

LEVEL: Grades 4-8

SUBJECTS: Science, Environmental Education, Physical Education, Geography, History.

PROCESS: Through a highly active simulation game, students discover how loss of habitat and nesting parasitism affect neotropical migrating songbirds.

OBJECTIVES: The student will:

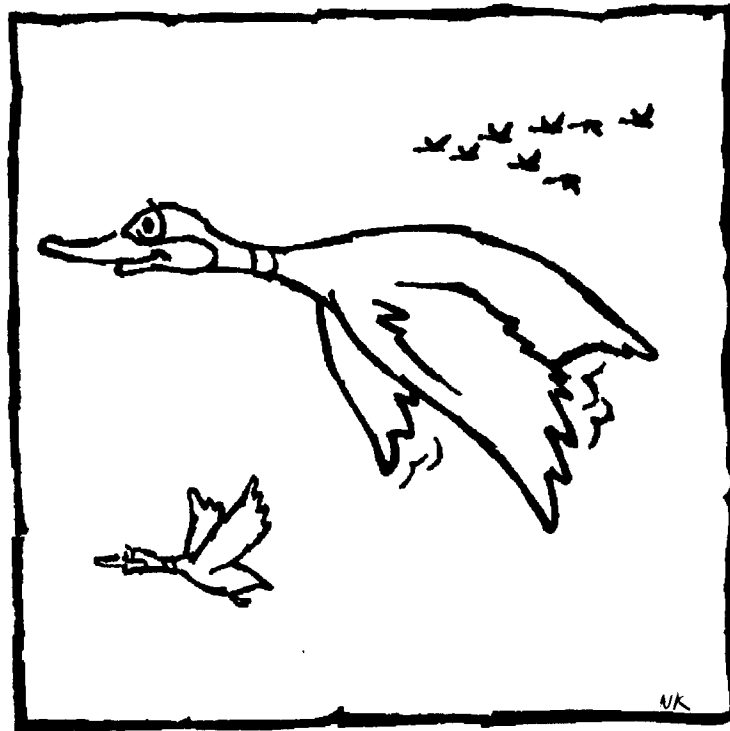
1. Describe four impacts of deforestation on neotropical songbirds.
2. Describe three ways that cowbirds negatively affect migratory songbirds.

TIMEFRAME: 30 to 45 minutes.

SKILLS: Analyzing, describing, developing psychomotor skills, developing vocabulary, discussing, evaluating, kinesthetic learning, problem solving, understanding cause and effect.

MATERIALS: String, rope or hula hoops to mark breeding and wintering grounds, traffic cones, paper and pencil to keep track of population changes, "Northern Conditions" and "Southern Conditions" cards (attached).

VOCABULARY: Corridors, edge effect, forest fragmentation, neotropical, nesting, nest parasitism, parasitic, riparian.



FOWL PLAY

OVERVIEW: There are over 200 species of birds known as neotropical migratory birds. These are birds that spend each summer in the United States or Canada and fly south of the Tropic of Cancer each fall to spend the winter. They find their way from breeding grounds in North America to wintering grounds in Mexico, the Caribbean, and Central and South America each year. It is not unusual for them to fly 600 miles each way. The blackpoll warbler flies 2500 miles from southern Maine to northern Venezuela without water, food, or rest.

Recent studies indicate that there has been a sizable decrease of neotropical migrants in much of eastern United States. Not enough data has been collected on western neotropical migrants to determine their population status and trend in species. Eastern flyways (migration routes) move along the eastern coast of North America to north-eastern lands of South America.

Western flyways extend from northwestern North America and travel through Texas, Central America, and on to northwestern lands of South America.

It is difficult to pinpoint causes for the decline of some neotropical migratory songbirds. Loss of riparian areas, or areas along streams, is thought to be a major factor in the decline of neotropical migrants. Riparian areas cover only 3% or less of all the land in the western United States, and are used by at least 80% of all birds as breeding habitat or migration stopover areas. Loss and fragmentation of breeding habitat in North America is due to suburban sprawl and habitat loss to reservoirs, stream channelization, highways, power lines, housing, and commercial development.

