NATIONAL GEOGRAPHIC

RESOURCE LIBRARY I ACTIVITY : 2 HRS 30 MINS

Protecting Biodiversity in the Amazon Rain Forest

Students explore biodiversity in the Amazon rain forest using the MapMaker Interactive and other online resources. Then students construct an argument for protecting biodiversity in the Amazon rain forest.

GRADES

6, 7, 8

SUBJECTS

Biology, Geography, Human Geography

CONTENTS

1 Image, 4 PDFs

OVERVIEW

Students explore biodiversity in the Amazon rain forest using the MapMaker Interactive and other online resources. Then students construct an argument for protecting biodiversity in the Amazon rain forest.

For the complete activity with media resources, visit:
http://www.nationalgeographic.org/activity/protecting-biodiversity-amazon-rain-forest/

DIRECTIONS

1. Activate students' prior knowledge about the environmental effects of biodiversity loss.

Activate students' prior understanding about human impacts on the environment by showing a photograph of clear-cutting in Brazil. Define the vocabulary terms *clear-cutting* and *deforestation* and then read aloud the photo caption. Have students discuss what the photo shows and brainstorm potential consequences to the ecosystem. Ask: *What did this area look*

like before clear-cutting happened? What organisms might live in an area like this? What are some reasons people cut down trees in a rain forest? Who benefits from cutting down the trees? If possible, elicit local examples of forest or biodiversity loss (e.g., for new development) to illustrate the fact that this is also happening locally, not just in faraway countries. Have students answer the same questions for the local example. Ask: *What living things are affected by clearing areas for development? How are they affected?* Then have students return to thinking about the effects of deforestation on the Amazon rain forest ecosystem and answer the same questions. Ask: *What living things are affected by deforestation? How are they affected?* Invite volunteers to share their thinking with the class. The focus of this discussion is to get students thinking about what organisms inhabit the tropical rain forest and how habitat destruction affects where they live, how they live, and possibly the survival of their species. Introduce the term *biodiversity* and explain that the Amazon rain forest is the most biodiverse place on Earth. But, this biodiversity is threatened due to human activity. Explain to students that they will explore biodiversity in the Amazon to try to understand why it is so important to protect. Tell students that the purpose of this activity is for them to construct an argument for protecting biodiversity of the Amazon rain forest.

2. Construct knowledge about biodiversity in the Amazon rain forest.

Project the MapMaker Interactive geo-tour Geography and Wildlife of the Amazon Basin on a screen and select the bookmark Where is the Amazon Basin? Point out the highlighted Amazon Basin and discuss its location and size. During this time, if students are unfamiliar with the MapMaker Interactive, point out some of the basic tools like zooming in (+) and out (-). Also point out the bookmarks at the bottom of the map. Explain to students that they will work in small groups to learn more about a smaller region of the Amazon rain forest. Distribute the worksheet Exploring the Animals and Plants in the Amazon Rain Forest. Divide students into small groups of three to explore different regions (north, west, east) of the Amazon rain forest. Assign a different region to each group. More than one group will investigate the same region. Explain that while the Amazon rain forest is known for its biodiversity, in this activity students will investigate a very small sample of the vast biodiversity that exists in this region. Have each student complete Part 1. Using MapMaker to Explore Animals and Plants in Regions of the Amazon Rain forest. Direct them to select three animals and three plants from their assigned region and write facts relevant to the importance of the plant and animal within the habitat. Advise students to focus on how the

plants and animals interact with other organisms in the forest as they complete the tables. Explain to students that this information will provide the evidence they need to support the arguments they will construct later in the activity.

3. Extend students' understanding of biodiversity through online research.

Once students have completed Part 1 of the worksheet, have them select one animal and one plant to research further online and complete Part 2. Conducting Online Research. Direct students to use website links associated with each plant or animal in the Geography and Wildlife of the Amazon Basin geo-tour. Ask students to add the facts they find to their tables on the worksheet.

4. Introduce threats to the Amazon rain forest.

Have students recall the clear-cutting photograph in Brazil from the beginning of the activity and share some of the real-world threats to the rain forest: human development, deforestation due to logging and cattle ranching, infrastructure development, hydroelectric power projects, and others. Focusing on their region (from step 3 above), ask students to consider the consequences of habitat destruction to the plants and animals from their region and discuss this in their groups. Ask students to take notes that could be useful when constructing their arguments about protecting the biodiversity of the Amazon rain forest.

