

# Introduction to Ecosystem Services

## Learner Packet



**Summary:** A short reading selection, a classification game, and an outdoor activity introduce learners to the classification of natural materials and ecosystem services. Use as part of a larger unit on ecosystems or the Ecological Footprint. (60 min.)

### CONTENTS

Activity	Description (Time)	Page
Activity 1) Classification of Natural Materials	Through a reading selection and matching game, students classify natural materials into three categories: renewable resources, renewable ecosystem services, and non-renewable resources. Note: See the file "Renewable/Non-renewable Classification Game" for directions and materials for a tag-like game. (20-30 min.)	2
Activity 2) Natural Materials and Ecosystem Services Scavenger Hunt	Students go on a scavenger hunt to explore examples of natural materials and ecosystem services near their home, school or campus. (30 min.)	4

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## Part A: Classification overview

Understanding sustainability requires understanding the classification of natural resources (also called “natural materials,” or “natural capital” when applied to economics). Here are the key principles:

### 1) Natural materials are classified as biotic (living) and abiotic (nonliving).

- Biotic materials include plants and animals.
- Abiotic materials include minerals, air, soil, and water.

### 2) Natural resources are classified as renewable or non-renewable:

- **Nonrenewable resources** cannot grow back or reproduce (regenerate); they are simply a stock (supply) of materials that is depleted with use. Examples include fossil fuels, minerals, and ores.
- **Renewable resources** are capable of reproducing or growing back. This is called **regeneration**. Examples of regeneration include the re-growth of trees and plants, and reproduction by animals. The ability of the environment to regenerate sustains life.

There are two types of renewable resources: materials and ecosystem services.

**1) Renewable materials** are biotic (living) things, such as plants and animals, that regenerate (renew) through growth and reproduction.

**2) Renewable ecosystem services** are on-going benefits provided by nature, such as the energy provided by the sun, a plant’s ability to produce food from the sun, and the soil’s ability to absorb pollution. Here are key services the ecosystem provides:

- **Sustaining life:** Examples include food production by plants and the sun, as well as the role of decomposers in returning nutrients to the soil.
- **Regulating natural processes:** Examples include the water and nutrient cycles.
- **Sustaining culture:** Nature serves as a source of inspiration and learning for spiritual, artistic, and educational activities.

### 3) Soil and water have unique properties



- The amount of water on the planet is fixed, although it changes form (from water to ice to vapor) through the water cycle. People can affect the quality of water. For example, causing water pollution affects the water’s ability to support life, thus reducing the supply of quality water. In addition, the fresh water in melting ice caps will dissolve into salt water, also impacting the amount of fresh water.
- Soil is technically renewable through natural processes such as erosion of minerals and decomposition, but it takes approximately 500 years to create an inch of topsoil; thus, soil is not typically considered “renewable” in the same way as other materials.

Some abiotic materials, such as solar energy and wind, are considered inexhaustible, at least in terms of human-scale time. (The sun will burn out in billions of years, considered “geologic” time.) And while the sun and wind are inexhaustible in terms of stock (supply), humans cannot control their **flow**, the speed at which the wind blows, or the rate at which the sun shines.

**All biotic materials are renewable, but not all renewable materials or ecosystem services are biotic.**

## Activity 1) Classification of Natural Materials Page 2 of 2

### Part B: Classification game (formative assessment)

Note: The file "Renewable/Non-renewable Classification Game" provides materials and directions for doing this activity as a tag-like game.

#### Directions:

1. Copy this page and cut the set of cards below.
2. The three shaded cards are categories of natural materials covered on the previous pages. Set these cards aside and sort the remaining cards into these three categories. Be ready to justify your responses.

A crop of vegetables	Solar energy	Iron ore
The replenishment of rivers through the water cycle	A wetland absorbs pollutants	A herd of cattle
Crude oil	A forest provides beauty	<b>RENEWABLE RESOURCE</b>
A hardwood forest	A school of tropical fish	<b>RENEWABLE SERVICE</b>
Coal	An ocean that traps CO <sub>2</sub> and replenishes the water cycle	<b>NONRENEWABLE RESOURCE</b>

## Activity 2) Natural Materials and Ecosystem Services Scavenger Hunt

**Directions:** Examples of natural materials and ecosystem services are all around, even if you don't always notice them. In this activity, you will work in a team to find examples around your home, school or campus. Review the types of ecosystem services in the table below. Use the prompts after it to conduct a scavenger hunt as directed. Be ready to share your results with others.

Type of ecosystem service	Examples
<b>Sustaining Life:</b> Providing materials and energy for humans, animals, and plants	<b>Air</b> , comprised of nitrogen, oxygen, water vapor and other gases, sustains life. <b>Trees and plants</b> absorb CO <sub>2</sub> , provide food, and give off oxygen and water. <b>The sun</b> provides energy in the form of heat and light, and is the source of energy for plants, the basis of the food chain.
<b>Regulating Natural Processes:</b> Absorbing wastes and cycling materials	<b>Wetlands</b> and the organisms that live there absorb water and filter waste products. <b>Soils</b> absorb water, trap waste products (including CO <sub>2</sub> ), and provide a medium for plants to grow. <b>Oceans</b> act as a sink for CO <sub>2</sub> , drive major climate trends, and are an important part of the water cycle. <b>Rivers and wind</b> act as a source of energy to cycle biotic and abiotic materials.
<b>Sustaining Culture:</b> Providing spiritual, aesthetic, artistic, and educational inspiration	<b>Forests, oceans, rivers, deserts, and mountains</b> provide recreation, inspiration, and learning for educational, artistic, and spiritual purposes.

1. Find three plants around your school. On a file card, write their names and give an example of an ecosystem service they provide.
2. Take a soil sample from around your school. Identify components in the soil and classify them into biotic and abiotic.
3. Find a source of renewable energy.
4. Find three places of beauty around your school. Describe them, draw them, or take pictures. Be ready to describe why you think they are beautiful.
5. Find three things around your school that absorb carbon dioxide.
6. Find an example of a decomposer.
7. Find three "clues" or signs of human interaction with the water cycle. Write them down, draw them, or take pictures. Explain how the water cycle provides services you rely on.
8. Find examples of three **abiotic** items that serve as raw materials for manufactured things you use.
9. Find examples of three **biotic** items that serve as raw materials for manufactured things you use.



**Extension: Describe how your community would be different if the ecosystem services described here disappeared.**

## Glossary

- **abiotic:** nonliving things such as minerals, air, soil, and water
- **biotic:** living things such as plants and animals
- **ecosystem service:** functions and benefits provided by the environment, including sustaining life, regulating natural processes, and sustaining culture
- **overshoot:** a condition in which human demands on the environment are greater than the earth can support
- **regeneration:** the ability of a resource to renew, grow back, or replenish. Verb form: to regenerate
- **sustainability:** a condition of living well within the means of the environment. Sustainability has specific principles for using renewable materials as described in this lesson.

## References/Resources

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