

LEVEL: Grades 3-12

SUBJECTS: Science, Language Arts, Physical Education.

PROCESS: Through a physical activity, students discover the components and relationships of ecoregions and the role of ecosystem management in these ecoregions.

OBJECTIVES: The student will:

1. Describe some non-living and living components of an ecoregion (a geographic area where the combination of climate and soils produce a distinct plant community).
2. Demonstrate a component of an ecoregion.
3. Describe how each living component in an ecoregion is related to the sun and to other ecoregion components.
4. Describe how different ecoregions are related to each other and how they form a larger ecosystem.
5. Identify and demonstrate the role of ecosystem managers.

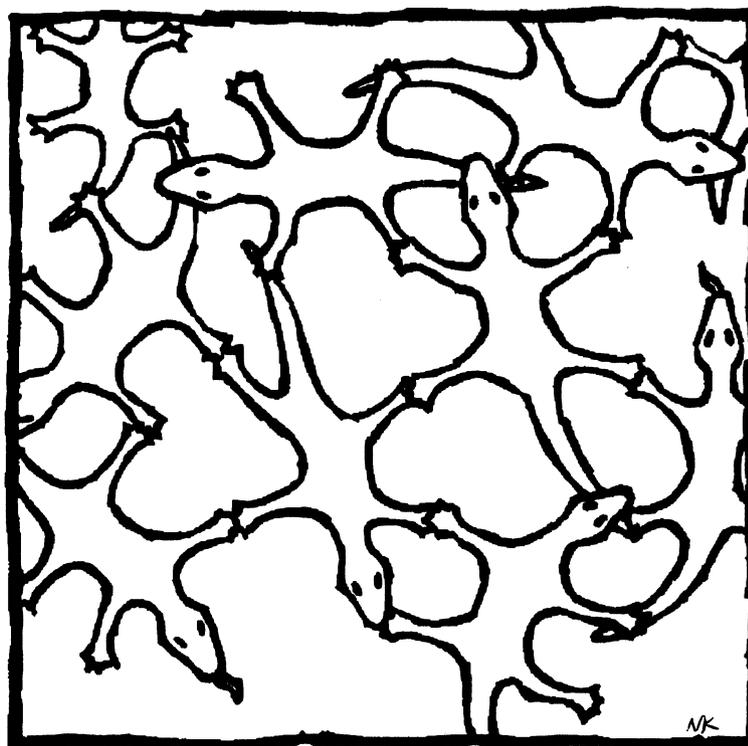
(Note: Younger students may only accomplish the first three objectives, while all five objectives are appropriate for upper grade levels.)

TIMEFRAME: 30 to 50 minutes.

SKILLS: Analyzing, comparing similarities and differences, critical thinking, demonstrating, describing, discussing, generalizing, identifying, listening, observing, predicting, role playing.

MATERIALS: A 3" x 5" index card and 12" string for each student, scissors, tapes, pencils or markers, large piece of yellow paper, yarn or string (two colors 200 ft. of one color cut into ten 20-ft. lengths (yellow yarn is ideal), and a 100-ft. length of the other color rolled into a ball), "Ecoregion Chart" (attached). (Extensions: Camerecorder or video camerecorder.)

VOCABULARY: Biodiversity, biosphere, ecoregion, ecosystem, ecosystem management, natural resources, predator, topography.



SPINNING THE ECOWEB

OVERVIEW: Ecosystems are systems formed by the interaction of a group of organisms with each other and their environment. Ecosystems include interdependent plants, animals, the physical environment, and the ecological processes (such as exchange of matter and energy) that connect them. Areas of different sizes can be considered ecosystems, depending upon who is drawing the lines of distinction. A jar of pond water, a rotting log, a grassland, or the entire earth can each be considered an ecosystem. In this activity, the term ecosystem will be used to represent the entire earth. The entire earth's ecosystem is commonly referred to as the biosphere.

