- Self-directed learning

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills
    - Communication and Collaboration
- 21st Century Themes
  - Environmental Literacy
- Critical Thinking Skills
  - Applying
  - Remembering
  - Understanding

National Standards, Principles, and Practices

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

• CCSS.ELA-LITERACY.RH.6-8.2:
Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.

Preparation

Background Information

Animal migration is defined as the process where a community of animals leaves a habitat for part of the year or part of their lives. Among creatures that migrate, the type of migration varies, depending on what the creatures need. They move to habitats that are more hospitable in terms of weather and climate, available food supply, or because they provide mating grounds. Many species of mammals, birds, reptiles, amphibians, crustaceans, and insects migrate, although not all species are migratory. Scientists use a wide range of technology to help track these migration patterns, and that data is used to learn how to support animal populations impacted by humans. Their results are often shared using the principles of regional geography, which provide a fuller ecological and social lens.

Prior Knowledge

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Recommended Prior Activities

- Geography Matters
- Intersecting Actions
- Map That Game Board

Vocabulary

Term	Part of Speech	Definition
altitudinal migration	*noun*	migration path up and down elevation gradients.
animal migration	*noun*	process where a community of animals leaves a habitat for part of the year or part of their lives, and moves to habitats that are more hospitable.
climate	*noun*	all weather conditions for a given location over a period of time.
irruptive migration	*noun*	dramatic migration that occurs at an irregular time or location.
latitudinal migration	*noun*	migration route that follows a north-south movement.

Term	Part of Speech	Definition
migration	*noun*	movement of a group of people or animals from one place to another.
movement	*noun*	the act, process, or result of moving.
multi-generational migration	*noun*	migration route that takes generations of a species to complete.
species	*noun*	group of similar organisms that can reproduce with each other.

ACTIVITY 2: RESEARCHING A REGION'S MIGRATORY ANIMALS | 1 HR 40 MINS

DIRECTIONS

***Interrupted Migrations* Unit Driving Question:** *How can human activities help or hinder animal migrations?*

***Mapping Migratory Routes* Lesson Driving Question:** *How do migratory animals move throughout the world?*

1. **Prepare students to think like game designers.**

- As a class, revisit the goals of the final project: creating a tabletop game that will raise awareness about animal migration and inspire people to care about human impacts on migratory routes. Ask students: *What have we created so far that can be used for your game?* (Answers: Human impact cards, the start to a geographic game board map, and a description of the setting).
- In this activity, students create critter cards that can be the characters in their game and a map of each critter's migratory route that will go with their setting descriptions. These maps will inform stylized sections on students' game boards.
    - For example, migratory routes might be portrayed as a series of spaces for pieces to move along.
- Ask: *What other components are often included in tabletop games besides a board, cards, and a setting?* (Possible answers: *dice, spinner, player pieces*)
    - Encourage students to think about what else will help create an engaging and inspiring game.

2. Guide student research of migratory species in each group's focal geographic area.

- Distribute a copy of the *Creating the Critter Cards* handout to each group and have each group create a set of three critter cards that relate to their geographic area.
- Prepare the class for the research process by first reading the directions on *Creating the Critter Cards* together.

    - Support students in starting their online research by giving them suggestions for search terms from the critter card directions (see "Tips" section for additional support for research).
    - Introduce students to the *National Geographic Photo Ark* and model how to search for an animal, such as the Atlantic loggerhead turtle, and use the information provided to develop a critter card (note: not all animals listed will be found in the Photo Ark).
    - Each group will be researching three species; ask groups: *What will be the best collaborative approach to accomplish this task?*

- As students are creating their critter cards, circulate to remind groups of the required project components and encourage students to make connections by using the following prompts:

    - Prompt for animal and regional habitat description: *Tell me a little about your animal and where it lives.*
    - Prompt for explanations of why and how their animal migrates: *Why does your animal need to migrate? How do they get from point A to point B and back again?*
    - Additional questions to ask students:

        - *What are some of the biggest human threats to your animal? Why?*
        - *What is the status of the species? Are there healthy populations or is the species endangered? Why?*

- At the end of the activity, collect the student-created critter cards for informal assessment.

3. Guide groups to create a migratory route map for each animal.

- Distribute a copy of the *Migration Route Map* to each group. This initial migratory mapping will lead to the future design of each group's game board.
- Have each group use their research findings to draw and label the migratory route of each of their focal species on the map. Each migration route should include:
    - Starting point, labeled with when the migration begins.
    - Path of migration, labeled with the animal, the type of migration, and reason for migration.
    - Ending point, labeled with when the migration ends.

