

actionbioscience.org lesson

To accompany the article “Ecosystem Services: A Primer”
by the Ecological Society of America (Summer 2000)
<http://www.actionbioscience.org/environment/esa.html>

How Much Is an Ecosystem Worth? (July 2005)

Lesson by **John Ausema**, science teacher
Gonzaga College High School, Washington, DC

Educator’s section: <i>p. 1-2</i> Handout 1: <i>p. 3</i> Handout 2: <i>p. 4</i>

Grades & Levels

- **Handout 1:** upper middle school–high school (general)
- **Handout 2:** high school (advanced/AP)–undergraduate (year 1)

Time Recommendations

- **Article discussion questions:** 30–40 minutes (more time will be required for discussion if students have not read the article before class time)
- **Handout 1:** one to two 40–60 minute periods to prepare (or time spent outside class); one 40–60 minute period to present projects in class
- **Handout 2:** one to two 40–60 minute periods to prepare (or time spent outside class); one 40–60 minute period to present projects in class (more time will be needed for larger class sizes)

NSES (USA) Content Standards, grades 9–12

- 1.1. Systems, order, and organization
- 1.3. Change, constancy, and measurement
- 4.4. Interdependence of organisms
- 4.5. Matter, energy, and organization in living systems
- 7.3. Natural resources
- 7.4. Environmental quality
- 7.6. Science and technology in local, national, and global challenges

Note: View the NSES content standards on this site to choose other curricular applications for additional activities at www.actionbioscience.org/educators/correlationcharts.html.

Learning Objectives: Students will

- explain the economic importance of ecosystems
- define and give examples of ecosystem services
- research and analyze environmental data
- suggest specific actions that would protect ecosystem services

Key Words: biodiversity, biomonitor species, ecosystem, ecosystem service, economics, habitat, natural resources, pollution, runoff, urban sprawl, watershed

Preparation

Article Discussion: Use the questions on page 2 for class discussion of the article. They may be used in several ways. It is suggested teachers provide the content questions to general level students (grades 9–10) and have them work in pairs or groups; advanced students may be asked to summarize the article using their own observations. The content questions can then be used to prompt class discussion. Extension and Personal Viewpoint Questions are better discussed in small groups and may require teaching of ecosystem

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concepts beyond what is found in the article. Refer to the Active Learning Links in “Useful links for educators” for guidelines on helping students work in groups through article questions and activities.

Student Handouts 1 and 2: Refer students to “Useful links for student research” found at the end of ESA article. Web resources are provided that will help students with their research on the activities in the handouts. You may want to provide a grading rubric to the students before they choose activities so that they know what will be assessed. Refer to Assessment Resources in “Useful links for educators” at the end of the article page.

For Educators: Article Discussion

About the article “Ecosystem Services: A Primer” by the Ecological Society of America
<http://www.actionbioscience.org/environment/esa.html>

Article Content Questions

1. What is an ecosystem?
2. List three services provided by ecosystems.
3. Give some statistics on the value of services provided by ecosystems.
4. Name some threats to ecosystems.
5. Are ecosystems well understood by scientists? Explain.

Extension Questions

1. Select one ecosystem service and predict the likely effect if this service is lost.
2. How does a natural ecosystem control agricultural pests?
3. Why is climate stability important?
4. What makes humans different from the rest of the ecosystem?
5. How is it possible for pollination services to be so valuable? How would we replace this service if the pollinators were lost?
6. Construction companies are often required to create new wetlands or plant trees when they have destroyed natural habitats during a project. What is the reasoning behind this requirement?

Personal Viewpoint Questions

1. Whose responsibility should it be to preserve and protect ecosystem services? Who should pay for preservation?
2. Does it make a difference if we can replicate an ecosystem service artificially for the same or lesser cost?

D. “What if?” Scenarios

1. Suppose you are CEO of a company that relies on clean water to manufacture your products. Describe what you can do to ensure that clean water is available.
2. Suppose you are an elected official at the state or national level. What sort of action would you take to ensure that ecosystem services remain available?

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Student Handout 1

A. Public Service Announcement

Working in small groups, design a brochure or public service announcement about the importance of ecosystem services. Choose roles for each student in the group, for example, designer, editor, and so on.

Project requirements:

- Your project should be colorful and informative—not too much information, not too little. Make people want to read the announcement.
- Include a few relevant statistics. Several studies of the actual value of ecosystem services have been conducted.
- Include at least four suggestions that would apply to homeowners and students—make them things that people can actually do!
- Include reasons and let people know why ecosystem services are important.
- Be prepared to give a brief explanation of your project in class.
- Suggested formats: tri-fold brochure, poster, web page, video, radio spot.

B. Healthy Services

Refer to the article you read (<http://www.actionbioscience.org/environment/esa.html>). It lists several services that are provided by ecosystems, for example, dispersal of seeds, cycling and moving nutrients, purifying air, and so on. Choose one of them. With a partner or in a small group discuss how the particular service maintains the health of the environment. Present your findings to the class.

C. Biomonitors

Research the concept of biomonitor species. Choose one species that scientists think makes a good environmental biomonitor. With a partner, hypothesize creating a business venture to use the species for commercial biomonitoring. Create an advertising presentation, such as a brochure, slide show, or poster, to convince your class that you have a viable venture.

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Student Handout 2

A. Ecosystem Services

Form groups of two to four students. Each group will be responsible for researching how ecosystems provide a particular service. Spend one to two class periods researching information, and then put together a 10-minute presentation of your findings. Look for information on the following:

- which ecosystem types are particularly noted for the service
- estimates of the dollar value provided
- species that are particularly important for providing this function
- threats to the services provided
- actions that can be taken to prevent these services from being threatened further

Following is a list of services to choose from:

- water purification
- air purification
- nutrient cycling
- recreation, for example, wildlife watching, camping, fishing, and so on
- flood and drought prevention
- climate regulation (temperature and precipitation)
- food (could be broken down into the following categories)
 - pollination (could be combined with food)
 - genetic value of natural plant species as sources of variation for agriculture
 - natural aquatic systems

B. Ecosystems Services Database

With a partner, explore the website Ecosystems Services Database, or ESD (the URL of the Ecoinformatics Collaboratory website is provided in “Useful links for student research” at the end of the ActionBioscience.org article, “Ecosystem Services: A Primer”).

Investigate the website. Keep a weblog so you can share your findings with the class.

- How is the site organized?
- What kind of data are available?
- How does the ESD provide a comparison of ecosystem service economic values?
- How would you rate the quality of information and the ease of navigation on the site?