On earth, there are geographic areas in which the combination of climate, topography (lay of the land), and geology determine what types of plants and animals grow and live there. These areas are called ecoregions. A desert, with its characteristic dry climate, sandy

soils, and unique wildlife is an example of an ecoregion. Other examples include grasslands, rainforests, coniferous and deciduous forests, oceans, arctic areas, fresh water streams, riparian zones, and wetlands. All of the ecoregions on earth interact to form one large ecosystem.

Human cultures have developed within different ecoregions and have been sustained by them. All of the resources humans have depended on for survival and comfort have come from natural resources. Over time, attitudes and beliefs about the natural world and the use of natural resources have changed. In the not-too-distant past, the human population was sparse compared to the natural resources available. Human impact on ecoregions was minimal. As human populations have increased, so have demands on various ecoregions. Some parts of the ecosystem are being heavily impacted and some species have

become extinct.

As people develop a better understanding of ecological functions and their place in the ecosystem, they are incorporating these ideas into the practice of natural resource use and management. A recent philosophy adopted by many natural resource agencies for managing the earth's resources is called ecosystem management.

Ecosystem management is the careful and skillful use of ecological, economic, social, and business principles in managing ecoregions as part of the larger ecosystem. This management's goal is to produce, restore, or sustain ecosystem integrity over the long-term. When ecosystem managers talk about maintaining the integrity of ecosystems, they mean retaining the ecosystem's biodiversity (variety of living organisms) and the structure and organization of the ecosystem. The need to conserve biodiversity is at the heart of ecosystem management.

While protection of biodiversity is of great importance, ecosystem managers must also consider human needs. People want ecoregions to be maintained for various uses, experiences, products, and services. Recreation, spiritual renewal, economic growth, timber and minerals for homes and other products, and forage for wildlife and domestic range animals are examples of human needs that may all come from a single ecoregion. The ecosystem manager must take the wide variety of human needs into account, along with the best scientific knowledge about ecosystems, in order to manage natural resources for sustainable use over time.

PROCEDURE:

PRE-ACTIVITY:

1. Cut string/yarn as defined in Materials.
2. Cut large yellow paper into a circle.
3. Write the following statement and question on the chalkboard or in another visible place: *All of the ecoregions are connected to the sun. In what ways is your ecoregion connected to other ecoregions?*

ACTIVITY:

1. Survey the student's background knowledge by asking for definitions of an

ecoregion and ecosystem. An ecoregion is a large geographic area in which the combination of climate, topography, and geology determine what types of plants and animals that can grow and live in an area. If students are not familiar with these concepts, take some time to explain a local example of an ecoregion. (See Overview for information.) If students are familiar with ecoregions, brainstorm various ecoregion types with them. Record the ecoregion types in a visible space. Taking an individual ecoregion, have students describe what the ecoregion might look like focusing on the non-living components of the ecoregion. Ask:

-What does the soil look like?

-Is there water in this ecoregion?

-In what form?

-Is the air dry or moist?

-Does it rain a lot?

-Is there wind?

-Is it rocky?

Record the non-living components for each of the ecoregions.

2. Depending on class size, choose eight to ten ecoregions (see the "Ecoregion Chart") for use in this activity. Choose enough ecoregions so that there will be three students involved in each ecoregion group and two to three students remaining to act as ecosystem managers.

3. Number students off or assign ecoregions to form the groups. Give each student a 3" x 5" index card and 12" string. The card will be worn around the neck. On the top half of the cards, students write the name of an organism that lives in their ecoregion. On the bottom half of the cards, they write the name of their designated ecoregion. At least one student out of the three in each group must be a plant. For best results, have each student in a group be an organism of a different category; for example, one plant, one plant-eater, and one predator (an animal that kills and eats another animal for food). For younger students, you might wish to

assign organisms ahead of time.

4. When student's cards are completed, have each ecoregion group stand together. Have the groups form a circle. (See diagram.) Students who represent the ecosystem managers remain outside of the circle at this time.

