

RESOURCE LIBRARY | ACTIVITY : 1 HR 15 MINS

Ecosystems Help Everyone—Even Humans!

Students learn about ecosystem services and how they can be classified. Using a card sort, students identify major ecosystem services provided by the Indonesian rainforest where the Sumatran rhino lives. Students then consider what would happen to the Sumatran rhino, local biodiversity, and ecosystem services if the main food source for rhinos experienced a major decline.

GRADES

6, 7, 8

SUBJECTS

Biology, Ecology, Conservation

CONTENTS

3 PDFs, 1 Link

OVERVIEW

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For the complete activity with media resources, visit:

<http://www.nationalgeographic.org/activity/ecosystems-help-everyoneeven-humans/>

In collaboration with

DIRECTIONS

This activity is part of the Extinction Stinks! unit.

1. Introduce the concept of ecosystem services through a reading and discussion.

- Have students read through the first section of the National Wildlife Federation's Ecosystem Services article. Then have a few volunteer to read about the different types of services listed out loud for the class.
- Ask: *How would you explain “ecosystem services” to a younger child?*
 - Guide students to produce specific explanations or metaphors so that you can assess students’ understanding of the concept.
- Ask: *What are some examples of ecosystem services provided by the area around our school? Into which category of ecosystem service does each example fall?*
 - Examples may include: regulating services such as trees providing shade on a hot day or vegetation filtering and regulating water flow in the schoolyard, or cultural services such as improved student mental health from nature on the school grounds.
- Ask: *Do you think the ecosystem services provided by some ecosystems are more important than others? Why or why not?*
 - Students may say that ecosystem services that provide essential life-sustaining resources for humans or wildlife, such as water purification and life-saving medicine, are more important, while others may argue that they are all equally important.
 - Point out that these will be important considerations when writing their final grant proposals for the Extinction Stinks! unit project.

2. Guide students as they engage in a card sort to check their understanding of the types of ecosystem services.

- Remind students of the Sumatran rhino’s ecosystem. Have students predict some of the ecosystem services the forest habitat likely provides. These may include:
 - Water filtration
 - Species that could be used for medicine
 - Tourism
 - Storing resources like water or carbon

- Organize students into small groups and give each group one set of the Way Kambas Ecosystem Services Cards.
 - Each card has a specific ecosystem service provided by rainforest ecosystems like that of Way Kambas National Park. Direct students to organize them into the category of ecosystem service that it provides: regulating, provisioning, cultural, or supporting.
- Circulate and elicit students' thinking by asking why cards are in particular categories.
- After all groups have sorted their cards, ask students to share a few of their categories. If students disagree, discuss why each group made their choice and see if students can reach a consensus.

3. Connect ecosystem services to biodiversity using the claims students made in *The Roots of Extinction* activity.

- Hand back students' Understanding Extinction handouts from the end of The Roots of Extinction activity.
- In Part II of the handout, have students connect the factors they identified as threats to the Sumatran rhino to the ecosystem services provided by and biodiversity of the rainforest ecosystem.
 - Using your own example, model how to fill out a row of the table. For instance, cutting down trees from the rainforest increases the provisioning services accessed by the local human community, but decreases Sumatran rhino habitat. It also decreases overall biodiversity because vegetation has decreased.
- Direct students to answer the guiding questions in Part II and then prompt a few volunteers to share out their responses with the class. Emphasize that there are many ways that the Sumatran rhino's survival relates to ecosystem services and local biodiversity, all of which need to be taken into account when designing possible conservation solutions to support its survival.

4. Return to the class *Know & Need to Know* charts to track changes in students' thinking.

- Retrieve the class *Know & Need to Know* chart created in the SOS—Saving Our Species activity.
- Lead a class discussion to update the chart to reflect students' current understanding. Some responses might include:

- The ecosystems endangered species live in may provide essential ecosystem services that are in conflict with conservation of the species.
- Ecosystem services may also only be maintained when endangered species are conserved, adding to the argument for species conservation projects.

5. Assess students' learning by prompting them to write scientific arguments related to the cascading impacts of a fire in Way Kambas National Park.

- Remind students that the essential question for the unit is "*How can we prevent a species from going extinct while also meeting the needs of humans and other local species?*"
- Distribute the Lesson 1 Assessment handout. Students must make a claim supported by evidence and reasoning about how these four groups of organisms will be affected by a significant loss of vegetation:
 - Sumatran rhinos
 - Other herbivores
 - Carnivores
 - Humans/ecosystem services
- Use the Lesson 1 Assessment Rubric to evaluate students' arguments.

