

LEVEL: Grades 7-9

SUBJECTS: Science, Environmental Education.

PROCESS: Through visiting places where habitats overlap, students explore the concept of ecotones.

OBJECTIVES: The student will:

1. Identify the characteristics of ecotones or overlapping ecosystems in wildlife habitat in or near their communities.
2. Describe why plants and animals are generally more diverse in ecotones than in separate ecosystems.

TIMEFRAME: 1 hour 30 minutes.

SKILLS: Analyzing, classifying, comparing similarities and differences, computing, describing, discussing, drawing, estimating, identifying, inferring, interpreting, listing, measuring, observing, predicting, synthesizing, visualizing, working in small groups, writing.

MATERIALS: Poster paints or water colors, pencils, paper, long rope or string for marking one-foot segments, clipboards, poster paper or chalkboard.

VOCABULARY: Diversity, ecosystem, ecotone, edge effect, scat.



COMMON GROUND

OVERVIEW: The idea of edges is an exciting concept. It brings an image of exploration to our minds. It is a powerful metaphor in our culture. The cutting edge, the growing edge, the leading edge, the edge of space are all commonplace expressions, reflecting our fascination with "edges."

The edges of ecosystems are exciting as well. They are places where evidence of differences is most present. The real action in ecosystems often takes place where edges meet and overlap. Where edges come together and overlap are the places "where the action is."

Ecology is the study of the interactions between living things and their environments. Ecology comes from the Greek word *oikos*, which means home. The word *ecosystem* refers to the system of interactions between living and non-living things. Ecosystems are sometimes described in terms of

the interactions and sometimes in terms of the area where interactions occur. This second definition is no longer as widely accepted as it once was. Newer ecosystem definitions emphasize the concept of interaction.

For teachers, an example from school might help to illustrate the similarities and differences between these definitions. When students do seventh grade work, they are called seventh graders. Seventh grade work is a system of interactions in many subjects and between many people. This is like viewing an ecosystem in terms of its interactions.

A classroom that houses seventh grade students is a place. It may or may not house students that are doing seventh grade work. As the "traditional" seventh grade classroom however, it may be called the seventh grade room. This is like viewing an ecosystem as an area.

An *ecotone* is a zone where two ecosystems overlap. It is in this zone of overlap that much of the action that biologists enjoy takes place. Many biologists call this action in an ecotone the "edge effect." See the drawing on page 4.

Traditionally, an ecotone is defined as the place where two plant communities come together. Here we will use a more expanded definition and include all organisms (plants and animals) as well as non-living substances like rocks and soil. This activity explores ecotones.

In local communities there are many edges and overlaps of edges. The most accessible edge in your community may be the edge of the school ground. Other edges such as stream banks, lake shores, and marsh edges are within walking distance of many schools. Although exploring only the edges of ecosystems focuses on small parts of the system, it provides opportunities for understanding the dynamics of change that take place in wildlife habitats. In ecotones, direct and indirect evidence of the influence of dominant ecosystems is readily found. The area where two ecosystems overlap tends to be more complex than any ecosystem by itself. For example, where a forest and a marsh overlap, it is common to find forest plants growing within the marsh. Often the forest plants are deformed or stunted due to the amount of water in the marsh.

Ecotones often have a diversity of wildlife because animals common to both overlapping ecosystems are brought together. Even though you may not see the animals themselves, they leave behind a lot of indirect evidence. Footprints, scat (droppings), and feathers are all common evidence. Ecotones where healthy ecosystems overlap usually show diversity, and diversity means more forms of wildlife. The absence of diversity in ecotones is often a clue that there are problems in the ecosystems that overlap.

Edges also attract humans. Lake shores, streambanks, ocean beaches, and forest meadows are examples of some of our favorite spots. In such places there is the possibility that humans will change the ecotone with damaging consequences for wildlife and plants. For example, marshes are often drained or filled for

construction or agriculture. Natural forests near our homes are often cut down for lawns and gardens. Streams are frequently dammed or diverted. Rivers are channelized for flood control, and to allow boating or shipping.

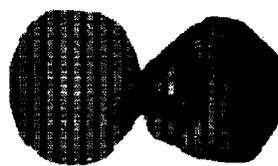
Human litter and other refuse on a lakeshore or streambank is often an indicator of other human-created problems. Fish kills and prolonged absence of waterfowl in an area may indicate contaminated water or loss of wetlands.

Individuals can take action to make a difference. Particularly beginning with small ecosystems, efforts can be made to enhance the likelihood of meeting animals' needs for survival.

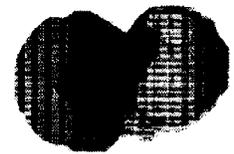
The major purpose of this activity is for students to increase their understanding of the concept of ecotones and edges in overlapping ecosystems.

