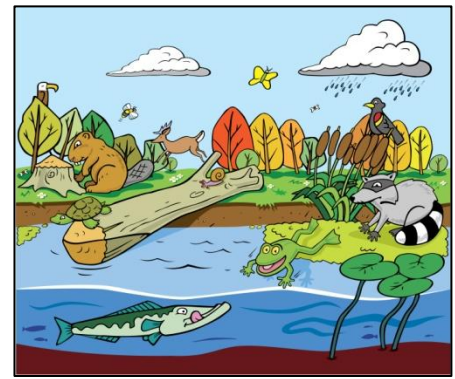


# Crafting an Aquatic Ecosystem

An in-depth investigation of four freshwater ecosystems



## Activity

Students create a collage to represent the biotic and abiotic factors important to their given freshwater ecosystem.

**Grade level:** 6-8

**Subjects:** Creative arts, Ecology, Science

**Setting:** Classroom

**Duration:** 1-2 class periods (depending on students background)

**Key Terms:** abiotic, biotic, ecosystem, lentic, lotic

## Objectives

- Students will compare and contrast four freshwater ecosystems: lakes/ponds, riparian areas, rivers/streams and wetlands.
- Students will identify the biotic and abiotic components of an ecosystem and describe the interactions between these components.
- Students will evaluate how aquatic nuisance species impact the fragile balance of aquatic ecosystems.

## Materials

- Four large pieces of butcher paper or poster board
- Reference books from trunk or school library
- Magazines
- Markers/crayons
- Glue
- Scissors

## Background

An **ecosystem** includes all of the plants, animals, soil, water, rocks, microorganisms and people living and interacting together in the same area or environment. Ecosystems contain **biotic** or living parts, as well as **abiotic** or non-living parts. Biotic factors include all of the living things inhabiting an area such as plants, animals, bacteria, fungi and humans, and the interactions between them such as competition, predation, mutualism and parasitism. Each species in an ecosystem has a direct effect on the other species in the ecosystem. Abiotic factors are the physical and chemical components of an ecosystem including sunlight, soil, water and even the weather. The abiotic factors present in an environment directly influence what types of organisms that will be present in an area. In other words, abiotic factors influence where

organisms live. For example, Pacific salmon can only exist in an aquatic environment and prefer oxygen rich water within a temperature range of 53-59°F.

There is a very fine balance between biotic and abiotic factors in an ecosystem. Changes in even a single biotic or abiotic factor can have a major impact on an ecosystem. A disruption such as a flood, drought or the introduction of a new species can alter the delicate balance of the ecosystem. For example, when an invasive species is introduced to an ecosystem, they may prey on native species, out-compete native species for limited resources (food, space and shelter), change food webs (see "*Food Web Crasher*" activity), alter important abiotic factors (such as oxygen availability) and eventually cause the decline in the number and types of species in the ecosystem.

Ecosystems are important because they provide humans with the resources we require in order to live and thrive. There are millions of ecosystems in the world, each with its own set of unique biotic and abiotic factors. Aquatic ecosystems are water based ecosystems. They include the marine ecosystem and freshwater ecosystem. Marine ecosystems cover approximately 70% of the earth's surface and include oceans, estuaries, coral reefs, salt marshes and other tropical habitats. Freshwater ecosystems cover less than 1% of the earth's surface and include lakes, ponds, rivers, streams, wetlands, riparian areas and even groundwater.

Lakes and Ponds: also known as **lentic** ecosystems are standing water habitats that support a variety of organisms including algae, rooted and floating-leaved plants, crayfish, frogs, salamanders and fish. Examples of abiotic factors in a lake environment include: sunlight, temperature, rainfall, water depth, soil and pH.

Rivers and Streams: also known as **lotic** ecosystems are moving bodies of water that flow from a source such as a spring or glacier to a terminus, which could be at an ocean, a larger stream or river, or some other type of reservoir. Rivers and streams support numerous species of aquatic insects, crayfish, mussels, fish and mammals such as beaver and river otter. Examples of abiotic factors in a lake environment include: sunlight, temperature, water flow, rocks and oxygen content.

Wetlands: are areas of land that are covered with a shallow layer of water for all or part of the year. Types of wetlands include: marsh, bog, swamp and slough. Freshwater wetlands are home to water lily, cattails, dragonflies, mosquitoes, frogs, salamanders, turtles, ducks, great blue heron and a variety of fish species. Examples of abiotic factors in a wetland include: sunlight, rainfall, soil composition, oxygen content, and temperature.

Riparian area: the transition zones between land and water. They are the strip of land that immediately borders creeks, river, lakes or other bodies of water. Riparian areas help reduce floods, stabilize stream banks, improve water quality and provide food and shelter for wildlife. Riparian areas support mosses, ferns, alter trees, willows, frogs, salamander, turtles, ducks, cranes, river otter, mink, and white tailed deer. Examples of abiotic factors in a riparian area include: sunlight, soil composition, temperature, water and topography.

## **Preparation**

Note: If the concept of ecosystems is new to students, more discussion may be needed on the topics of ecosystems and biotic/abiotic factors prior to beginning the activity.

- Before beginning the activity, provide students with a short introduction to ecosystems, biotic and abiotic factors.
- Ask the students to name the biotic and abiotic factors in their own environment and record them on the board.
- Provide a brief introduction to aquatic ecosystems including the four freshwater ecosystems the students will be studying in more detail.

## **Directions**

- Split students into four groups.
- Pass out a piece of paper/poster board, magazines, markers/crayons, scissors and glue to each group.
- Explain that each group will be creating a collage of a particular freshwater ecosystem.
- Assign one group to each of the following ecosystems: Group 1: lake/pond, Group 2: river/stream, Group 3: riparian area, Group 4: wetland.
- Tell the students that each group is in charge of “crafting” their freshwater ecosystem using the reference books, magazine pictures, their own drawings and words to describe it. They are to include everything that they think makes up this ecosystem.
- Remind the students to include both biotic and abiotic components in their collages and also to make note of interactions between the different organisms (e.g., predation, food chain) and their environment (i.e., where is everyone living and why).
- When there is about 20 minutes remaining, assign each group an aquatic nuisance species (ANS) to add to their collage. Group 1: bullfrog, Group 2: rock snot, Group 3: nutria, Group 4: Purple loosestrife.
- Tell the students to brainstorm how the ANS might disturb the freshwater ecosystem. What will it eat? Where will it live? What organisms will it impact the most and why? Will the ANS have an impact on any of the abiotic factors in the ecosystem?

## **Evaluation**

- When each group is finished, have them present their collages to the entire class, explaining all of the components.
- Following each presentation, give other groups a chance to point out abiotic/biotic factors or interactions that may be missing from the ecosystem collage.

## **Extensions**

- Have students research why their particular freshwater ecosystem is so important to humans.
- Have students research how human activities may alter the equilibrium in freshwater ecosystems.

## **Washington State Science & Environmental Science Standards**

6-8 LS2A – An ecosystem consists of all the populations living within a specific area and the nonliving factors they interact with. One geographical area may contain many ecosystems.

6-8 LS2D – Ecosystems are continuously changing. Causes of these changes include nonliving factors such as the amount of light, range of temperatures, and availability of water, as well as living factors such as the disappearance of different species through disease, predation, habitat destruction and overuse of resources or the introduction of new species.

6-8 LS2E – Investigations of environmental issues should uncover factors causing the problem and relevant scientific concepts and findings that may inform an analysis of different ways to address the issue.

ESE Standard 1 - Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.