Destruction of Latin American forests, where many species winter, contributes to the decline of some species. Pesticides, such as

DDT, now illegal in the United States, are still used freely in the countries where neotropical songbirds winter. Consequently, many neotropical songbirds are lost in their winter nesting grounds due to poisoning by pesticides. Even though we do not use DDT in the United States, we still produce it and sell it for use in Central America and South America.

Some migratory songbirds prefer to nest in forest interiors as far from roads as possible. These areas are safer from predators that enter along edges and corridors (a tract of land through which species travel to reach habitat suitable for reproduction and other life sustaining needs). Forest fragmentation (breaking up of larger tracts) due to land clearing, conversion of forest to farmland and suburbs, and logging leaves nesting songbirds more vulnerable to predatory grackles, raccoons, snakes, and house cats. As predation increases, fewer nests are successful, fewer young birds return the next spring to replace adults lost to natural mortality, and the songbird populations decline.

Nest parasitism by cowbirds is a significant threat to songbird survival. Nest parasitism is when a bird lays an egg in another bird's nest, leaving the host bird to hatch its egg and raise its young. This is a natural way for cowbirds to reproduce.

Native cowbirds in the western United States, Brown-headed Cowbirds, were once called buffalo birds because they followed the endless herds of bison as the bison moved across prairies and plains. They traveled with the large herds, feeding on insects stirred by thousands of hoofs and undigested seeds in piles of manure. Later, as huge herds of cattle moved west, the cowbirds extended their range west from the Great Plains across the United States. This change in range and land use allowed cowbirds a greater food supply and more access to songbirds' nests.

The female cowbirds would leave their eggs in any unattended nests that were handy and "hit the trail," leaving the unsuspecting owner of the nest to raise their young.

As the west was settled and the forests, grasslands, and marshes were replaced with

farms, pastures, and ranches, the cowbirds too settled into a new habitat. They no longer followed the buffalo migrations or long cattle drives. They became more permanent residents as cattle were pastured in fenced-in areas.

As they expanded their range, cowbirds invaded the breeding grounds of many songbirds that had no natural defense toward the parasitic tendencies of the cowbird. Some species of birds recognize and reject cowbird eggs, but many species are unable to distinguish a cowbird egg from their own eggs. Songbirds that are able to recognize a cowbird egg will either build another layer of nest over it, completely abandon their nest, or chuck the cowbird egg out of their nest. The problem with these defense mechanisms is that adults may not have enough time to renest and still have time to put on a sufficient fat load for the migration.

Cowbirds sometimes kick a songbird egg out of the nest, or even eat it, before laying their own egg(s) in the nest. Cowbird eggs may hatch one day ahead of the host bird's eggs. The cowbird young are larger and will sometimes kick the songbird young out of their nest. Cowbirds may grow more quickly than songbirds do. Due to their larger size, the cowbird young require more food, are more aggressive, and are much noisier than the songbird young. Consequently, songbird young are unable to compete for food.

Most songbirds lay three to five eggs a year. Some species may renest if something happens to their eggs or chicks. In contrast, cowbirds have adapted to their constant supply of host nests and can produce a tremendous number of eggs each year. The average female cowbird may lay up to 40 eggs a year. About three percent of cowbird eggs develop into adults. They generally lay one egg per nest.

Whether the songbirds are in their northern breeding grounds or their southern wintering grounds, they must still contend with dilemmas of deforestation, cowbird nest parasitism, and all of the previously discussed problems that are a result of or that accompany these concerns.

PROCEDURE:

PRE-ACTIVITY:

1. Read Overview information thoroughly. It is essential to your understanding of this activity.

2. Using a playing field or a gymnasium, identify one end as the Northern Breeding Grounds and the other end as the Southern Wintering Grounds.

3. Place four circles made from string or hula hoops at each end of the playing area. These represent nesting or wintering grounds. Carrying capacity, the greatest number that each nest site can hold, for each nesting ground should be limited to five birds.

