

# Interrupted Migrations: Impacts and Solutions

Students investigate different solutions to human impacts on animal migration and identify different stakeholders; this information will be represented in the final map layer for their unit project. Groups develop and present an evidence-based argument that takes a stand on a specific human impact on animal migration and aims to convince stakeholders to implement a recommended solution. 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**

3 Activities

## In collaboration with



ACTIVITY 1: EXPLORING SOLUTIONS TO  
HUMAN IMPACTS ON ANIMAL MIGRATION |  
50 MINS

## DIRECTIONS

*This activity is part of the *Detours and Distractions: How Humans Impact Migration Patterns* unit.*

## I. Remind students of the ways humans can impact animal migrations and introduce a solution.

- Direct students' attention to the Human Impacts Photo Gallery around the room.
- Ask students:
  - *In what ways do we know humans impact animal migrations and ecosystems?* (Possible responses: Human infrastructure and behavior have altered animal migration patterns in many ways. Roads act as a barrier to wildlife crossings; wind farms create hazards for birds, bats, and insects; climate change can render ecosystems uninhabitable.)
- Invite volunteers to summarize the wind turbine problem for animal migration. (Wind turbines provide a cost-effective, clean, sustainable source of energy. But it is estimated that hundreds of thousands of birds, bats, and insects die every year when they accidentally collide with turbine blades. Bats may even succumb to the pressures created when the giant turbine blades pass through the air, a phenomenon known as barotrauma. Depending on where wind farms are located, they can also impact other animals who migrate on the ground.)
- Ask students:
  - *What are some solutions that could help this problem?*
  - Engage the class in a discussion about potential solutions. Invite students to share their ideas; record students' responses to be displayed in the classroom.
  - Possible responses may include: removing wind turbines, using them during times when they will have minimal effects on wildlife, changing locations, turning them off, or changing their shapes.
- Project the article *For the Birds (and the Bats): 8 Ways Wind Power Companies are Trying to Prevent Deadly Collisions*.
- Read the introductory section aloud to students, then either facilitate a whole-class reading of the article or assign each of the eight sections to different groups of students to read and report on the solutions addressed.
- Debrief by comparing the ideas presented in the article to students' initial solution ideas.

## 2. Guide students in exploring animal migration problems, solutions, and stakeholders.

- Organize students into their project groups and distribute the following resources to each student, selecting for the correct reading levels:
  - Wildlife Crossings
  - Fish Tale

- [The Gray Whale: Past, Present, and Future](#)
  - [Snake Migration](#)
  - [Exploring Solutions to Animal Migration Problems](#) handout
- Orient students to the *Exploring Solutions to Animal Migration Problems* handout; explain that after they complete the reading, they will be asked to summarize the solutions outlined in the articles, identify different stakeholders, and brainstorm pros and cons to each solution.
  - Define a stakeholder: a stakeholder is someone with an interest or concern in something or one who is involved in or affected by a course of action. Ask students:
    - *How many stakeholders can you identify in the wind turbine problem?* (Possible responses: wind turbine businesses; scientists who study birds, bats, or other animals; people who get electricity from wind turbines; community members who like their community with or without the wind turbines; environmentalists)
    - Remind students to keep this concept in mind as they identify stakeholders in their final project.
  - Provide groups with choices for how they can work together to complete the handout; for example, students could use the Jigsaw method where each member reads one article and reports back to the others. Or, all students can read the articles together and compare notes. Each student should complete their own handout.
  - Ask students to complete the handout with their groups, circulate to facilitate discussion, and press student thinking. Press student thinking with questions like:
    - *How are the components of these solutions similar or different?*
    - *Do you think the same kind of solutions would work for all animals, or do different kinds of animals need different kinds of solutions?*
    - *How would you measure success of these solutions?*
  - Collect students' handouts upon completion or at the end of the activity.

### 3. Direct students to revisit the *Human Impacts Photo Gallery*.

- Distribute a supply of two new colors of sticky notes.
- Remind students of the initial exercise from the [Collision! Human Impacts on Animal Migration](#) activity: they examined each photograph in the gallery walk and identified what they thought could be impacting a migrating animal (e.g., a highway) and what effects that might have. Then explain the activity:

- Sticky color number one: First, students will examine each photograph in the gallery walk and reflect on their earlier thinking. Encourage students to read their own, and others', original sticky notes, and to add anything that has changed about their thinking. As before, students should stick their new note on the wall next to the photograph.
- Sticky color number two: Have students record a possible solution that could overcome the impact in the photograph. Again, students should stick their note on the wall next to the photograph.
- Bring students back together as a class and invite volunteers to share their ideas and thoughts about each photograph.

