



## Activity 1.4: Introducing Ecosystem Services

**Grades 10 – 12**

**Description:** Students will be introduced to the concept of ecosystem services, and the role of such services in their lives. Students will learn about four types of services: provisioning, regulating, supporting, and cultural services. The concept of ecosystem services will be revisited in future units.

**Materials:**

- Student journals
- “Ecosystem Services” handout

**Time:** 1-2 class periods for all activities

**National Science Education Standards:**

**F2.b** Causes of environmental degradation and resource depletion vary from region to region and country to country.

**F3.b** Human activities also can induce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal.

**F4.d** Important personal and social decisions are made based on perceptions of benefits and risks.

**AAAS Benchmarks:**

**4C/M7** Human activities, such as reducing the amount of forest cover, increasing the amount and variety of chemicals released into the atmosphere, and intensive farming, have changed the Earth's land, oceans, and atmosphere. Some of these changes have decreased the capacity of the environment to support some life forms.

**4B/H9** Although the Earth has a great capacity to absorb and recycle materials naturally, ecosystems have only a finite capacity to withstand change without experiencing major ecological alterations that may also have adverse effects on human activities.

**8C/H4** Industrialization brings an increased demand for and use of energy. Such usage contributes to having many more goods and services in the industrially developing nations but also leads to more rapid depletion of the Earth's energy resources and to environmental risks associated with some energy resources.

**Guiding Questions:**

- What is the value of healthy ecosystems?
- How do I benefit from ecosystem services?

**Background Information:** Ecosystem services are the many processes and natural materials provided by nature and intact ecosystems. A list is provided below. Experts currently recognize four categories of ecosystem services.<sup>[1]</sup> The following lists represent samples of each:

**Provisioning services**

- food, including seafood and game, crops, wild foods, and spices
- water



- timber
- fiber
- pharmaceuticals, biochemicals, and industrial products
- energy (hydropower, biomass fuels)

#### **Regulating services**

- carbon sequestration and climate regulation
- waste decomposition and detoxification
- purification of water and air
- crop pollination
- pest and disease control
- seed dispersal

#### **Supporting services**

- nutrient dispersal and cycling
- soil formation
- primary production
- photosynthesis

#### **Cultural services**

- cultural, intellectual, and spiritual inspiration
- recreational experiences (including ecotourism)
- scientific discovery

Millennium Ecosystem Assessment (MEA). 2005. *Ecosystems and Human Well-Being: Synthesis*. Island Press, Washington. 155 pp.

**Teacher Notes:** This day is primarily a lecture/discussion format about ecosystems. This can be conducted indoors, but holding class outside adds an extra dimension to this lesson and allows for more brainstorming. Students may be able to observe some processes (such as pollination) if you have access to any planted areas outside.

#### **Procedure:**

1. Introduce the topic by asking questions such as
  - Why should people care about the environment?
  - Why do we need healthy ecosystems?

An interesting discussion may develop, as students are typically told they should care about the environment, rather than asked why they should care. You may wish to have students take a few minutes to answer this question in their journals before having a whole-class discussion on the topic.

2. Distribute the student handout “Ecosystem Services.” Have students observe the painting, and answer question 1. Discuss their answers. Students may note that the plants depend on the pond for water, fish in the pond may eat algae, etc.)



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3. Next, have students answer question 2 on the handout. Have them share their answers. The most obvious answer is that the man is fishing, so he is getting fish from the pond for his food/survival. Other answers may include: The man could use the trees to build a house, or a boat or use fallen branches for firewood. The trees in the forest provide shade and help cool the area and they provide oxygen through photosynthesis. The man relaxes by walking around in the woods with his dog.
4. Have students work in pairs to answer question 3. Based on the painting, observing nature, and simply brainstorming, they should be able to come up with ten ways in which they require healthy ecosystems to survive. If students are stuck, you may wish to guide them. For instance, you can ask students what they had for breakfast. If anyone had an apple, the apple tree requires clean water, nutrients from decomposition, and pollination to produce fruit. Then, the fruit may be packaged in wooden cases, and fossil fuels are likely used to bring the apple to the store, etc.
5. If you are outside, the students may be able to observe and take notes on other services such as power from wind or sun, earthworms renewing the soil, bees pollinating crops, etc. See background information for more hints.
6. Students should share answers with the rest of the class for question 4.
7. For question 5, students divide their answers into three main categories:
  - Provisioning services: food, water, and other necessities to sustain life.
  - Regulating or supporting services: things that keep our planet running as it should.
  - Cultural services: spiritual, religious, and recreational uses of ecosystems.
8. Depending on the reading level of your students, you can also assign, “The value of the world’s ecosystem services and natural capital,” by Robert Costanza et. al from the magazine *Nature*, Vol 387, May 15, 1997, as a homework reading assignment. The article can be downloaded at: [www.esd.ornl.gov/benefits\\_conference/nature\\_paper.pdf](http://www.esd.ornl.gov/benefits_conference/nature_paper.pdf). This article quantifies the dollar amounts that various ecosystem services would be worth on the “open market.”

### Homework

At the end of this activity or for homework, students should answer the journal question.

- Summarize what is meant by ecosystem services.
- What do you think are positive and negative aspects of viewing ecosystems based on their worth to humans?
- What would happen to ecosystem services if ecosystems were degraded?
- How do you think climate change affects ecosystem services?
- Give specific examples.