4. Place cones down center of field, six to seven feet across from each other, to form a corridor for the "birds" to migrate through. (See attached diagram.)

5. Review vocabulary words. Then identify students as either "cowbirds" or "songbirds" with approximately one cowbird to every four songbirds. Mark the cowbirds with an arm band, vest, or whatever you have.

ACTIVITY:

1. You have one set of condition cards for the Northern Breeding Grounds and one set of condition cards for the Southern Wintering Grounds. Begin your first migrations. As students arrive at their breeding grounds or wintering grounds, read to them a card from the corresponding condition cards.

2. Each time the students migrate through the corridor, move the cones closer together by four to five inches to indicate the gradual loss of habitat along their migration route.

3. Look ahead in the condition cards. You will want to remove or add nesting circles from the breeding grounds or wintering grounds as the students leave and before their return.

4. As condition cards are read, the number of songbirds and cowbirds changes with mortality due to loss of habitat, cowbird parasitism, and many other factors. Birds that are "removed" from migration stand along the side-

lines until they are recalled for new conditions.

5. Be sure to record the number of cowbirds and songbirds after each migration.

6. Option: Have a student tag cowbirds and songbirds as they migrate through. This student represents disease, severe weather, predation, or weaknesses due to poor food or difficult flying. Students tagged become mortalities until they are needed to replace birds as the condition cards instruct.

7. Have students go through at least ten migrations.

8. Graph the population changes for the cowbird and the songbird. Use contrasting colors to plot cowbird populations versus neotropical migratory songbird populations.

9. Ask students to analyze the results of their graph. Ask:

-What happened that caused certain fluctuations in population to occur?

-Can you see any apparent patterns?

-What do you predict might happen if the graph were to continue for another ten or 20 migrations?

-How did it feel to be a neotropical migratory songbird?

-How did it feel to be a cowbird?

10. Discuss with the students the factors that affected the songbirds and the factors that affected the cowbirds. Ask:

-How did the loss of habitat affect the songbird population?

-How did the loss of habitat affect the cowbird population?

-Why did it actually seem to help the cowbirds?

-What other factors caused the songbird populations to drop off?

-What solutions can you recommend for this dilemma?

11. Have students discuss some ways in which people can help the neotropical migratory songbird populations. Have them explain ways they might help in their own community. What if nothing is done to change the present situation? What effects might the loss of songbirds have?

12. Chief Seattle once said "All things are connected like the blood that unites us. We did not weave the web of life. We are merely a strand in it. Whatever we do to the web, we do to ourselves." Ask:

-How does this statement apply to the loss of not only songbirds, but all species of life upon this planet?

ASSESSMENT:

1. Ask students to design both a suitable habitat for neotropical migratory songbirds and an unsuitable habitat for them. They must be able to describe the qualities they have included in each and explain why they benefit or why they are detrimental to songbirds.

2. Have students produce a news report about neotropical migratory songbirds and the cowbird dilemma.

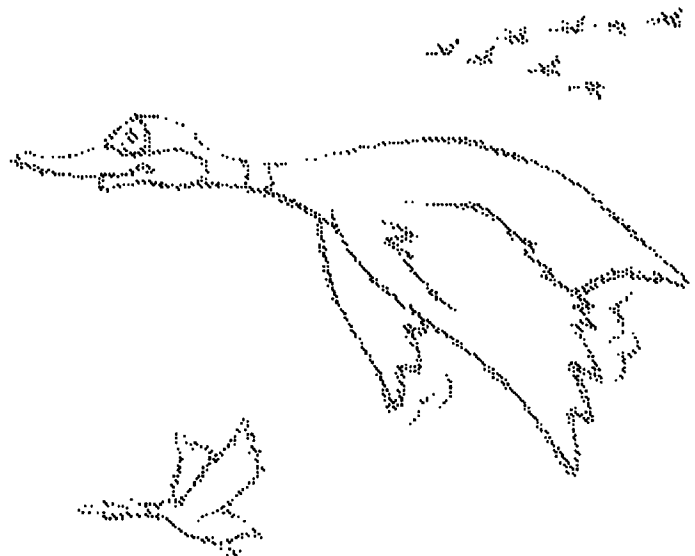
3. Have students write an obituary for the deceased "Sarah Songbird" or "Clara Cowbird."