5. Place the large yellow circle in the center of the larger circle of students. Tell students the yellow circle represents the sun. Tape one end of each of the 20-ft. pieces of yarn to the "sun" circle. Ask students what they think the pieces of yarn represent (the sunlight traveling through space to the earth).

6. Standing in their groups, ask students to name the organism from their ecoregion most dependent upon sunlight. Hopefully, they will name the plant in their ecoregion. Hand the "plant" student in each ecoregion the unattached end of the 20-ft. string. All the pieces of yarn are now attached to the sun and stretched out to the ecoregion groups, creating the appearance of the "spokes of a wheel" or the "rays of the sun."

7. Students in each ecoregion must now determine which organism might get the sun's energy next. In other words, which organism might eat the plant? The "plant" student gives the next student (plant-eater) in his or her group part of the piece of string to hold also.

8. The "plant-eating" student now passes a piece of the string along to the organism that eats it, the predator. At this point, all students in each ecoregion will be holding on to their groups' piece of string. Ask:

-How is each organism in your ecoregion dependent upon the sun?

-How do all the organisms in your ecoregion need each other?

-What would happen if there were no plants in your ecoregion? No plant-eaters? No predators?

-In what ways is the sun important?

-Besides the sun, what else do plants

need to grow? (*Soil, air, water.*)

9. Have students in each ecoregion mention one or more of the non-living components on which they depend (water, soil, rocks, wind, etc.).

10. Introduce the ecosystem managers. Ask students sitting in the circle what they think ecosystem managers do. (Ecosystem managers manage the natural resources in ecoregions in order to maintain biodiversity or variety of life in each ecoregion and to protect the larger ecosystem. They assess and evaluate the conditions of an ecoregion considering both living and non-living components. Ecosystem managers make and carry out decisions about ecoregions while making sure people are able to use necessary natural resources.)

11. Ecosystem managers enter the circle with the 100-ft. ball of yarn. Starting with any ecoregion group, the ecosystem managers pose the question written on the board. Write responses on the board. Students, after the first group, can repeat an answer already written on the board or respond with a different answer. One of the ecosystem managers, holding onto the end of the string, gives students in the ecoregion the string and then carries or passes the ball of string to the next ecoregion that was mentioned as being connected in some way to the first ecoregion. Repeat the question and this process of passing the ball of string until there are no further connections. At that time, the other ecosystem managers hold onto part of the string also. You can suggest some connections to the students if necessary. When groups' responses are complete, a large web will have been spun, demonstrating the large ecosystem made up of connecting ecoregions. Students have spun an eco-web! Have students stay in place and ask:

-How is your string from the sun different from the string to other ecoregions? How is it similar?

-What do the strings between the ecoregions represent? (*The larger ecosystem.*)

-What can you now tell me about

ecoregions?

-What can you tell me about an ecosystem?

-Why are ecoregions important to one another?

-What helped you know how ecoregions are related?

-If ecosystem managers discovered one plant or animal in an ecoregion in trouble, how do you think they would work to help that species?

12. Choose any organism from any ecoregion and identify that organism as a species in trouble. (Examples: toucans in the rainforest are being collected, clams in an estuary are being poisoned by pollution, the Florida panthers are disappearing due to shrinking habitat, etc.) Pose the problem to the ecosystem managers. Ask:

-What might they do to help the species?

-What information do you need to make a good decision?

-What do you need to know about this species and its relationship to other species?

-How does knowing that ecoregions are connected influence your decision?

-How will your management decision affect other organisms or other ecoregions?

-What is the role of ecosystem manager?

-What are some other roles humans play in ecoregions besides managers?

-In what ways can humans be good caretakers of the ecoregions? The ecosystem?

-What can you do to be a good caretaker?

13. What would happen if one of the ecoregions disappeared? Have one group drop

their strings and discuss the implications for other ecoregions and the ecosystem. Ask:

-Which ecoregion is the most important?

-Is any ecoregion more important than another?