5. Construct an evidence-based argument for protecting biodiversity in the Amazon rain forest.

Distribute the rubric Evidence-Based Argument about Protecting Biodiversity in the Amazon Rain Forest and review it with students. Next, distribute the worksheet Constructing an Evidence-Based Argument. Ask students to construct their evidence-based argument for why it is important to protect biodiversity in the Amazon rain forest. Introduce and explain the components of a scientific argument:

- ***Claim***: a statement that answers the original question/problem.
- ***Evidence***: scientific data that supports the claim. The data needs to be appropriate and sufficient to support the claim.
- ***Reasoning***: a justification that connects the evidence to the claim.

Remind students that the facts they collected from their exploration of the Geography and Wildlife of the Amazon Basin geo-tour in the MapMaker Interactive and from their online research will serve as the evidence they need to support their claims.

6. Have students present their scientific arguments.

Have students share their arguments about the importance of protecting biodiversity in the Amazon rain forest with the class. Students with the same region should present following each other so students can compare the different pieces of evidence and reasoning they used to support their claim. Conclude with a whole-class discussion reflecting on the potential loss of biodiversity in the Amazon rain forest. Ask: *What is biodiversity? What is important about biodiversity in the Amazon rain forest? What happens when biodiversity decreases? What environmental issues are impacting biodiversity?*

Modification

Group students who are less comfortable with technology with tech-savvy students.

Modification

Place struggling readers or English language learners with peers who are stronger readers and can help them process the research.

Tip

Research issues related to forest and biodiversity loss in your local area to help students make a local connection to these concerns. Have students discuss how development in the area affects the plants and animals that used to live there. Connect this discussion to development, logging, mining, and creating pastureland in the Amazon rain forest.

Tip

Students should have a good understanding of biodiversity. To help construct knowledge around biodiversity, select appropriate sections from the following encyclopedic entries for students to read prior to this activity: rain forest and biodiversity.

Modification

This activity can be conducted as a jigsaw. Following the completion of the worksheet Exploring the Plants and Animals in the Amazon Rain Forest, have students work in small groups of three to become experts on the plants and animals in one region while they complete the tables using the MapMaker Interactive (Part 1) and online research (Part 2). Then assign students to new groups of three in which each student is an expert from another region. In these second groups, students can draw on evidence from all three regions to construct arguments about protecting biodiversity in the Amazon rain forest.

Tip

Three, 50-minute class periods are suggested for this activity as follows: Day 1—introduce the project and have students start research using the MapMaker Interactive; Day 2—students complete online research, discuss, and formulate their arguments; Day 3—students present their arguments and wrap up the project.

Modification

To ensure that everyone participates in group work, assign or allow students to choose jobs according to their strengths (e.g., recorder, facilitator, speaker, computer driver).

Tip

To make sure all students are involved in presenting the argument, assign roles or different speaking parts (claim, evidence, reasoning) to individual group members.

Alternative Assessment

Use the provided answer key for the worksheet Exploring the Animals and Plants in the Amazon Rain Forest and the provided rubric to score each group's scientific arguments.

Extending the Learning

- Have students observe biodiversity around the outside of their school, making connections between the plants and animals within the habitat. Have students work in groups of two or three to mark sampling sections of the school grounds with circles (such as a small hula hoop). Have them search for insects, birds, animal tracks, scat, feathers, nests, different

types of trees, grasses, and plants; list signs of plant and animal life found in the sample area; and estimate the number of each species. Remind students that biodiversity refers to the number of species as well as the number of each species. Have students discuss the biodiversity found in their sample area.

- Identify an environmental activist or decision-making stakeholder that is connected to preserving the Amazon rain forest. Have students send their final arguments from the activity in the form of a letter to this person or group.
- Have students transform their arguments into public service announcements and publish short YouTube videos.
- Create relevant Twitter hashtags (#Amazonbiodiversity, #Amazonplant) for the different regions or organisms and have students tweet interesting facts, questions, or concerns they come across as they conduct their research. Advise students to not include any identifying information in their tweets.
- Create a closed classroom website or discussion board for students to share questions, ideas, or concerns as they conduct their research.