#### 4. Start planning how students will take additional action.

- Work with students to select which of the following projects you would like to pursue at the conclusion of the unit:
  - Identify local migratory organisms. Create a backyard “pit stop” for the most vulnerable—such as a bat box or specific native flowering plants.
  - Author a class letter to Congress, local government, or a local business to encourage an animal migration solution (e.g., building a wildlife crossing bridge). Students can submit copies of their maps and presentations as evidence.
  - Download the [Animal Tracker app](#) or [eBird app](#) and follow and add to scientific knowledge about migrating animals through student citizen science field work.
- To maximize student engagement, assign student roles in the planning process.
- Remind students that this opportunity for further action serves to continue student momentum toward helping end the negative impacts of humans on animal migration and extends the impact of their project work into the local or global community.

## Tip

**Step 2:** There are several text levels available for the articles above; choose the level that is most appropriate for your students

## Tip

**Step 2:** The articles used for this activity can either be printed out in advance or students can engage with them on a computer or tablet.

## Modification

**Steps 1 and 2:** Instead of having every group read every article, you could have different groups read different articles and then compare and contrast using group or class discussions.

## Informal Assessment

Students' participation during class discussions, their responses on the *Exploring Solutions to Animal Migration Problems* handout, as well as their reflective responses to the *Human Impacts Photo Gallery*, provide assessment opportunities for this activity.

## Extending the Learning

- Visit a local zoo or aquarium on a field trip or encourage students to go on their own. This could give students a chance to see the animals they studied, as well as add to their knowledge of animal migration. Additionally, many zoos and aquariums feature conservation programs that your class could contribute to or mirror (e.g., plant milkweed, use bird-proof glass, create a turtle crossing).

## OBJECTIVES

## Subjects & Disciplines

### Biology

- Ecology
- Conservation

## Learning Objectives

Students will:

- Reflect and build on prior thinking about human impacts on animal migration.
- Be inspired by solutions to human-made problems.

## Teaching Approach

- Project-based learning

# Teaching Methods

- Discussions
- Reading
- Reflection

# Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills
    - Communication and Collaboration
- Critical Thinking Skills
  - Analyzing
  - Applying
  - Evaluating
  - Remembering
  - Understanding
- Science and Engineering Practices
  - Asking questions (for science) and defining problems (for engineering)
  - Constructing explanations (for science) and designing solutions (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.6-8.2:

Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

- 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 Concepts: Cause and Effect:**

- **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.

- **MS-ESS3-4:**

Construct an argument supported by evidence for how increases in human and natural resources impact Earth's systems.

- **MS-ESS3: Earth and Human Activity:**

MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment

- **MS. Interdependent Relationships in Ecosystems.:**

MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

- **MS-LS2: Ecosystems: Interactions, Energy, and Dynamics:**

MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem

- **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 6:**

Constructing explanations and designing solutions

- **Science and Engineering Practice 8:**

Obtaining, evaluating, and communicating information

## Preparation

# BACKGROUND & VOCABULARY

## Background Information

Unfortunately, human infrastructure and behavior have altered animal migration patterns. From building roads that act as a barrier to wildlife crossing, to constructing wind farms that create hazards for birds, bats, and insects, to causing climate change that renders ecosystems uninhabitable for many native organisms, humans are impacting animal migration. However, many individuals and organizations are working hard to help overcome these impacts. From creating wildlife bridges that help animals cross over roads, to designing new wind turbines to minimize wildlife impact, solutions to these problems are becoming more prevalent.

## Prior Knowledge

### []

## Recommended Prior Activities

- [Collision! Human Impacts on Animal Migration](#)
- [Create an Animal Migration Map](#)
- [Create an Ecosystem Map Layer](#)
- [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.
argument	<i>noun</i>	reason or set of reasons given with the aim of persuading others that an action or idea is right or wrong.
detour	<i>noun</i>	unplanned or temporary path.
distract	<i>verb</i>	to divert or draw attention away from something.

Term	Part of Speech	Definition
empirical		adjective able to be proved with evidence or experience.
evidence	noun	data that can be measured, observed, examined, and analyzed to support a conclusion.
impact	verb	to influence or have an effect on something.
implement	verb	to carry out plans.
interrupt	verb	to break the uniformity or continuity of something.
migration pattern	noun	predictable movements, in time and space, of a group of animals or people.
solution	noun	an answer to a problem.
stakeholder	noun	person or organization that has an interest or investment in a place, situation, or company.
wind turbine	noun	machine that produces power using the motion of wind to turn blades.