14. Conclude the activity by asking:

-What surprised you the most during this activity?

-What did you find most interesting?

-How might what you've learned in this activity help you in other areas of your life?

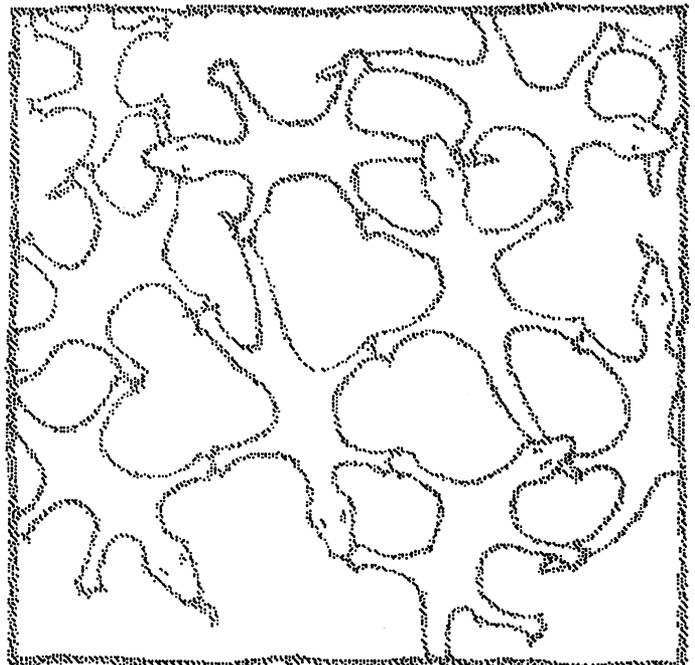
ASSESSMENT:

Have students:

1. Choose one ecoregion to draw, including both living and non-living components.

2. Take two ecoregions and demonstrate ways they are connected by any method of choice such as drawing, writing, role playing, etc. Students can choose ecoregions not previously discussed: or can discuss soil as an ecosystem and its connection to the total ecosystem.

3. Complete a paragraph, "If I were an ecosystem manager, I would...."



EXTENSIONS:

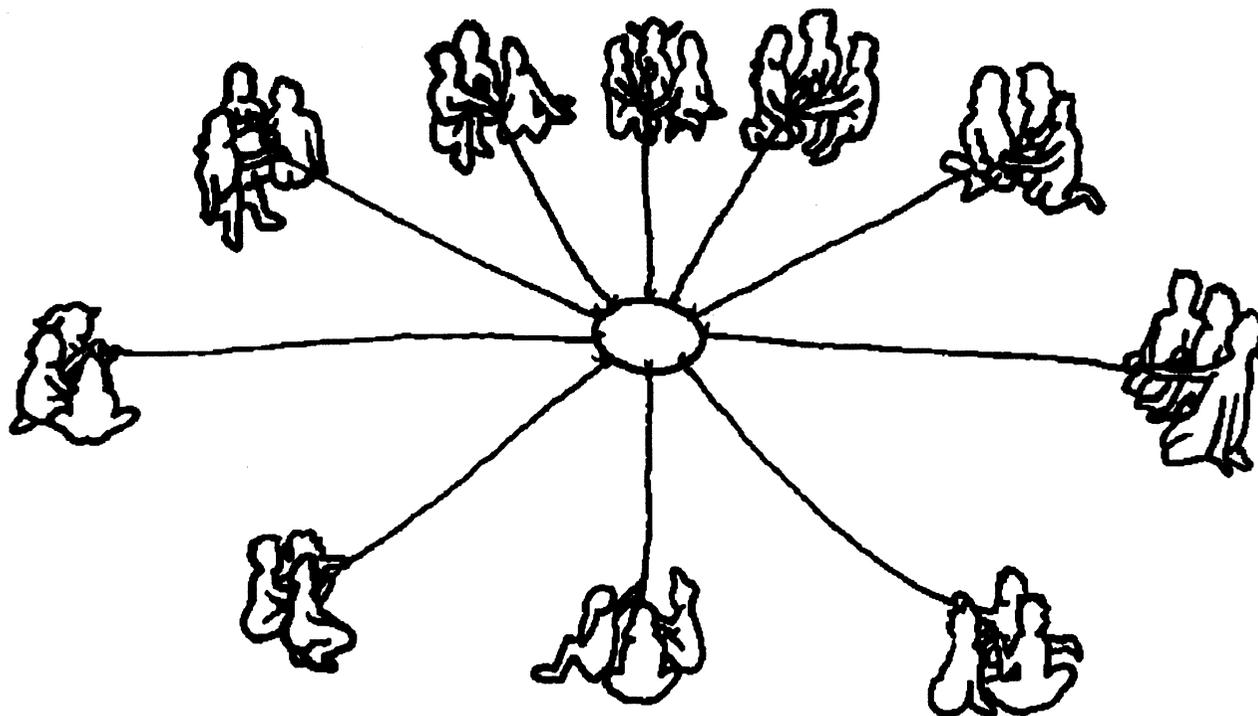
1. Invite students to photograph or videotape a local ecoregion to illustrate the non-living and living components of that ecoregion. Have students describe the connections between the components.