OBJECTIVES

Subjects & Disciplines

Biology

Geography

- Human Geography

Learning Objectives

Students will:

- use the MapMaker Interactive and online research to identify evidence of biodiversity in the Amazon rain forest
- identify and explain why human activity threatens biodiversity in the Amazon rain forest
- construct a scientific argument to conserve biodiversity in the Amazon rain forest that includes a claim for why it is important, evidence that supports the claim, and reasoning that connects the evidence to the claim

Teaching Approach

- Learning-for-use

Teaching Methods

- Cooperative learning
- Discovery learning
- Discussions
- Reading
- Writing

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Information, Media, and Technology Skills
    - Information Literacy
    - Media Literacy
  - Learning and Innovation Skills
    - Communication and Collaboration
    - Critical Thinking and Problem Solving
- 21st Century Themes
  - Environmental Literacy
- Critical Thinking Skills
  - Analyzing
  - Understanding
- Geographic Skills
  - Acquiring Geographic Information
  - Analyzing Geographic Information
- Science and Engineering Practices
  - Analyzing and interpreting data
  - Asking questions (for science) and defining problems (for engineering)
  - Engaging in argument from evidence
  - Obtaining, evaluating, and communicating information

National Standards, Principles, and Practices

IRA/NCTE STANDARDS FOR THE ENGLISH LANGUAGE ARTS

- **Standard 7:**

Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.

NATIONAL GEOGRAPHY STANDARDS

- **Standard 1:**

How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information

- **Standard 14:**

How human actions modify the physical environment

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

- **CCSS.ELA-LITERACY.SL.6.2:**

Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.

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

Presentation of Knowledge and Ideas, SL.8.4

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

Comprehension and Collaboration, SL.6.4

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

Comprehension and Collaboration, SL.7.4

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

Comprehension and Collaboration, SL.8.4

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

Comprehension and Collaboration, SL.7.2

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

Comprehension and Collaboration, SL.7.3

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

Presentation of Knowledge and Ideas, SL.7.4

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

Comprehension and Collaboration, SL.8.1.

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

Comprehension and Collaboration, SL.8.2

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

Comprehension and Collaboration, SL.8.3

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

Comprehension and Collaboration, SL.6.1

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

Comprehension and Collaboration, SL.6.3

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

Presentation of Knowledge and Ideas, SL.6.4

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

Comprehension and Collaboration, SL.7.1

- **Writing Standards 6-12:**

Text Types and Purposes, W.6.1

- **Writing Standards 6-12:**

Text Types and Purposes, W.7.2

- **Writing Standards 6-12:**

Text Types and Purposes, W.8.2

ISTE STANDARDS FOR STUDENTS (ISTE STANDARDS*S)

- **Standard 4:**

Critical Thinking, Problem Solving, and Decision Making

NEXT GENERATION SCIENCE STANDARDS

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

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

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Blank paper
- Pencils

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per small group, Presentation software

PHYSICAL SPACE

- Classroom
- Computer lab
- Media Center/Library

GROUPING

- Heterogeneous grouping
- Large-group instruction

OTHER NOTES

Three, 50-minute class periods are suggested for this activity as follows: Day 1—introduce the project and have students start research using the MapMaker Interactive; Day 2—students complete online research, discuss, and formulate their arguments; Day 3—students present their arguments and wrap up the project.

RESOURCES PROVIDED: WEBSITES

- MapMaker Interactive GeoTour: Geography and Wildlife of the Amazon Basin

RESOURCES PROVIDED: HANDOUTS & WORKSHEETS

- Exploring the Animals and Plants in the Amazon Rain Forest
- Exploring the Animals and Plants in the Amazon Rain Forest Answer Key
- Rubric for Evidence-Based Argument about Protecting Biodiversity in the Amazon Rain Forest

- Constructing an Evidence-Based Argument

RESOURCES PROVIDED: IMAGES

- Clear-Cutting in Brazil

BACKGROUND & VOCABULARY

Background Information

The Amazon is the largest tropical rain forest in the world. It is globally important for its biodiversity as well as its role in climate change. Found within the rain forest are plants and animals that have helped make advances in medicine; for example, the bushmaster's venom led scientists to discover medicines to treat high blood pressure.

More than 20% of the world's oxygen is produced in the rain forest. The rain forest is also a carbon sink, which means it helps to remove carbon dioxide from the atmosphere. With rapid deforestation, it has been estimated that 20% of the Amazon rain forest has disappeared in the last 50 years, which has already led to detrimental effects to biodiversity and the increase of climate change.