4. Ask students to draw a cartoon illustrating the "Cowbird Dilemma."

EXTENSIONS:

1. Have students choose a specific neotropical migratory bird to research, report on, and trace its migration route. Find out about its wintering grounds, too!

2. Have students role play the "life of a cowbird" in a comical, yet realistic way.



NORTHERN CONDITIONS

Good news! Local ecologists have taken action against cowbird parasitism through trapping and removing cowbirds. Songbirds have a slight increase in population. Add one songbird to each of the nesting grounds.

NORTHERN CONDITIONS

The Least Bell's Vireo in California and the Black-capped Vireo in Oklahoma and Texas are victims of a new species of cowbird, the Bronzed Cowbird. They have no defense against these newcomers' nesting parasitism. Their population is declining rapidly. Remove one songbird from each nesting area.

NORTHERN CONDITIONS

You survived your migration north! But as you arrive in your nesting area, you find that the riparian woodlands have been drastically reduced from reservoir construction. Remember, only 3% or less of all land in the western United States is made up of riparian areas, yet they are used by at least 80% of all birds. Remove one cowbird and two songbirds.

NORTHERN CONDITIONS

Your return migration is more difficult this time. Riparian areas that are important stopover areas for your migration have been heavily impacted by human development. Decrease your songbirds by two and cowbirds by one.

NORTHERN CONDITIONS

Good news! A large area of your lost habitat has been replaced as wetlands as part of the mitigation agreement for the construction of the reservoir. Increase your population by two songbirds and one cowbird. Increase your nesting grounds by one circle.

NORTHERN CONDITIONS

You return to your nesting ground to find that several hundred acres are now open to grazing. Poor management has resulted in negative impact on the riparian nesting habitat. Increase cowbirds by three and reduce songbirds by three.

NORTHERN CONDITIONS

As you return you find that cowbirds continue to expand their range with the increased development of your nesting area. Cowbird nesting parasitism is having a major impact on Willow Flycatchers and Western Tanagers. Replace one songbird in each nesting area with a cowbird.

NORTHERN CONDITIONS

You find that human development has left your nesting habitat fragmented. This increase in forest edge has resulted in greater predation by Great-tailed Grackles, as well as more threat of nest parasitism by cowbirds. Decrease songbirds by one and increase cowbirds by one.

NORTHERN CONDITIONS

Upon your return you find an increase in agriculture has meant a greater use of pesticides and herbicides. This has had a slight impact on bird populations; there are less insects to eat. Remove one songbird and one cowbird.

NORTHERN CONDITIONS

You finish the migration to your northern breeding grounds and find that a new housing development has cut roads throughout your nesting grounds. That means predation on nests has increased. You lose one songbird from each of the three most southerly nesting grounds. (Teacher may determine which nesting grounds in the North.)

NORTHERN CONDITIONS

Good news! Due to a bumper crop of caterpillars, the Warbler populations are booming! Increase your songbird population by three.

NORTHERN CONDITIONS

You arrive safely at your breeding grounds. Unfortunately, so have all of your fellow cowbirds. Add one cowbird to each nesting ground. (Note to the teacher: This may mean changing a songbird into a cowbird. If so, consider it cowbird parasitism.)

SOUTHERN CONDITIONS

You arrive safely at your wintering grounds to find that neotropical deforestation has greatly reduced your habitat. Reduce your songbird population by two and increase cowbird population by one.

NORTHERN CONDITIONS

You return to your northern nesting grounds to find that a logging company has done some clear cutting, destroying much of your habitat. The furthest nest area from your teacher is completely wiped out! Cowbirds are absorbed into other nest sites first, due to their adaptability, and then songbirds are absorbed in other nest areas if they still have not reached their carrying capacity.