## ACTIVITY 2: CREATE A HUMAN IMPACTS MAP LAYER I 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 human impacts on migration and create a *Know & Need to Know* chart to engage groups in setting research goals.**

- Distribute the [Human Impacts Map Layer: Know & Need to Know Chart](#) to each student.
- Ask students to discuss the questions in their project groups and record their thoughts on their chart:
  - *What do we already know about how our animal's migration pattern is impacted by humans?*
  - *What do we already know about solutions to these impacts?*
  - *What do we need to know about how our animal's migration pattern is impacted by humans in order to create a human impact map layer?*
  - *What do we need to know about solutions to these impacts? Or, what do we need to know to create solutions to these impacts?*

## 2. Prepare groups for their project work.

- Explain that for the remainder of this activity, each group will research, gather, and organize information to create a final map layer showing how their focal animal's migration is impacted by humans and explaining, illustrating, or describing at least one possible solution to this impact. This map layer should also include a key.
- Remind students about the definition of stakeholders: a person with an interest or concern in something or one who is involved in or affected by a course of action.
- Explain to students that as they are learning about human impacts on their animal's migrations and recommending solutions, they will list at least four stakeholders and explain what their stake is in the impact, solution, or animal migration.
- Distribute the Human Impacts Map Layer Rubric and orient students so that they are familiar with the expectations before they begin their work.

## 3. Prepare groups to research and create the final migration map layer, the Human Impacts Map. (This step should take up the majority of the activity.)

- Prompt students to gather all completed map layers and handouts from previous activities.
- Help students choose and print the same map layer as their base map using MapMaker 1-Page Maps.
- Set parameters for students on where they can do additional research. See the *Background & Vocabulary* tab for helpful sources.
- Support and structure student research as needed based on how the previous project work sessions have gone.
- While students are working, circulate to provide assistance and remind them of the required components.
  - Prompt for a key: *What do all of the symbols and colors on your map mean?*
  - Prompt for an understanding of the human impact on their animal's migration pattern: *How is your animal's migration impacted by humans? How are you illustrating that on your map layer? Are these effects being seen now? How might these effects continue to get worse if no solution is provided?*
  - Prompt for a list of stakeholders and descriptions of their stake: *Who is responsible for this human impact? Who would be involved or affected by a solution? How would they be affected?*
  - Prompt for an explanation of at least one solution to the human impact on the animal's migration pattern: *What are some ways that your focal animal's migration pattern can be helped? Are these solutions already in place, or ones that you are*

coming up with? Is there evidence that these solutions are successful? How would you measure their success? How feasible are these solutions? Are there real-life examples of this happening and helping? How long do you think it might take for this proposed solution to help?

- Collect group maps at the end of the activity to assess students' work and provide formative feedback.

## Tip

**Step 1:** Watch the Animal Migration [GeoChallenge Video](#) to show examples of student solutions to this problem.

## 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 Human Impacts Map 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 Human Impacts Map, adjust your pacing as needed before students develop their final presentation of the unit.

## Rubric

The [Human Impacts Map Layer Rubric](#) can be used to assess each group's Human Impacts Map Layer. All group maps should show how humans impact the animal, should have a key, and should describe at least one solution to the impact. To be successful, groups should also list and describe at least four stakeholders who have a stake in the human impacts or the solution.

## Extending the Learning

Solutions to human impacts on the environment influence multiple stakeholders. Hold a debate about a solution to a human impact and have different students or student groups act as different stakeholders. Different stakeholders can be local landowners, scientists, conservationists, native communities, business owners, and local communities.

## OBJECTIVES

# Subjects & Disciplines

### **Biology**

- Ecology
- Conservation

### **Geography**

# Learning Objectives

Students will:

- Identify and describe at least four stakeholders that are involved with the human impact or solution.

# 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
    - Creativity and Innovation
    - Critical Thinking and Problem Solving
  - 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)
  - Constructing explanations (for science) and designing solutions (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:**

- **Disciplinary Core Ideas LS3: Earth and Human Activity:**

- **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.

- **MS-ESS3-4:**

Construct an argument supported by evidence for how increases in human and natural resources impact Earth's systems.