2. Construct a classroom ecoregion (on paper, a diorama, a mobile, etc.).

3. Play "Ecoregion Charades." Have groups role play different ecoregions while their classmates guess which ecoregion they are portraying.

4. Have students design advertisements to promote the importance of ecosystem management.

5. Have older students research a real-life situation in which a variety of management decisions are possible. (Examples: Northern Spotted Owl controversy, reintroduction of the wolf and grizzly bear to former historic range, salmon runs in dammed rivers, fishing with drift nets, etc.) They research all sides of the issue, including social and economic connections, and make a management decision. Have them then write a position paper supporting their management decisions and present their decisions to the class.



Ecoweb
Circle of kids holding string.

ECOREGION CHART

ECOREGION	NON-LIVING COMPONENTS AND DESCRIPTORS	POSSIBLE ORGANISM
Grasslands	Escarpment (cliff like), buttes, soil, fire, wind	grass , mice, grasshoppers, prairie dogs, bull snake, red-tailed hawk, etc.
Rainforest	Humidity, heavy rainfall, soil, equatorial, nutrient pool, little temperature variations	fig tree, periwinkle , howler monkey, toucan, beetle, tree frog, jaguar, etc.
Forest-Coniferous* (cone-bearing evergreens)	Granite rock formations, rocky soil, wind, snow, high elevation	pine tree , pine beetle, mosquito, deer, black bear, mountain lion, etc.
Forest-Deciduous* (leaf-bearing) *choose based on your location	Moderate rainfall, fertile soil, low elevation, temperature variation	oak tree, maple tree , squirrel, cicada, white-tailed deer, black bear, etc.
Ocean	Salt, coral reef, rock, sand, waves, wave action, wind	plankton , coral, fish, whale, shark, etc.
Estuary, Tide Pool	Mixing of salt and fresh water, tides, nutrient-rich soil, high humidity	saltgrass, reedgrass , clams, crayfish, fish, heron, seagull, etc.
Arctic	Glaciers, high latitude, permafrost, low temperature, short growing season, wind	forget-me-nots , musk ox, caribou, seal, wolf, polar bear, etc.
Fresh Water Stream	Water, rocks, gravel	algae , mayfly, dragonfly, fish, otter, bald eagle, etc.
Desert	Low rainfall, intense sunlight, daily extreme variation in temperature, sandy soil	cactus , gila monster, kangaroo rat, peccaries, road runner, coyote, etc.
Riparian (streamside)	High water table, moderate temperatures, banks	willow, cottonwood, birch , rabbits, moose, raccoons, owls, etc.
Wetlands	Water, high humidity, water-logged soil, nutrient-rich soil	cattails , redwing blackbirds, ducks, fox, Northern Harrier, etc.