SOUTHERN CONDITIONS

You arrive at your wintering grounds. Increased agriculture has resulted in a greater use of DDT and other harmful pesticides and insecticides. Decrease your songbird population by three and cowbirds by two.

NORTHERN CONDITIONS

Your northern migration was difficult with severe wet and cold weather. Remove two songbirds and two cowbirds from your population in the breeding grounds.

SOUTHERN CONDITIONS

Your luck is improving. Ecologists have set aside a habitat reserve for migratory birds. Increase your songbirds by two and cowbirds by one.

SOUTHERN CONDITIONS

You return to find that the Central America for the Rainforest Alliance, one of many groups to help neotropical songbirds, has saved tropical forests in the Tortuguero National Park together with Barra del Colorado National Wildlife Refuge. Increase your songbird population by four and decrease your cowbird population by two.

SOUTHERN CONDITIONS

You return to find that increased pasture lands in Central America have decreased forest habitat and added to forest edge. The cowbird populations are thriving. Increase cowbirds by one per nesting area.

SOUTHERN CONDITIONS

A banana farm has replaced part of your wintering habitat. This increases forest edge. Decrease your songbird population by one and increase the cowbird population by two.

SOUTHERN CONDITIONS

As you return to the Caribbean islands you find them overcrowded, due to loss of habitat on neighboring islands from hurricane damage. That means you have a lower food supply. Decrease songbirds by two and cowbirds by one.

SOUTHERN CONDITIONS

Your wintering ground has been partially developed by ranchers. Decrease your songbird population by one and increase your cowbirds by one.

SOUTHERN CONDITIONS

This is a bad winter for you. Pesticide use in Latin and South America results in toxins being concentrated in birds' fat reserves. This affects songbird and cowbird survival and reproduction. Reduce both songbird and cowbird populations by two.

SOUTHERN CONDITIONS

Good news! A new group is formed, the Association for the Environmental Well-being of Sarapiquí. These dedicated conservationists realize the value of the forest and its wildlife as a lure for tourists. Increase your songbird population by four and decrease your cowbird population by two.

SOUTHERN CONDITIONS

You return this winter to learn that numerous conservation groups have sprung up all over Latin America. They are raising money to purchase habitat for reserves. Increase your songbird population by two.

SOUTHERN CONDITIONS

You are relieved to find that lost habitat has been mitigated for migratory songbirds. Increase your songbird population by two and cowbird population by one.

SOUTHERN CONDITIONS

Things are looking up! A tree nursery in central Mexico is giving interested residents trees for reforestation. This is an important neotropical migratory bird corridor. Increase your songbird population by two and cowbird population by one.

SOUTHERN CONDITIONS

You return to find that education programs about conservation in rural communities has had a positive impact. Increase your songbird population by one and decrease your cowbird population by one.

SOUTHERN CONDITIONS

You can celebrate! Funds from international partnerships provide resource protection at reserves in the Yucatan. Increase your songbird population by two and cowbird population by one.

SOUTHERN CONDITIONS

Watch out! Neotropical songbird trafficking is taking a toll on bird populations in one nesting area. Decrease songbird population in one nesting area by three.

SOUTHERN CONDITIONS

You are devastated to find that slash and burn logging in Costa Rica has greatly reduced important habitat for songbirds and increased forest edge. Decrease your songbird population by two and increase your cowbird population by three.

SOUTHERN CONDITIONS

It has been a hard winter. Poaching is affecting bird populations in two nesting areas. Reduce each area's songbird population by two.

SOUTHERN CONDITIONS

Things are looking up! The Belize Audubon Society has expanded a reserve for Howler Monkeys, which increased songbird habitat as well. Increase your songbird population by one.

SOUTHERN CONDITIONS

You are relieved to know that landowners have formed a voluntary system of wildlife sanctuaries. Increase your songbird and cowbird populations by one.