- **MS-ESS3: Earth and Human Activity:**

MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment

- **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 6:

Constructing explanations and designing solutions

- Science and Engineering Practice 8:

Obtaining, evaluating, and communicating information

## Preparation

# BACKGROUND & VOCABULARY

## Background Information

Mapping animal migration is an important way to understand more about the animals, their movement pattern, and their global relationship. Additionally, creating and reading maps are important skills, and 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 help students learn geographical information, but help 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](#)
- [Create an Ecosystem Map Layer](#)
- [Exploring Solutions to Human Impacts on Animal Migration](#)
- [Interactions Among Organisms in Ecosystems](#)
- [Tracking Animal Migration](#)
- [Why and How Animals Migrate](#)

# Vocabulary

<b>Term</b>	<b>Part of Speech</b>	<b>Definition</b>
<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>detour</b>	<i>noun</i>	unplanned or temporary path.
<b>distract</b>	<i>verb</i>	to divert or draw attention away from something.
<b>effect</b>	<i>noun</i>	result or impact produced by an action.
<b>evidence</b>	<i>noun</i>	data that can be measured, observed, examined, and analyzed to support a conclusion.
<b>feasible</b>	<i>adjective</i>	possible.
<b>focal</b>	<i>adjective</i>	central and important.
<b>impact</b>	<i>verb</i>	to influence or have an effect on something.
<b>key</b>	<i>noun</i>	an explanation of symbols and abbreviations used on a map, also known as a legend.
<b>map</b>	<i>noun</i>	symbolic representation of selected characteristics of a place, usually drawn on a flat surface.
<b>map layer</b>	<i>noun</i>	part of a map representing specific features of a place.
<b>measure</b>	<i>verb</i>	to determine the numeric value of something, often in comparison with something else, such as a determined standard value.
<b>migration pattern</b>	<i>noun</i>	predictable movements, in time and space, of a group of animals or people.
<b>scale</b>	<i>noun</i>	distinctive relative size, extent, or degree.
<b>solution</b>	<i>noun</i>	an answer to a problem.
<b>stakeholder</b>	<i>noun</i>	person or organization that has an interest or investment in a place, situation, or company.

## ACTIVITY 3: TAKING A STAND AGAINST HUMAN IMPACTS ON ANIMAL MIGRATION | 2 HRS 30 MINS

### DIRECTIONS

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

## I. Introduce evidence-based arguments.

- Explain to students that they will prepare and present an evidence-based argument that takes a stand on human impacts on animal migration.
- On the board, define more clearly each of the following components of an evidence-based argument:
  - **Question:** *Why should your recommended solution(s) to animal migration be implemented by your stakeholders?*
  - **Claim:** *What is your answer to the question? Your claim should state your position. For example, “[Our recommended solution] is effective because it will...”*
  - **Evidence:** *What data supports your claim? You should have multiple pieces of evidence gathered from your research.*
  - **Reasoning:** *How does your evidence support your claim? You should provide reasoning for all evidence.*
- Show the [Wildlife Crossings Stop Roadkill. Why Aren't There More?](#) video. As the video is playing, encourage students to identify the question, claim, evidence, and reasoning from the video. As a class, have students share what they have identified.
  - **Question:** Why aren't there more wildlife crossings when they have been shown to prevent roadkill?
  - **Claim:** Wildlife crossings prevent roadkill, but they are expensive to install. When design solutions are identified that are more cost effective, more wildlife crossings can be built.
  - **Evidence:** Wildlife crossings that are already made (like in Banff, Canada), tracking data that show individual animals using the crossings, camera trap videos showing different kinds of animals using the crossings. When a cheaper design solution was identified through a design contest, Colorado agreed to install it.
  - **Reasoning:** Data show that wildlife crossings are effective, and that states agreed to install a wildlife crossing when the cost was more reasonable. This shows that when wildlife crossings become more affordable, more will be built.
- Ask students: *Why are evidence-based arguments important?* (They support critical thinking, provide support for making decisions and forming opinions, and help to express content knowledge in an accurate and fair way.)

