

# Animal Migrations and their Ecosystems

Students engage with a variety of resources to learn about ecosystems and the interactions among organisms in ecosystems, with a focus on elk migration in the Greater Yellowstone Ecosystem. Groups create a second map layer for their unit project that shows how their focal animal's migration impacts its ecosystem. This lesson is part of the [Detours and Distractions: How Humans Impact Migration Patterns](#) unit.

## GRADES

6, 7, 8

## SUBJECTS

*Biology, Ecology, Conservation, Geography*

## CONTENTS

2 Activities

## In collaboration with



ACTIVITY 1: INTERACTIONS AMONG  
ORGANISMS IN ECOSYSTEMS | 1 HR 40  
MINS

## DIRECTIONS

*This activity is part of the [Detours and Distractions: How Humans Impact Migration Patterns](#) unit*

**I. Activate and build on students' prior knowledge about ecosystems.**

- Read aloud and write on the board the following quotes from the Ecosystem encyclopedic entry.
  - “Every factor in an ecosystem depends on every other factor, either directly or indirectly.”
  - “The whole surface of Earth is a series of connected ecosystems.”
- Invite students to think-pair-share and come up with examples and ideas about what the quotes above mean. Then invite students to share with the class; record student responses to be displayed in the classroom.
- Use some of the following prompts to elicit students’ prior knowledge about ecosystems:
  - *What is an ecosystem?*
  - *What are some living and nonliving components of an ecosystem?*
    - In the discussion, help students identify and distinguish between biotic vs. abiotic factors.
    - Biotic factors are living parts of an ecosystem, such as predators, plants, and bacteria.
    - Abiotic factors are nonliving parts of an ecosystem, such as wind, temperature, and elevation.
  - *What are some examples of ecosystems?* (deserts, your backyard, rainforest, Arctic tundra, the deep sea)
  - *How are things in ecosystems related?*
  - *What happens when you change one component of an ecosystem?* (Possible responses: Other components are impacted. There could be few or many wide-reaching effects causing the ecosystem to be greatly stressed or, in extreme cases, collapse).
- Distribute the Ecosystem Illustration handout to each student. Allow time for students to complete these individually, and for students to swap handouts with a peer to check and add to their work.

## 2. Introduce students to the Greater Yellowstone Ecosystem resources.

- Remind students that their final project will include an ecosystem map layer. Explain that this activity will help them understand how their assigned animal is connected to the

ecosystem(s) in which it lives, using elk migration in Yellowstone National Park as an example.

- Distribute the Elk Migration: Yellowstone Ecosystem Research Guide to each student, and provide student groups with the following resources:
  - Yellowstone's Great Migration video
  - Follow the Elk's Perilous Journey interactive
  - What Drives Yellowstone's Massive Elk Migrations? article
- Encourage students to work with their groups to investigate the resources and complete Part 1 of the research guide.
- For the last few minutes or so of this step, invite volunteers to share their answers to the questions. Check for accuracy and supplement any missing information with the answer key.

### 3. Prepare students to diagram how changes in the ecosystem can have cascading effects.

- Write the definition of *cascading effects* where all students can see: a series of secondary changes that are triggered by the primary changes to a key species in an ecosystem.
- Illustrate the concept of cascading effects in an ecosystem by showing the Wolves of Yellowstone video.
- After the video, show the Trophic Cascade Scenario as an example of a cascading effects diagram.
- On Part 2 of the research guide, have students use their knowledge of the elk migration and cascading effects to diagram the following scenario:
  - *What would happen if the temperature got too hot for grass to grow where it normally does? (If the temperature gets too hot, then grass may grow at a slow rate. This might mean that elk populations won't have an adequate supply of food to support their populations. Or grass won't grow where it normally does, meaning elk migration patterns may change.)*
- Ask students to work with a partner and explain their ecosystem and their cascading effect diagram to each other. Invite volunteers to share their diagrams with the class. Collect the research guides upon completion.

## Tip

**Step 1:** Depending on students' prior knowledge, spend more time exploring the [Ecosystem](#) encyclopedic entry, if needed.

## Modification

**Step 1:** To provide more context about what an ecosystem is, visit a local ecosystem first and have a similar discussion. This can include the school grounds, a surrounding neighborhood, or a nearby unique ecosystem, such as a forest, desert, mountain, lake, river, or ocean.

## Modification

**Step 2:** To reduce the number of computers used to access resources or to enhance comprehension and literacy learning opportunities, consider facilitating the video and animation with the whole class and/or providing printed copies of the article.

## Informal Assessment

Student responses on the [Elk Migration: Yellowstone Ecosystem Research Guide](#), as well as their participation during class discussions, can be used to informally assess their understanding of ecosystem(s), abiotic and biotic factors in ecosystems, the main components of the Yellowstone National Park Ecosystem, and how migrating elk interact with the ecosystems they travel through. Students' peer explanations can be used to assess their ability to describe how changes in ecosystems can have cascading effects.