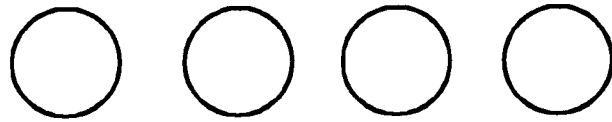
SOUTHERN CONDITIONS

Time to celebrate! The Guatemala Audubon Society recently bought nearly 1,000 hectares of tropical forest. Increase your songbird population by two and cowbird population by one.

SOUTHERN CONDITIONS

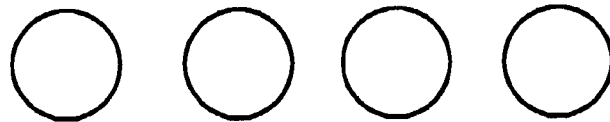
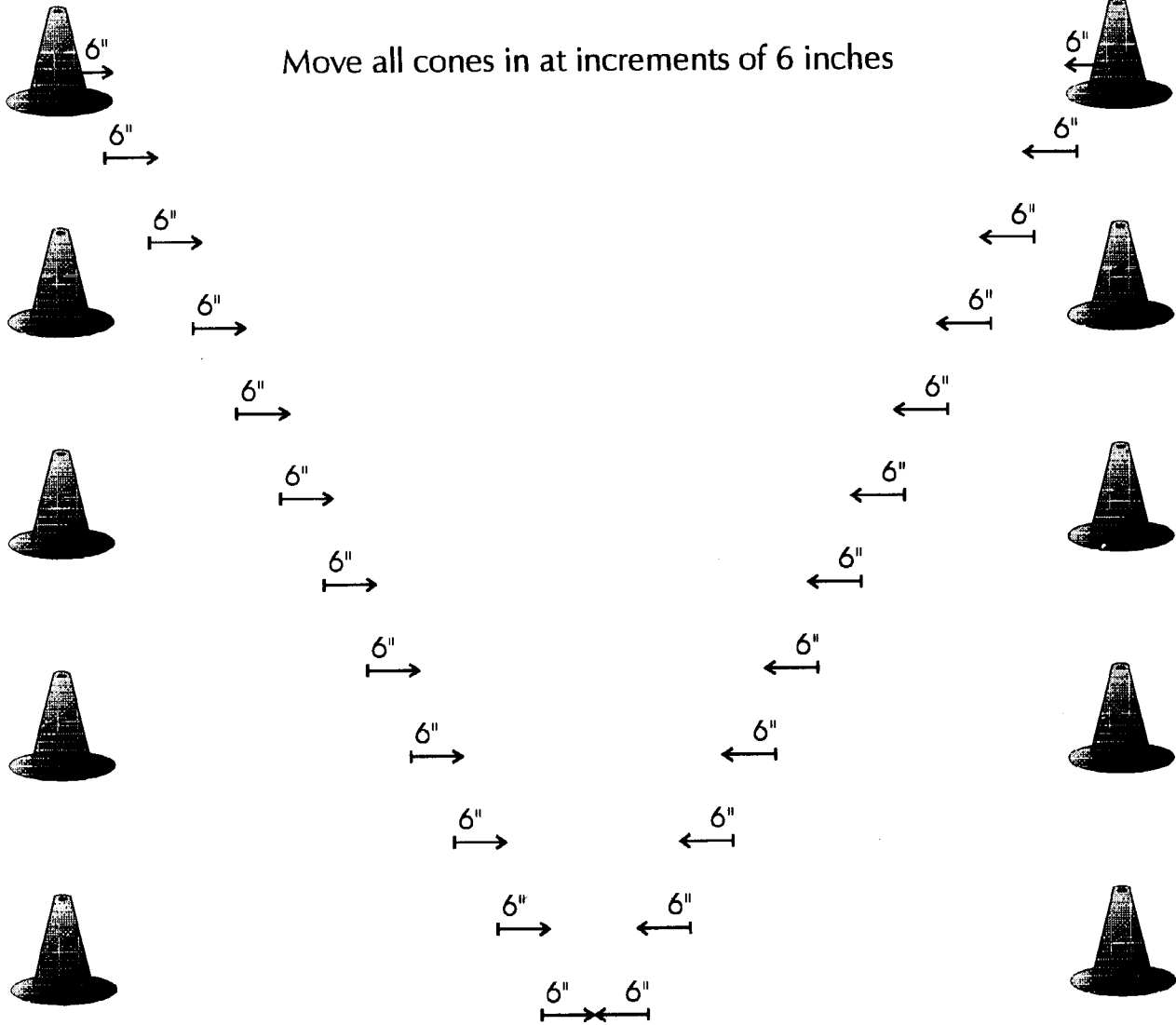
No privacy here! Increased tourism has been hard on songbird populations. Decrease your songbird population by two.