## 2. Prepare groups for their final presentation.

- Distribute the *Presentation Rubric* to each student and orient students to expectations.
- The objective for the presenting group is to convince key stakeholders (role-played by their classmates) that they should implement their recommended solution.
  - The stakeholders will be identified and defined by student groups, and will be portrayed by another student group that will evaluate their argument during presentations. Each student in the listening group will evaluate from the perspective of one stakeholder.
  - To be successful at this presentation, groups will need to think from the perspective of different stakeholders, and provide evidence and reasoning to support their claims.
  - Groups will research, gather, and organize evidence to support their argument. Their completed unit project maps, with its animal migration base layer, ecosystem layer, and human impact layer, will act as a key piece of evidence for their argument.
- The objective for the listening group is to decide, from each stakeholder's perspective, whether they should approve the solution recommended, whether they should offer revisions, or whether they will not approve the solution.
  - Whatever they decide, they must provide reasoning to back up their decision. Each stakeholder's reasoning will be a part of the presenting group's assessment, and the reasoning for the stakeholder's decision should be persuasive and fair (e.g., stakeholders cannot just say "because we think so.").
- Orient students to the presentation method and parameters.

## 3. Guide groups to identify their stakeholders.

- Distribute the following documents to each group:
  - *Sample Stakeholder Descriptions*
  - *Stakeholder Descriptions and Evaluations*
- Ask students to retrieve their *Exploring Solutions to Animal Migration Problems* handout.
  - This was completed during the *Exploring Solutions to Human Impacts on Animal Migration* activity. Students will use this handout now to guide how they identify and

define their stakeholders.

- Allow students to read the *Example Stakeholder Descriptions* handout and work in their groups to complete the stakeholder descriptions on the *Stakeholder Descriptions and Evaluations* handout.
- After students have completed this, collect their *Stakeholder Descriptions and Evaluations* handout and, while they are working on their presentations, make enough copies for the listening group (e.g., if there are four students in every group, four copies should be made so that each student can represent a different stakeholder).

#### **4. Support groups in preparing their arguments and presentations.**

- Prompt students to retrieve all of the completed handouts, thought organizers, *Know & Need to Know* charts, and all other articles, videos, encyclopedic entries, and resources used throughout the unit.
- Set boundaries for students on how much additional research is expected. Encourage students to limit their research to only what is necessary to support their arguments. As needed, provide instruction for effective online research and online literacy.
- As students are working, remind them to keep in mind the different stakeholders they are trying to convince. Make sure that for every different claim they make (which may be a different claim for each different stakeholder) there is evidence to support their claim.
- Focus students' research with questions like:
  - *What pieces of evidence are you using to support your claim? How many pieces of evidence do you have to support your claim? Is that enough to convince all stakeholders?*
  - *Do any of your stakeholders need to see different kinds of evidence to be convinced?*
  - *How does this piece of evidence support your claim? What is the reasoning behind this?*
  - *How are you going to present all of this information in a clear way?*
  - *Do you have any visuals or pictures to support your textual evidence?*

#### **5. Facilitate group presentations.**

- Distribute the corresponding, now completed, *Stakeholder Descriptions and Evaluation* handouts to each group that will be acting as listening groups during a presentation. (Each presenting group should have one listening group, and each group should act as a listening group at least once.)

- Remind non-participating groups that they should still be actively listening to the presentations.
- Orient stakeholder groups to their roles. Each member of the group will act as a different stakeholder. If there are more group members than stakeholders, students can work as teams or there can be duplicate stakeholders.
  - Reminder: Their objective is to decide, from the stakeholder’s perspective, whether they should approve the recommended solution, offer revisions, or reject the solution. Reasoning must be provided for all decisions.
- Presenting groups will be evaluated by the teacher using the *Presentation Rubric* and by the listening group with the *Stakeholder Descriptions and Evaluations* handout.
- Determine in advance whether the stakeholder groups will share their thoughts out loud with presenting groups, or whether the feedback will be written on the handouts.

#### **6. Reflect on the project.**

- Invite volunteers to share their reflections, thoughts, and changes in thinking regarding the unit. To close, ask students to share actions or behaviors they feel would minimize human impacts on animal migration.

#### **7. Prepare to execute the opportunity for further action.**

- Now that the unit is over, prepare your class to execute further action to continue student momentum toward helping end the negative impacts of humans on animal migration and extend the impacts of their project work into the local or global community.
  - Identify local migratory organisms. Create a backyard “pit stop” for the most vulnerable—such as a bat box or specific native flowering plants.
  - Author a class letter to Congress, local government, or a local business to encourage an animal migration solution (e.g., building a wildlife crossing bridge). Students can submit copies of their maps and presentations as evidence.
  - Download the [Animal Tracker app](#) or [eBird app](#) and follow and add to scientific knowledge about migrating animals through student citizen science field work.