## Extending the Learning

- Show students the [Who's in My Backyard?](#) or [Floodplains Ecosystem](#) infographics. Students could replicate this activity's discussion by working in pairs or groups, or as a homework assignment.
- Visit a local ecosystem and have a similar discussion. This can include the school grounds, a surrounding neighborhood, or a nearby unique ecosystem, such as a forest, desert, mountain, lake, river, or ocean.

## OBJECTIVES

## Subjects & Disciplines

**Biology**

- Ecology
  - Conservation
- Geography**

# Learning Objectives

Students will:

- Understand how migrating elk interact with the ecosystems they travel through.

# Teaching Approach

- Project-based learning

# Teaching Methods

- Discussions
- Research
- Self-directed learning

# Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills
    - Communication and Collaboration
  - Life and Career Skills
    - Initiative and Self-Direction
- Critical Thinking Skills
  - Analyzing
  - Remembering
  - Understanding
- Science and Engineering Practices
  - Asking questions (for science) and defining problems (for engineering)

- Obtaining, evaluating, and communicating information

# National Standards, Principles, and Practices

## COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

- **CCSS.ELA-LITERACY.SL.7.1:**

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

- **CCSS.ELA-LITERACY.SL.7.2:**

Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

## NEXT GENERATION SCIENCE STANDARDS

- **Crosscutting Concept 1:**

Patterns

- **Crosscutting Concept 4:**

Systems and system models

- **Crosscutting Concept 7:**

Stability and change

- **Crosscutting Concepts: Cause and Effect:**

- **Disciplinary Core Ideas LS2: Ecosystems, Energy, and Dynamics:**

- **MS. Ecosystems: Interactions, Energy, and Dynamics:**

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

- **Performance Expectations: MS-LS2-2:**

MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

- **Science and Engineering Practice 1:**

Asking questions and defining problems

- **Science and Engineering Practice 8:**

Obtaining, evaluating, and communicating information

## Preparation

# BACKGROUND & VOCABULARY

## Background Information

Ecosystems are geographic areas where plants, animals, and other organisms, as well as weather and landscape, work together to form a bubble of life. The whole surface of the Earth is a series of interconnected ecosystems, and whether indirectly or directly, every component in an ecosystem relies on every other factor. From deserts to the Antarctic tundra to tidepools, there are many different kinds of ecosystems. Cascading effects in ecosystems are a series of secondary changes that are triggered by the primary changes to a key species in an ecosystem. Understanding ecosystems, and how the components are interrelated, can aid in understanding how animal migration patterns are shaped by, and help shape, their ecosystems.

The Greater Yellowstone Ecosystem is one of the largest nearly intact temperate zone ecosystems on the planet. Yellowstone National Park is at the heart of this wider ecosystem, and serves as an ideal example of a complex ecosystem with many interacting factors and stakeholders. The ecosystem is diverse with biotic and abiotic factors that influence the ecosystem, such as hydrothermal vents, lakes, rivers, and iconic wildlife, like elk (who have a well-studied annual migration), wolves, bison, foxes, and many more. The human use of Yellowstone National Park for recreation and the surrounding areas for hunting, fishing, and development provide for a great case study of how humans impact animal migration.

## Prior Knowledge

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## Recommended Prior Activities

- [Collision! Human Impacts on Animal Migration](#)
- [Create an Animal Migration Map](#)
- [Tracking Animal Migration](#)
- [Why and How Animals Migrate](#)

## Vocabulary

<b>Term</b>	<b>Part of Speech</b>	<b>Definition</b>
<b>abiotic</b>	<i>adjective</i>	characterized by the absence of life or living organisms
<b>animal migration</b>	<i>noun</i>	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.
<b>biotic</b>	<i>adjective</i>	having to do with living or once-living organisms.
<b>cascading effect</b>	<i>noun</i>	series of secondary changes that are triggered by the primary changes to a key species in an ecosystem.
<b>component</b>	<i>noun</i>	part.
<b>detour</b>	<i>noun</i>	unplanned or temporary path.
<b>distract</b>	<i>verb</i>	to divert or draw attention away from something.
<b>ecosystem</b>	<i>noun</i>	community and interactions of living and nonliving things in an area.
<b>growth rate</b>	<i>noun</i>	measurement of how fast something increases in size during a particular period of time.
<b>impact</b>	<i>verb</i>	to influence or have an effect on something.
<b>migration pattern</b>	<i>noun</i>	predictable movements, in time and space, of a group of animals or people.
<b>model</b>	<i>noun</i>	image or impression of an object used to represent the object or system.
<b>perilous</b>	<i>adjective</i>	dangerous.
<b>population</b>	<i>noun</i>	total number of people or organisms in a particular area.
<b>predator</b>	<i>noun</i>	animal that hunts other animals for food.
<b>prey</b>	<i>noun</i>	animal that is hunted and eaten by other animals.
<b>resource</b>	<i>noun</i>	substances such as water, air, shelter, and food sources which are valuable in supporting life.
<b>temperature</b>	<i>noun</i>	degree of hotness or coldness measured by a thermometer with a numerical scale.
<b>Yellowstone National Park</b>	<i>noun</i>	large national park in the U.S. states of Wyoming, Idaho, and Montana.