**Ecosystem services – introduction:**

1. Observe Melanie Magee's painting above. Describe the ecological community in the painting in two to three sentences. You may assume that certain organisms are present, even if you cannot see them in the painting. How might the organisms in this scene interact?



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2. Now, look at the painting again from a new perspective. This time, try to describe the painting in terms of the value of the ecological community **to humans**. That is, explain the value to humans of the organisms in the painting. Be as specific as possible.

3. *Ecosystem services* are ways in which healthy ecosystems benefit humans. Working with a partner, try to brainstorm ten ways in which you depend on healthy ecosystems, and their components for your lifestyle. Think broadly, including your food, clothing, transportation, health, recreation, etc.

<b>Ecosystem service</b>	<b>Description</b>
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

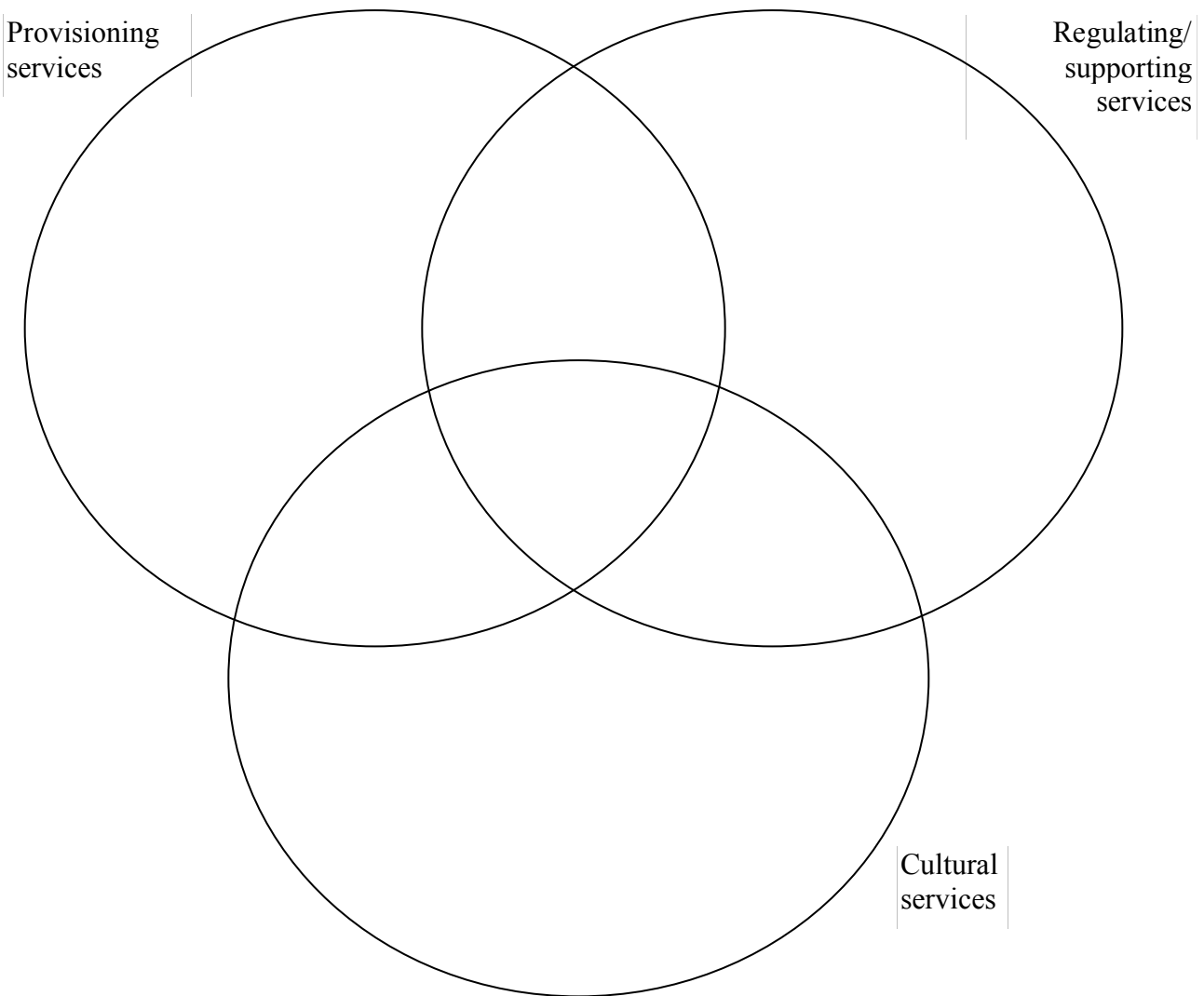
4. Share your thoughts with the rest of the class. Write down any additional ecosystem services that you did not think of:



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5. Ecosystem services are divided into these main categories:
- Provisioning services: food, water, and other necessities to sustain life.
  - Regulating or supporting services: things that keep our planet running as it should.
  - Cultural services: spiritual, religious, and recreational uses of ecosystems.

Fill in the diagram below with the ecosystem services you and your class brainstormed:



6. **Journal Question:** Summarize what is meant by ecosystem services. What do you think are positive and negative aspects of viewing ecosystems based on their worth to humans? What would happen to ecosystem services if ecosystems were degraded? How do you think climate change affects ecosystem services? Give specific examples.