4. Revisit the class Know and Need to Know chart.

- Discuss the following questions as a class:
    - *What answers were we able to find today?*
    - *What new questions do we have based on what we learned?*
- Explain that in the next activity students will be applying their research to their game designs.

Tip

Step 2: As needed, provide instruction for effective online research and online literacy. Set boundaries for students on where they can do additional research on their species. Let students know that .gov, .edu, and .org resources are more reputable/reliable than .com pages. You may want to restrict students' use of websites to those that fall into those three categories.

Tip

Step 2: Set expectations for whether students can print and/or draw images of their animals for their critter card.

Tip

Step 2: Scaffold students' research using the critter card requirements such as, "[name of the animal] migratory route in [geographic area]" or "[name of the animal] habitat."

Tip

Step 2: When using the Photo Ark, let students know that this is a good place to start research, but not all animals will be found here, nor may all of the information needed for a complete Critter Card.

Tip

Step 2: To create sturdier game cards, consider providing card stock paper to groups.

Informal Assessment

Critter Cards: Review completed critter cards and maps to ensure groups have acquired complete and accurate information.

OBJECTIVES

Subjects & Disciplines

- Conservation
  Geography
  Social Studies
  Storytelling

Learning Objectives

Students will:

- Research and describe migratory patterns and geographic range of specific species.
- Create maps of migratory routes for particular species.

Teaching Approach

- Project-based learning

Teaching Methods

- Discussions
- Multimedia instruction
- Research

Skills Summary

This activity targets the following skills:

- Geographic Skills
  - Acquiring Geographic Information
  - Analyzing Geographic Information
  - Answering Geographic Questions
  - Asking Geographic Questions

National Standards, Principles, and Practices

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

• **CCSS.ELA-LITERACY.RH.6-8.2:**
Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.

THE COLLEGE, CAREER & CIVIC LIFE (C3) FRAMEWORK FOR SOCIAL STUDIES STATE STANDARDS

• **D2.Geo.3.6-8:**
Use paper-based and electronic mapping and graphing techniques to represent and analyze spatial patterns of different environmental and cultural characteristics.

Preparation

BACKGROUND & VOCABULARY

Background Information

Migrating animals commonly take well-defined routes on their migration journey. Animal migrations can take different types of routes. Animals might travel on land, water, or air. They may move back and forth across both ocean and land. They move in all cardinal directions, vertically, and across different topographies. These routes sometimes cover short geographic distances, but can also cross multiple continents. Being able to map movement using regional geography helps reveal the impact of these migrations, as they cross continents, habitats, and political boundaries.

Animals' migratory routes are tracked by humans using various methods like banding (in the case of birds), GPS tracking, drones, remote cameras, acoustic tags, and satellite tracking. Some animals' migratory routes are increasingly imperiled by human activities and changing landscapes, making this research important to the future of a wide range of species. When students focus on the migratory patterns of one particular animal, it provides an opportunity to understand multiple facets of an issue through this use of regional geography. For example, the migration of javelinas brings them across the US-Mexico border, which has a range of implications.

Prior Knowledge

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Recommended Prior Activities

- Geography Matters
- Intersecting Actions
- Map That Game Board

Vocabulary

Term	Part of Speech	Definition
animal migration	*noun*	process where a community of animals leaves a habitat for part of the year or part of their lives, and moves to habitats that are more hospitable.
key	*noun*	an explanation of symbols and abbreviations used on a map, also known as a legend.
map	*noun*	symbolic representation of selected characteristics of a place, usually drawn on a flat surface.

Term	Part of Speech	Definition
mapping	*noun*	making and using maps.
migration route	*noun*	path followed by birds or other animals that migrate regularly.

ACTIVITY 3: MAPPING A REGION'S MIGRATORY ANIMALS | 50 MINS

DIRECTIONS

***Interrupted Migrations* Unit Driving Question:** *How can human activities help or hinder animal migrations?*

***Mapping Migratory Routes* Lesson Driving Question:** *How do migratory animals move throughout the world?*

1. Use the *Butterfly Surveillance* video to focus groups on game design and the final project.

- Remind students they will be using what they have learned about their focal animals and geographic area to create a game that inspires people to understand and care about animal migration.
- As a class, watch *Butterfly Surveillance*. Pause the video at 0:47 to bring students' attention to the migratory map in the video and connect with their game boards. Ask students to discuss with a neighbor:
    - *What do you notice about the monarch butterfly's migration route* (Possible answers: it spreads out as it goes north, it crosses many regions, it crosses national borders, there are a lot of opportunities for human interruption).
- Watch the rest of the video as a class. Then, have student discuss with a neighbor:
    - *How does this video make you hopeful about people supporting monarch butterfly migration?*
- In this activity, students add the animals' migratory routes to their game boards. Encourage a persuasive and strategic mindset by discussing the following question as a class:
    - *What strategies can you use in your game design to convince people to care about the migrating animals in your region?* (Possible answers: players take on roles of migrating

species, give the animals feelings, have people's survival depend on the animal's ability to successfully migrate)