PROCEDURE:

1. Ask the students to paint two large spots -- one each of two different colors -- on a single piece of paper. Make sure the paints are quite wet to insure blending. Blue and yellow are good choices. Ask students to enlarge the spots until they "touch," but do not overlap. Have them note what happens when the wet paints touch. Ask them to repeat the process on a separate sheet of paper so that the colors actually overlap. With blue and yellow the overlap produces green and is thus highly visible.



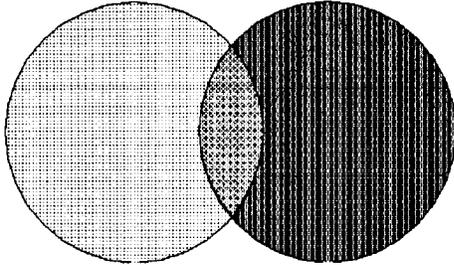
Paint Spots Touch



Paint Spots Overlap

2. Tell students you are soon going to take them to a natural setting where there are places that overlap like their paintings did. They are going to investigate these places, including the areas where there is some kind of overlap. The images in their simple paintings are a metaphor for an important biological concept -- ecotones in nature.

3. As further background for the trip outside, draw two large overlapping circles on the chalkboard. Put a large number of small squares and triangles in one circle. Do not draw in the overlapping segment. In the second circle, draw many small circles and stars; again avoid the overlap area. Ask students to predict the kinds of things they would expect to find in the overlapping circles. Draw circles, squares, triangles, and stars in the overlapping segment.

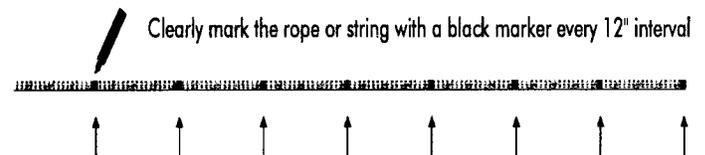


Ask students where the greatest diversity exists. Label the overlapping segment the ecotone. (This is the area of greatest diversity.) Label the original two circles as Ecosystem 1 and Ecosystem 2. Ask the students to point out the edges of the overlap. These are the places where the two ecosystems come together and interact. The process and results of this coming together or interaction are called the “edge effect.”

4. Now take the students outside to the school grounds to study the edge effect. Choose a place where plants are invading a parking lot or playing field or where the edge of the lawn meets a sidewalk. Have students consider these miniature ecosystems. Ask them to work in teams of two or three to list the things they find on either side of the edge. Each team should examine two different ecosystems -- without looking at the interactions in the ecotone yet. They can list different kinds of plants and animals they observe and tally what they find, including direct and indirect evidence of life.

Ask them to discuss similarities and differences and to keep notes about their observations. Next ask them to carefully examine the edge. Have them try to determine how wide the zone of shared characteristics is. Point out that this is a miniature ecotone. The students might try to estimate the size of the ecotone, as well as the diversity of species within the ecotone. Ask them to try to compare the diversity of plants

and animals within the ecotone with that of the plants and animals they found in the two separate ecosystems -- compare what’s inside the ecotone with what is outside it. NOTE: It may help students organize observations more systematically by stretching a length of rope or string from one ecosystem to another. Have the students make and record observations in one-foot intervals along the line. It helps to mark the string or rope at one-foot intervals before you begin the activity. For example:



5. Go back to the classroom. Write all student team lists on poster paper. Discuss similarities and differences between plants and animals. Ask:

-How wide is the zone of shared characteristics?

Discuss the comparison of what’s inside the ecotone with what’s outside.

6. Compare and interpret the students’ findings. Ask for evidence to support the idea that populations of plants and animals tend to be more diverse within ecotones than in separate ecosystems.

7. OPTION: Take the class to a site in your community that has aquatic edges. You may be able to find a place where a stream enters or exits a lake, a beach, highway edges, the edge of town, or others that might be available in the community. Once there, ask the students to use the same investigating techniques, working again in teams of two or three. They should identify at least two ecosystems, list and describe the characteristic organisms in each, identify the ecotone, and list, observe, and describe the organisms in the ecotone.

ASSESSMENT:

1. Have students list the characteristics of ecotones based on your observations.

2. Listen for concept understandings as

students describe two ecosystems and an associated ecotone.

EXTENSIONS:

1. Have students continue the quest for edges! Create an ecosystem map or model of your community. Indicate the location of the principal ecotones.