6. Have students rank their species preferences for the unit's final project.

- Introduce the six potential target species that students can study during the species-specific part of the unit project:
 - Monarch butterfly (*Danaus plexippus*)
 - Sierra Nevada yellow-legged frog (*Rana sierrae*)
 - Mekong giant catfish (*Pangasianodon gigas*)
 - Transient killer whales (*Orcinus orca*)
 - Cheetah (*Acinonyx jubatus*)
 - Northern spotted Owl (*Strix occidentalis caurina*)
- Have students rank their preferences.
 - You could choose to have students write their top three preferences on a piece of paper, use an online form, or assign species groups randomly.
 - Students will receive their species assignment in the next activity of the unit: Challenges Faced by Endangered Species.

Tip

Step 6: If you need more time to assign students to their project groups, incorporate this step into an earlier activity.

Rubric

Use students' updated *Understanding Extinction* handout to assess their current understanding of the relationships between species' survival, biodiversity, and ecosystem services. The guiding questions create a strong foundation for thinking about the complex relationships in the ecosystems of students' target species. Additionally, the revisiting of the *Know & Need to Know* chart is an opportunity to see the change in students' understanding and identify any gaps in their thinking. This will allow you to respond to students' curiosity and tie it into the unit's objectives, sparking authentic connection to the work of the unit.

At the end of this activity, use the *Lesson 1 Assessment Rubric* to assess students' understanding through their final claim-evidence-reasoning statements.

Extending the Learning

Consider the ecosystem services in your local schoolyard. What are the provisioning services at your school? What about the regulating services? Is there grass that drains and filters rainwater, or unique species that live there that might not be present elsewhere? What animals use the school's local environment to survive? Using some of the ideas listed [here](#), consider what steps you might take to enhance the ecosystem services provided by the land your school sits on. For example, you might consider planting more native plants, installing a rain garden, or setting up bird feeders to support local wildlife.

OBJECTIVES

Subjects & Disciplines

Biology

- [Ecology](#)
- Conservation

Learning Objectives

Students will:

- Define ecosystem services and categorize them according to general function.
- Categorize ecosystem services into different categories provided by the rainforest habitat of the Sumatran rhino.
- Use cause and effect to explain how ecosystem services would be altered with a biological or physical change to the local ecosystem of the Sumatran rhino.

Teaching Approach

- Project-based learning

Teaching Methods

- Cooperative learning
- Discussions
- Reading

Skills Summary

This activity targets the following skills:

- 21st Century Themes
 - Environmental Literacy
 - Global Awareness
- Critical Thinking Skills
 - Analyzing
 - Applying
 - Evaluating
 - Remembering
 - Understanding
- Science and Engineering Practices
 - Analyzing and interpreting data
 - 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.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.6-8.1.A:**

Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

- **CCSS.ELA-LITERACY.WHST.6-8.1.B:**

Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

NEXT GENERATION SCIENCE STANDARDS

- **Crosscutting Concept 2:**

Cause and Effect

- **Disciplinary Core Ideas LS2.A: Interdependent Relationships in Ecosystems:**

- **LS4.D: Biodiversity and Humans:**

Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4)

- **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.

- **Science and Engineering Practice 7:**

Engaging in argument from evidence

- **Science and Engineering Practice 8:**

Obtaining, evaluating, and communicating information

Preparation

What You'll Need

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per classroom

PHYSICAL SPACE

- Classroom

GROUPING

- Large-group instruction
- Small-group learning

BACKGROUND & VOCABULARY

Background Information

Ecosystems provide many essential services for the local, regional, and global community of living organisms, including humans. These services are broadly described in four categories: provisioning, regulating, cultural, and supporting services. Accessing or overexploiting provisioning ecosystem services can be seen as being at odds with preserving endangered species. Provisioning services like agriculture, hunting, or lumber extraction—all of which provide economic, food, and shelter benefits to people—can also threaten species' survival.

Prior Knowledge

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Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
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Term	Part of Speech	Definition
cultural services	<i>noun</i>	non-material benefits that humans obtain from ecosystems, e.g., sense of home, mental and physical health, tourism, spiritual experience, etc.
provisioning services	<i>noun</i>	material benefits humans obtain from ecosystems, e.g., food, water, lumber, fiber, etc.
regulating services	<i>noun</i>	ways in which ecosystems regulate fluctuating factors in the environment, such as disease, climate, water cycles, nutrient cycles, etc.
supporting services	<i>noun</i>	benefits provided by ecosystems that are indirectly supportive of other types of ecosystem services, e.g., providing habitat, nutrient cycling, maintaining genetic diversity, etc.

For Further Exploration

Articles & Profiles

- [Medium: How Much Is a Species Worth?](#)
- [National Geographic: How One Odd Bird Embodies the Endangered Species Act Debate](#)
- [National Wildlife Federation: Ecosystem Services](#)



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