The Amazon is one of the most biodiverse ecosystems in the world. Biodiversity refers to all the different kinds of living organisms within a given area. Biodiversity includes plants, animals, fungi, and other living things. "One in 10 biological species resides here and it contains the world's largest living collection of plants and animals. Although the inventory is far from being completed and described, there are over 1 million insect species, 40,000 plants, 2,200 fish, and 2,000 birds and mammals" (Gerald & Gerald, 2015, pg. 58).

Biodiversity is important because all species are interconnected. They depend on one another. Forests provide homes for animals. Animals eat plants. The plants need healthy soil to grow. Fungi help decompose organisms to fertilize the soil. Bees and other insects carry pollen from one plant to another, which enables the plants to reproduce. With less biodiversity, these connections weaken and sometimes break, harming all the species in the ecosystem. The

unique biodiversity of the Amazon rain forest has been threatened by deforestation caused by clear-cutting forests for hardwood timber, and to provide pastureland for cattle and crop farms. Human development, such as the construction of roads, has also contributed to deforestation.

Many species of plants and animals that live in the Amazon rain forest are endangered or threatened, including primates such as the spider monkey and red-handed howler monkey. When large trees are removed, the canopy that provided shelter, food, or nesting for some of these species disappears, resulting in relocation and possible fragmentation of some populations. Changes made to the ecosystem affect all life that lives there, but for the endangered or threatened populations, these changes could challenge their survival.

Prior Knowledge

["ability to define biodiversity and explain what happens when it is threatened","some knowledge of what resources living organisms need to survive and how elimination or reduction of these resources could influence population growth","basic knowledge about interrelationships among organisms within an ecosystem (e.g., food webs)","ability to select evidence from maps and text that supports a claim","ability to obtain, evaluate, and communicate information from media and text resources"]

Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
biodiversity	*noun*	all the different kinds of living organisms within a given area.
canopy	*noun*	one of the top layers of a forest, formed by the thick leaves of very tall trees.
carbon sink	*noun*	area or ecosystem that absorbs more carbon dioxide than it releases.
climate	*noun*	all weather conditions for a given location over a period of time.
deforestation	*noun*	destruction or removal of forests and their undergrowth.
ecosystem	*noun*	community and interactions of living and nonliving things in an area.

Term	Part of Speech	Definition
emergent layer	*noun*	uppermost layer of a forest, where sunlight is plentiful and trees tower on thin trunks.
endanger	*verb*	to put at risk.
greenhouse gas	*noun*	gas in the atmosphere, such as carbon dioxide, methane, water vapor, and ozone, that absorbs solar heat reflected by the surface of the Earth, warming the atmosphere.
habitat	*noun*	environment where an organism lives throughout the year or for shorter periods of time.
indigenous	*adjective*	characteristic to or of a specific place.
logging	*noun*	industry engaged in cutting down trees and moving the wood to sawmills.
mining	*noun*	process of extracting ore from the Earth.
rainforest	*noun*	area of tall, mostly evergreen trees and a high amount of rainfall.
ranching	*noun*	practice of raising livestock for human use, such as food or clothing.
shifting cultivation	*noun*	type of agriculture where a field or plot is cleared, cropped, and harvested until its fertility is exhausted. Also called slash-and-burn, milpa and swidden.
threatened species	*noun*	organism that may soon become endangered.
tropical rain forest	*noun*	grouping of tall evergreen trees, usually close to the Equator, which receives more than 203 centimeters (80 inches) of rain a year.
understory	*noun*	ecosystem between the canopy and floor of a forest.

For Further Exploration

Maps

- The Embattled Amazon
- World Wildlife WildFINDER

Reference

- South America: Physical Geography

Websites

- National Geographic Magazine: The Last of the Amazon
- National Geographic Education: Encyclopedic Entry—Rain Forest
- National Geographic Education: Encyclopedic Entry—Biodiversity
- National Geographic Environment: Tropical Rain Forest Map
- National Geographic Education: Amazonian Diversity
- National Geographic: Deforestation
- ICAA - The Initiative for the Conservation of the Andean Amazon and the World Wildlife Foundation: Purus-Manu Conservation Corridor

FUNDER

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