NESTING AREAS

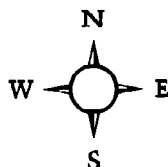


Start distance apart at 6 foot

Move all cones in at increments of 6 inches



SUMMER HOME



look endangered plants. Plants form the basis of ecosystems, and people directly depend on plants for food, clothing, building materials, medicine, and much more. Most of the world's plant species have not yet been identified, or studied to determine their usefulness to humans.

The welfare of one species of plant or animal is likely to have a direct effect on other species, as well as on the functioning of the entire ecosystem. Ecosystem Managers enter data into computers, create graphs, and base management decisions on carefully weighed factors.

Many times, just removing the problem that threatens an endangered species allows it to recover on its own. But sometimes the survival of an endangered species requires more extensive human intervention. Today these efforts are in the form of habitat protection in parks and preserves, habitat restoration, and zoos and botanical gardens that nurture and breed animals and plants to preserve genetic diversity.

PROCEDURE:

PRE-ACTIVITY:

PART A:

Have students tape construction paper together to prepare four or five large paper mats, each a different color. Variation: Cut two 3" X 3" (7.6cm X 7.6cm) squares out of brown, blue, and white construction paper for each person in the group.

PART B:

Provide a list of locally endangered, threatened, and rare plant and animal species from your state natural resource agencies, the U.S. Fish and Wildlife Service, the U.S. Department of Agriculture, the Nature Conservancy, or the National Wildlife Federation (see Resources). Outside the United States, contact the comparable agencies in your country. Have students write letters to obtain some of this information. Ask your local librarian to set aside books on some of these endangered species. Make copies of Student Pages 1-3 for each student.

ACTIVITY:

PART A HABITAT SCRAMBLE:

1. What happens to wildlife when a habitat is altered, either naturally or by humans?

Have each student assume the identity of an animal (bird, fish, mammal, reptile, etc.). Place large colored paper mats on the ground and label them to represent different habitats - rainforest, deciduous forest, field, pond, tundra, ocean, and so on.

2. According to their animal identities, have students choose an appropriate habitat. (They must stand with at least one foot on the mat. More than one animal can occupy a habitat mat.)

3. When everyone is in place, tell a brief story describing the destruction or alteration of a particular habitat (i.e., a wetland is drained to build a housing development or dries up in a severe drought). After the story, pull away the colored mat representing that habitat. The animals that were standing there must scramble to find a new habitat that is suitable and stand with one foot on it. If they cannot adapt to another habitat, they do not survive and are out of the game.

4. Continue telling stories of habitat destruction and removing habitat mats after each one. As habitats disappear, students must scramble to find another suitable habitat mat to stand on or they die. Crowding, tension, and aggressive behavior will result, mimicking what often occurs in nature. Stop the game when most animals have lost their habitat.

5. Afterward, discuss the principles the game demonstrated. Focus on how habitat study and planning for development is important for wildlife and people. Also point out that many plants and animals can often adapt to changes in their habitat.

VARIATION FOR PART A: EVERY SPECIES FOR ITSELF

Students simulate how animals and often entire species compete for their essential needs (food, water, and space).

1. Tell students to choose an endangered animal species they would like to portray. They can choose from the sample profiles of endangered animals on Student Page 2. Ask:

-Why did you choose the species you did?