2. Student groups add the migratory routes of their species to their game boards.

- Have students discuss how they want to use the migratory routes in their games. Have groups discuss the following questions and share out their decisions with the class:
    - *Will the routes be spaces that animals move along?*
    - *How will you balance accurate representation of migratory routes with the way the game is played?* (For example, will players have to complete a full life cycle or simply arrive at one destination?)
    - *How will you make sure that human impacts disrupt or support animal migration in the game?*

- Next, have students review their findings from the *Researching a Region's Migratory Animals* activity and have each group decide how to represent their species' migratory routes on their game boards. Routes may be fully contained within the area, or they may begin, end, or cross through the area.
    - Encourage students to be creative! By thinking about how the migratory routes will be used, they are really thinking about some integral structures for their games.

- Then, have students add the migratory route of their species to their game board that they created in the *Map That Game Board* activity. Provide materials for creating and illustrating game boards, such as cardboard, colored paper, markers, colored pencils, scissors, and glue.
- As groups are working, circulate to ensure that human developments on their game board contact, or potentially contact, the migratory route of their species.

3. Lead students in a gallery walk of game boards for peer feedback.

- Begin by having groups display their game boards and migratory route maps from the activity *Researching a Region's Migratory Animals* for students to see as they walk around the room. Before beginning the gallery walk, have each group briefly share the way that migratory routes will be used in their game.

- Then, have students walk around the room providing feedback on sticky notes to each group in response to one or two of the following questions:

    - *What challenges to the migrations do you predict will result from human developments and geographical features on the game board?*
    - *What geographical information is clearly communicated through the game board about the region? Which features are missing or could be more clearly communicated?*
    - *How clear is the game's focus on migration? What additions would help clarify the focus?*

- After the gallery walk is complete, have groups read through the sticky notes left by their peers in order to refine their design and game play for their final game design.

Tip

Step 2: If students struggle with thinking about how to use the migratory routes, encourage them to think about board games they have played and how players moved around the board.

Informal Assessment

Assess group game boards for accurate representation of a close-up section of the migratory routes that are in the focal geographic area.

OBJECTIVES

Subjects & Disciplines

Geography
Social Studies
Storytelling

Learning Objectives

Students will:

- Understand and map the migratory routes of particular species.

- Design a functional game board that represents migratory routes in a specific geographic area.

Teaching Approach

- Project-based learning

Teaching Methods

- Cooperative learning
- Discussions
- Hands-on learning

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills
    - Communication and Collaboration
    - Creativity and Innovation
    - Critical Thinking and Problem Solving
- Critical Thinking Skills
  - Analyzing
  - Applying
  - Creating
  - Evaluating
  - Remembering
  - Understanding
- Geographic Skills
  - Analyzing Geographic Information
  - Answering Geographic Questions
  - Organizing Geographic Information

National Standards, Principles, and Practices

THE COLLEGE, CAREER & CIVIC LIFE (C3) FRAMEWORK FOR SOCIAL STUDIES STATE STANDARDS

- **D2.Geo.1.6-8.:**

Construct maps to represent and explain the spatial patterns of cultural and environmental characteristics.

- **D2.Geo.3.6-8:**

Use paper-based and electronic mapping and graphing techniques to represent and analyze spatial patterns of different environmental and cultural characteristics.

Preparation

BACKGROUND & VOCABULARY

Background Information

As migrating animals are threatened by human impacts on the environment, it is important to map and narrate their migratory routes and raise awareness of how humans can help or hinder these journeys. Understanding where human interactions overlap with migratory routes is key to diagnosing a way forward for these species.

Scientists use a wide range of technology to help track migratory patterns, and that data is used to learn how to support animal populations impacted by humans. Their results are often shared using the principles of regional geography, which provide a fuller ecological and social lens for viewing data. In this case, when information is shared through a game, it provides a relevant avenue for engaging an audience, as games have been shown to promote interest and action related to civic pursuits.

Prior Knowledge

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Recommended Prior Activities

- Geography Matters
- Intersecting Actions
- Map That Game Board

- Meet Migratory Animals
- Researching a Region's Migratory Animals

Vocabulary

Term	Part of Speech	Definition
animal migration	*noun*	process where a community of animals leaves a habitat for part of the year or part of their lives, and moves to habitats that are more hospitable.
mapping	*noun*	making and using maps.
migration	*noun*	movement of a group of people or animals from one place to another.
migration route	*noun*	path followed by birds or other animals that migrate regularly.