## ACTIVITY 2: CREATE AN ECOSYSTEM MAP LAYER 1 1 HR 20 MINS

### DIRECTIONS



This activity is part of the [Detours and Distractions: How Humans Impact Migration Patterns](#) unit.

**I. Activate students' developing knowledge about their focal animal's ecosystem and create *Know & Need to Know* charts to engage groups in setting research goals.**

- Distribute the [Ecosystem Map Layer: Know & Need to Know Chart](#) to each student.
- Ask students to discuss the questions in their small groups and record their thoughts on their chart:
  - *What do we already know about our animal's ecosystem(s)?*
  - *What do we need to know about our animal's ecosystem(s) and how it interacts with its ecosystem(s) in order to create an ecosystem map layer?*
- Hand back and encourage students to use their base migration map from the [Create an Animal Migration Map](#) activity and the *Elk Migration: Yellowstone Ecosystem Research Guide* from the [Interactions Among Organisms in Ecosystems](#) activity to prompt their thinking.

**2. Orient groups to their project work.**

- Explain that for the remainder of this activity, each group will research, gather, and organize information to create a second paper map layer showing how their focal animal's migration impacts the ecosystem(s) it travels through.
  - As before, each group will create a map that includes a key, accompanying descriptions of their animal's ecosystem, and explanations about how that ecosystem impacts the animal's migration.
- Remind students that their final project will include a focal animal, a base map depicting the migration route of their focal animal, an ecosystem map layer (the focus of this activity), a human impact map layer, and suggested solutions to help the animal migrate.
- Distribute the [Ecosystem Map Layer Rubric](#) and orient students so that they are familiar with the expectations before they begin their work.

**3. Prepare groups to research migration impacts and create a second map layer. (This step should take up the majority of the activity.)**

- Help groups choose and print the same map layer as their base map using [MapMaker 1-Page Maps](#). Students should work together to produce one group map, but multiple copies

should be printed to promote engagement from the whole group.

- Set boundaries for students on where they can do research. See the *Background & Vocabulary* tab for helpful sources.
- Encourage students to limit their research to only what is needed to complete their unit project.
- As needed, provide instruction for effective online research and online literacy.
- While students are working, circulate to provide assistance and remind groups of the required components.
  - Prompt for a key: *What do all of the symbols and colors on your map mean?*
  - Prompt for an explanation of how their animal impacts the ecosystem it migrates through: *Does the ecosystem change in response to your animal showing up? What would happen if your animal didn't migrate to this ecosystem anymore?*
  - Prompt for an explanation of how the ecosystem impacts their animal's migration: *Think back to why your animal needs to migrate to this ecosystem. What doesn't its original ecosystem have that the one it migrates to does? Would another ecosystem provide what this one does? If something in the ecosystem changed, how would that impact your animal's migration?* (Students should have chosen the correct map scale where they can address all ecosystems on one map.)
- Collect all group maps at the end of the activity to assess student work and provide formative feedback.

## Modification

**Step 2:** In place of a hard copy map, students may use a map-making software such as [MapMaker Interactive](#) or [ArcGIS](#) to complete their map layers.

## Tip

**Step 2:** To provide some background information on maps and their components, spend time as needed exploring the [Map](#) encyclopedic entry.

## Tip

**Step 3:** Review each group's Ecosystem Map Layer to provide formative feedback and ensure students are meeting expectations. If your review indicates that many groups need more time to revise or improve their Ecosystem Map Layer, adjust your pacing as needed to provide time before students develop their final map layer, the Human Impacts Map Layer in Lesson 3 of the unit.

## Rubric

The *Ecosystem Map Layer Rubric* can be used to assess each group's ecosystem map. All groups' maps should show how their animal impacts the ecosystem(s) it travels through, include a key, contain descriptions of their animal's ecosystem, and explain how the ecosystem impacts their animal's migration. Their thoroughness, time management, and creativity during project time can also be informally assessed.

## Extending the Learning

- Have students free write in response to the prompt: *How do you influence your ecosystem(s)?*
- Interdisciplinary opportunity: Have students create a 2D or 3D piece of art that depicts their group's focal animal and its migration. Have the students think about how to creatively show that it is a migrating animal from another ecosystem.

