

# Ecosystems: Biotic and Abiotic Factors

by Shawnda Zindler

---

**Grade level** 7

**Time required**

Three to five fifty minute class periods

**Materials/Technology**

Student journals (one per student)

2 - large sheets of butcher paper

Leaf shapes in a variety of colors and sizes

Soil samples

Several quart size glass jars

Rulers

“Uses of the Buffalo” charts (one per student)

Stories (see references):

“Four Worlds: The Dine Story of Creation”

“Tanka-shila, Grandfather Rock”

“The Buffalo and the Cedar Tree”

**Summary**

Through discussion, observation, experimentation and journal writing, students will understand the concepts of biotic and abiotic factors and how they interact in an ecosystem. Also, students will become aware of the cultural perspective of local tribal people on the ideas of interdependence and stewardship.

**Objectives**

The student will:

- 1) define and give examples of biotic and abiotic factors in an ecosystem.
- 2) give examples of how living and nonliving things interact within an ecosystem.
- 3) explain and give examples of cultural perspectives of ecosystems, interactions and stewardship.
- 4) use their senses to make and record observations in a natural setting.
- 5) classify living and nonliving things in an ecosystem.

**Montana Science standards addressed**

- 1) Students demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.
- 2) Students understand how scientific knowledge and technological developments impact society.
- 3) Students understand historical developments in science and technology.

**Assessment**

- 1) Evaluate each student’s observations and responses that were recorded in their journals.
- 2) Assess students’ understanding of the concepts through oral questioning.

**Procedure**

*Pre-unit bulletin board* - Crinkle Trees (You will need two of these.)

- 1) Cut a large piece of paper 1 meter by 1 meter (approximately).

- 2) Along the top edge cut seven slits in the following lengths: 50 cm, 35 cm, 25 cm, 10 cm, 25 cm, 35 cm, and 50 cm.
- 3) Crinkle each “branch” and the trunk and place on bulletin board or the wall in the shape of a tree for use later in the lesson. Label one-tree “Living” and the other “Non-Living”

#### *Day 1 – Living vs. nonliving*

- 1) Introduce the lesson by reading the story “Four Worlds: The Dine Story of Creation”. Discuss the meaning of the story, as understood by the students. Discuss what the words interactions and stewardship mean.
- 2) Take students and their journals to the nearest tree. Have students use their senses to record what they see. Emphasize that they first record the “big” picture (whole tree, leaves, trunk, and ground) and then move into the smaller details (insects, bark, mosses, webs, twigs, rocks, and soils). Proper journaling includes sketches and labels describing each item.
- 3) Have students cut out four leaf shapes. On two of the leaves, students are to put two living things they observed on or around the tree and on the other two leaves they need to write two non-living things from their journaling activity. Place a hook in each leaf (ornament hooks or paperclips work best) and hang on the proper trees on the bulletin board.

#### *Day 2 – Biotic vs. abiotic*

- 1) Have students brainstorm what an ecosystem is. Discuss and share examples. Introduce abiotic (non-living things such as air, soil, water, temperature, and light) and biotic factors (living things such as plants or animals) within an ecosystem. Use the student examples from the Crinkle trees. Have students add examples of factors that might be missing on the trees.
- 2) Have students rename the trees with the titles “Abiotic Factors” and “Biotic Factors”.
- 3) To reinforce students’ understanding of one particular abiotic factor, soil, have students conduct the “What’s in Soil” observation activity on the attached handout. It needs to be prepared on one day and observations taken on the next day.

#### *Day 3 - Interactions within an ecosystem*

- 1) Read aloud the Lakota story “Tanka-shila, Grandfather Rock”.
- 2) As a whole class, discuss interactions of Spirits with Earth in this story and the natural creation of Earth’s features because of these interactions.
- 3) Read the Osage story “The Buffalo Bull and the Cedar Trees”. In small groups have the students reread the story and list and discuss what they believe are interactions within this story.
- 4) Share the groups’ findings with the whole class.
- 5) Take a nature walk to a local park or on your own school grounds if there is a re-creational use area there. In the students’ journals, have students record what they see as interactions in the area. Again emphasize “big picture” to “small details” progression (this will help focus them).
- 6) Have students categorize their observations from the nature walk into biotic and abiotic factors.
- 7) Discuss the concepts of interactions and interdependence. Look at park users (recreationalists, nature watchers, domestic animals, and park caretakers) and discuss their effects on this particular ecosystem and its components.

*Day 4/5 - Unit Wrap-Up: Interdependence between buffalo and Native Americans*

- 1) Ask a guest speaker to talk to your students about the historical interdependence of the buffalo and some Native American tribes. Utilize the resources of a local museum (such as the People's Center in Pablo, MT or the local culture committees of the various tribes). It is very important that students "see" actual items. Have copies of the handout "Uses of the Buffalo" available for each student.
- 2) At the end of the presentation, have students record in their journals three main points made by the guest speaker as well as a brief summary of their understanding of the interdependence between the buffalo and Native Americans.

### **Further information**

For further information about the relationship between the local tribes and the buffalo or stewardship issues contact the Salish or Kootenai culture committees.

### **References**

Caduto, M. J. & Bruchac, J. (1989). Four Worlds: The Dine Creation story. In Keepers of the Earth. Golden, CO: Fulcrum.

Tanka-shila, Grandfather Rock. As cited above.

Caduto, M. J. & Bruchac, J. (1989). The Buffalo Bull and the Cedar Tree. In Keepers of Life. Golden, CO: Fulcrum.

## What's in Soil?

### *Materials*

Variety of soil samples (at least 8 small ziplock bags full, labeled as to where the soil came from)  
8- quart size glass jars  
Water

### *Procedure*

- 1) In small groups, fill each jar with one sample of soil. Label the jar as to where the soil came from.
- 2) Fill the rest of the jar with water (stop about 10cm from the top).
- 3) Shake or stir the soil and water.
- 4) Let settle overnight.
- 5) Without disturbing the soil, measure each layer and write a description in your journal of what each layer looks like and the things contained in it (for example, small pieces of twigs, leaves, rocks, etc.).
- 6) After observations are recorded, discuss as a class any relationship that might exist between the location of the soil (where it came from) and its composition.