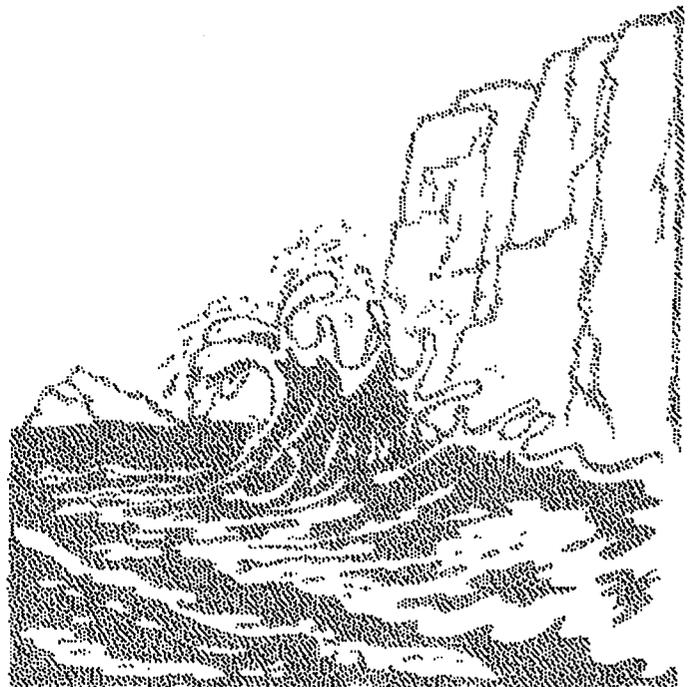
2. Help students visualize the diversity edges can bring. Take a piece of paper and measure the edges. Cut the paper into four equal pieces - and measure the edges again. Repeat this twice again, measuring the edges each time. Support the idea that each new rectangle is a suitable habitat for some aquatic organism and discuss how diversity is related to edges.

3. Working in small groups, assess the overall health of any ecotones that seem particularly important to the quality of life for aquatic species in your community. Take action to protect any aquatic habitats in danger of being damaged, degraded, or lost.

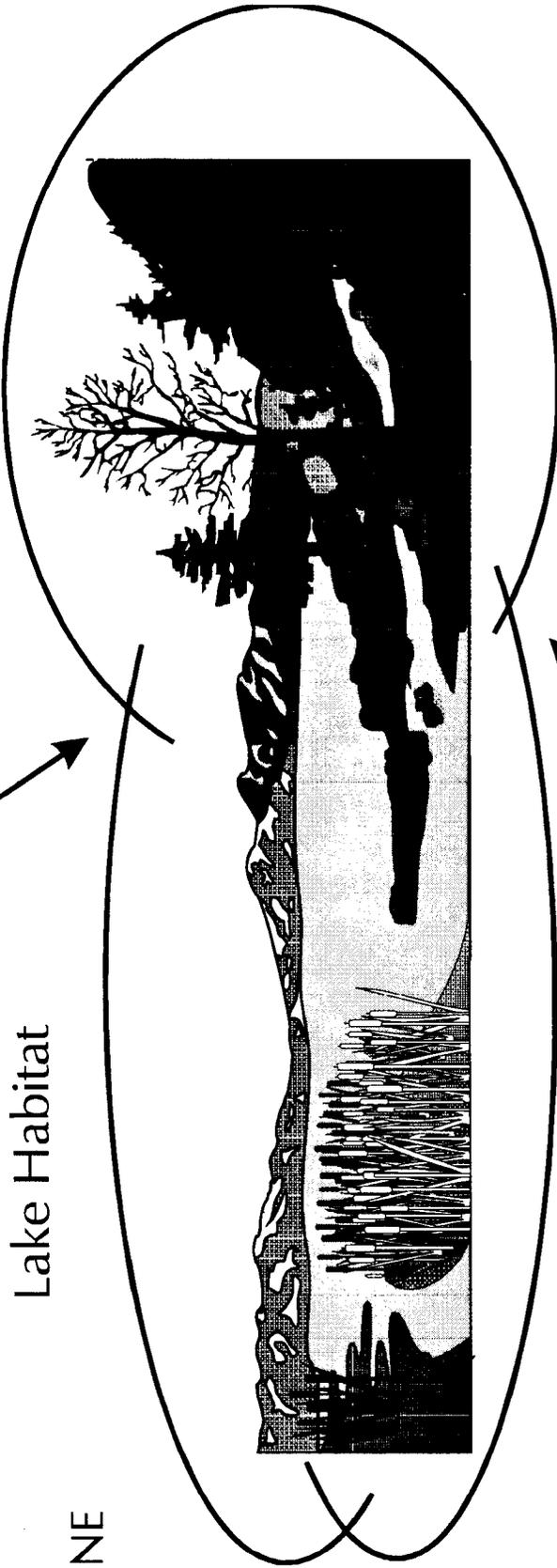
4. On your next field trip, have students bring cameras and take pictures of the edges. Remember, edges also occur in urban areas. For example, road meets park, or skyscraper meets sidewalk, or garden (in park) meets pond.

5. Invite a wildlife biologist or district wildlife manager to talk to the class or show slides on ecotones.

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ECOTONE ILLUSTRATION



ECOTONE

Lake Habitat

ECOTONE

Marshland Habitat

ECOTONE

Forest Habitat