## OBJECTIVES

## Subjects & Disciplines

### Biology

- Ecology
- Conservation

### Geography

## Learning Objectives

Students will:

- Conduct research on their project animal's ecosystem using a variety of sources.
- Annotate their ecosystem layer with additional information about their animal's ecosystem, and how their animal is impacted by their ecosystem(s).

- Add to their Know & Need to Know chart about their project animal that will guide their future research.

## Teaching Approach

- Project-based learning

## Teaching Methods

- Discussions
- Research
- Self-directed learning

## Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills
    - Communication and Collaboration
  - Life and Career Skills
    - Initiative and Self-Direction
    - Productivity and Accountability
- Critical Thinking Skills
  - Analyzing
  - Applying
  - Creating
  - Evaluating
  - Remembering
  - Understanding
- Geographic Skills
  - Acquiring Geographic Information
  - Analyzing Geographic Information
  - Answering Geographic Questions
  - Asking Geographic Questions

- Organizing Geographic Information
- Science and Engineering Practices
  - Asking questions (for science) and defining problems (for engineering)
  - Obtaining, evaluating, and communicating information

# National Standards, Principles, and Practices

## COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

- CCSS.ELA-LITERACY.RST.6-8.7:

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

- CCSS.ELA-LITERACY.SL.7.2:

Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

- CCSS.ELA-LITERACY.WHST.6-8.7:

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

- CCSS.ELA-LITERACY.WHST.6-8.8:

Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

## NEXT GENERATION SCIENCE STANDARDS

- CCSS.ELA-LITERACY.SL.7.1.B:

Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.

- Crosscutting Concept 1:

Patterns

- Crosscutting Concept 2:

Cause and effect: Mechanism and prediction

- Crosscutting Concept 4:

Systems and system models

- **Crosscutting Concept 7:**

Stability and change

- **Disciplinary Core Ideas LS2: Ecosystems, Energy, and Dynamics:**

- **MS. Ecosystems: Interactions, Energy, and Dynamics:**

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

- **Performance Expectations: MS-LS2-2:**

MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

- **Science and Engineering Practice 1:**

Asking questions and defining problems

- **Science and Engineering Practice 2:**

Developing and using models

- **Science and Engineering Practice 4:**

Analyzing and interpreting data

- **Science and Engineering Practice 8:**

Obtaining, evaluating, and communicating information

## **Preparation**

# BACKGROUND & VOCABULARY

## Background Information

Ecosystems are geographic areas where plants, animals, and other organisms, as well as weather and landscape, work together to form a bubble of life. The whole surface of the Earth is a series of interconnected ecosystems, and whether indirectly or directly, every component in an ecosystem relies on every other factor. From deserts to the Antarctic tundra to tidepools, there are many different kinds of ecosystems. Cascading effects in ecosystems are a series of secondary changes that are triggered by the primary changes to a key species in an ecosystem. Understanding ecosystems, and how the components are interrelated, can aid in understanding how animal migration patterns are shaped by, and help shape, their ecosystems.

Creating and reading maps are important skills that help students to simplify complex patterns and gain new perspectives. Spatial representations are important tools students can use to aid in memory and learning. Utilizing different maps (e.g., state, country, and world maps) not only helps students learn geographic information, but also helps them to understand geographic perspective and scale.

## Prior Knowledge

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## Recommended Prior Activities

- [Collision! Human Impacts on Animal Migration](#)
- [Create an Animal Migration Map](#)
- [Interactions Among Organisms in Ecosystems](#)
- [Tracking Animal Migration](#)
- [Why and How Animals Migrate](#)

## Vocabulary

Term	Part of Speech	Definition
animal migration	<i>noun</i>	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.
Antarctic	<i>noun</i>	region at Earth's extreme south, encompassed by the Antarctic Circle.
Arctic	<i>noun</i>	region at Earth's extreme north, encompassed by the Arctic Circle.
detour	<i>noun</i>	unplanned or temporary path.
distract	<i>verb</i>	to divert or draw attention away from something.
ecosystem	<i>noun</i>	community and interactions of living and nonliving things in an area.
focal	<i>adjective</i>	central and important.
impact	<i>verb</i>	to influence or have an effect on something.
key	<i>noun</i>	an explanation of symbols and abbreviations used on a map, also known as a legend.
map	<i>noun</i>	symbolic representation of selected characteristics of a place, usually drawn on a flat surface.
map layer	<i>noun</i>	part of a map representing specific features of a place.
migration pattern	<i>noun</i>	predictable movements, in time and space, of a group of animals or people.

<b>Term</b>	<b>Part of Speech</b>	<b>Definition</b>
<b>scale</b>	<i>noun</i>	distinctive relative size, extent, or degree.



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