## Rubric

Students will be assessed on their presentations by their teachers and by their peers. A rubric is used to standardize this assessment.

## Extending the Learning

Have students write a research paper making the argument that changes to physical or biological components of an ecosystem affect populations.

### OBJECTIVES

## Subjects & Disciplines

### **Biology**

- Ecology
- Conservation

## Learning Objectives

Students will:

- Create and present an argument that aims to convince four stakeholders to implement a recommended solution.
- Identify and define four stakeholders whom they aim to convince.
- Gather and organize evidence to support their argument.

## Teaching Approach

- Project-based learning

## Teaching Methods

- Information organization
- Research
- Role playing

## 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
  - Life and Career Skills
    - Initiative and Self-Direction
    - Productivity and Accountability
    - Social and Cross-Cultural Skills
- Critical Thinking Skills
  - Analyzing
  - Applying
  - Creating
  - Evaluating
  - Remembering
  - Understanding
- Geographic Skills
  - Analyzing Geographic Information
- Science and Engineering Practices
  - Asking questions (for science) and defining problems (for engineering)
  - Constructing explanations (for science) and designing solutions (for engineering)
  - Engaging in argument from evidence
  - 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.SL.7.4:**

Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.&nbsp;

- **CCSS.ELA-LITERACY.SL.7.5:**

Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

- **CCSS.ELA-LITERACY.SL.7.6:**

Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 7 Language standards 1 and 3 here for specific expectations.)&nbsp;

- **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.

- **Speaking and Listening Standards 6-12:**

Comprehension and Collaboration, SL.7.3

## **NEXT GENERATION SCIENCE STANDARDS**

- **5-ESS3-1 :**

Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

- **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:**

• **Disciplinary Core Ideas LS3: Earth and Human Activity:**

• **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.

• **MS-ESS3-4:**

Construct an argument supported by evidence for how increases in human and natural resources impact Earth's systems.

• **MS-ESS3: Earth and Human Activity:**

MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment

• **MS. Interdependent Relationships in Ecosystems.:**

MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

• **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 6:**

Constructing explanations and designing solutions

• **Science and Engineering Practice 7:**

Engaging in argument from evidence

## **Preparation**

# BACKGROUND & VOCABULARY

## Background Information

Human infrastructure and behavior have altered animal migration patterns. From building roads that act as a barrier to wildlife crossing, to constructing wind farms that create hazards for birds, bats, and insects, to causing climate change that renders ecosystems uninhabitable for many native organisms, humans are impacting animal migration. However, there are many individuals and organizations that are working hard to help overcome these impacts. From creating wildlife bridges that help animals cross over roads, to designing new wind turbines

to minimize wildlife impact, solutions to these problems are becoming more prevalent. When considering possible solutions, it is important to take into account not only what is good for the animal, but also what would be most successful for the widest variety of stakeholders. Constructing arguments from the perspective of different stakeholders can help students gain important skills in empathy and forethought.

## Prior Knowledge

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## Recommended Prior Activities

- [Collision! Human Impacts on Animal Migration](#)
- [Create a Human Impacts Map Layer](#)
- [Create an Animal Migration Map](#)
- [Create an Ecosystem Map Layer](#)
- [Exploring Solutions to Human Impacts on Animal Migration](#)
- [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.
approve	<i>verb</i>	to accept or allow something.
argument	<i>noun</i>	reason or set of reasons given with the aim of persuading others that an action or idea is right or wrong.
claim	<i>verb</i>	to state as the truth.
component	<i>noun</i>	part.
detour	<i>noun</i>	unplanned or temporary path.
distract	<i>verb</i>	to divert or draw attention away from something.
evidence	<i>noun</i>	data that can be measured, observed, examined, and analyzed to support a conclusion.
impact	<i>verb</i>	to influence or have an effect on something.
implement	<i>verb</i>	to carry out plans.

<b>Term</b>	<b>Part of Speech</b>	<b>Definition</b>
<b>migration pattern</b>	<i>noun</i>	predictable movements, in time and space, of a group of animals or people.
<b>perspective</b>	<i>noun</i>	point of view or way of looking at a situation.
<b>reasoning</b>	<i>noun</i>	process of using evidence to make inferences or conclusions using logic.
<b>revise</b>	<i>verb</i>	to correct or improve an existing material, often a written document.
<b>solution</b>	<i>noun</i>	an answer to a problem.
<b>stakeholder</b>	<i>noun</i>	person or organization that has an interest or investment in a place, situation, or company.



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