



# Creating Corridors

**Grade:** 5

**Subject Areas:**

Life Science, Economics,  
Social Studies

**Skills:** discussing,  
predicting, modeling,  
observing, role playing,  
critical thinking

**Duration:** 1 hour

**Connections:**  
social studies, environment,  
resource management

**Vocabulary**  
biodiversity

niche

extinct

disruption

genes

gene pool

public lands

habitat fragmentation

range

extinct

endangered

critical habitat

corridors

**Objective:**

Students will learn about extinction events, biodiversity, and how wildlife corridors can enhance critical habitat.

**Materials**

- 3 x 5 cards of 4 different colors . Every student needs one of each color.
- pictures of fragmented habitat and local or exotic wildlife
- a large area clear of tables
- tape or flagging to mark the park boundary
- time piece and a whistle
- rope, boards, and fabric to make obstacles and corridors

**Standards**

**Strands: Excellence in Environmental Education Guidelines**

**Strand 1 — Questioning and Analysis Skills: C) Collecting Information:**

Learners are able to locate and collect information about the environment and environmental topics. **F) Working with models and simulations:** Learners understand that relationships, patterns, and processes can be represented by models.

**Stand 2.3 — Humans and Their Societies: C) Political and economic systems:**

Learners understand that government and economic systems exist because people living together in groups need ways to do things such as provide for needs and wants, maintain order, and manage conflict. **D) Global Connections:** Learners understand how people are connected at many levels—including the global level—by actions and common responsibilities that concern the environment.

**Strand 2.4 — Environment and Society: C) Resources:** Learners understand the basic concepts of resource and resource distribution.

**Strand 3.2—Decision-Making and Citizenship Skills: B) Evaluating the need for citizen action:** Learners are able to think critically about whether they believe action is needed in particular situations and whether they believe they should be involved.

**California State Educational Standards:**

**Life Sciences 3a:** Students know ecosystems can be characterized by their living and nonliving components.

**Investigation and Experimentation (I and E) 6c:** Students will formulate and justify predictions based on cause-and-effect relationships.

# Background

## Gone Forever?

Extinction events are not unknown throughout the history of life. Evidence shows mass extinctions have happened periodically and somewhat suddenly following a large scaled catastrophic event like an asteroid impact. As a matter of fact, over 90% of all species that have ever inhabited our planet are now extinct. Today, an extinction event is happening again, but this time it is different. The catastrophic event is being caused by the actions of modern humans coupled with climate change. According to a comprehensive report put out by the MA (Millennium Ecosystem Assessment), humans have changed most ecosystems beyond recognition. What happens next, is up to us.

E.O. Wilson, a famous American naturalist, has been studying biodiversity for over 30 years is a leading expert. He warns that the rate of extinction is higher today than it has ever been before. He even predicts that we are losing species 10,000 times faster today compared to the background rate of approximately 100 species per year, particularly in tropical regions.

**Biodiversity** can be defined many ways. One definition is the total number of species living within a certain ecosystem. For instance, about 150 bird species and 400 different plant species live in the King Range National Conservation Area (NCA). In Costa Rica, a country in the tropics, about 850 birds species and over 9,000 plant species have been identified. This means that Costa Rica has a higher biodiversity of plant and bird species compared to the King Range NCA. Biodiversity is important for many reasons. First of all, organisms do not

live in isolation. They coexist and interact with one another within a particular ecosystem. Each species has a particular niche or role in an ecosystem. A **niche** is how an organism makes a living in order to survive. For instance, flies and bees pollinate flowers. As they fly from plant to plant they carry pollen with them. Pollination needs to happen in order for fertilization to occur. Many plants depend on insect pollinators to reproduce. If a species cannot successfully reproduce, the population will eventually die out or become extinct. Once a species becomes **extinct**, it is gone forever. Gone along

with an extinct organism is its role in the ecosystem. If a species has a primary role, like pollination, and is no longer there, the ecosystem can be disrupted or even collapse.

Using the example from above, if insects like bees and flies become extinct, so do the flowers that depend on them and any animals that depended on the flowers. This is where biodiversity comes in. When there are multiple species present, often one species can fill a similar niche to another species. Therefore, biodiversity can deter large **disruptive** events and

## Local Connection

### Humboldt Redwood State Park

The single largest area of protected redwoods in the world is Humboldt Redwoods State Park (HRSP) located along the Eel River. The park encompasses over 53,000 acres and contains the entire Bull Creek watershed. The ancient redwoods in this park are some of the most majestic and were highly threatened during construction of the redwood highway. This is the reason why Save The Redwoods League began a legacy of redwood forest protection inaugurating the first protected redwood grove here in 1921.

HRSP is home to many sensitive plants and animals species like the Humboldt marten, ringtail cats and Coho salmon. Other places inside the park, however, are divided by Highway 101, Avenue of the Giants, Honeydew Road and other roadways. Barriers besides roads within the park include trails, beaches and campgrounds used by humans.

Because of its remoteness, size and proximity to the King Range NCA (another sizable protected area southwest of the park), action has been taken to create a wildlife corridor connecting the two places. This idea has been called the Redwoods to the Sea Wildlife Corridor and became one step closer to reality in 2008 when Save the Redwoods League deeded the BLM (Bureau of Land Management) 216 acres of redwood and Douglas fir habitat within the gap. Save the Redwoods League has worked with private land owners and has partnered with public agencies and environmental organizations to help create this vital link. Since 1999, it has helped protect 10,000 acres within this corridor.

prevent ecological collapse. A disruption is something that causes confusion and can throw a system into disorder.

Another reason biodiversity is important is because every species is unique. Every species has accumulated changes throughout its evolution. These evolutionarily changes are coded within its genes. **Genes** are portions of DNA that code for particular traits or behaviors. The combination of different genes within a population is called a **gene pool**. Through sexual reproduction, genes are reshuffled producing a unique genetic sequence for every individual (unless they are identical twins) within that population. Mutations are another important source of variation. Populations with a large gene pool are healthier because as populations become smaller, their sequences become more alike. Species that have a shallow gene pool (small population), don't have a lot of variation and may end up carrying genetic defects, diseases and suffer from inbreeding depression. By maintaining genetic diversity, populations have a lesser chance of getting harmful genetic diseases or losing genetic fitness.

One way habitat, and therefore biodiversity, is conserved is through the acquisition of public lands like parks, reserves and wilderness areas. **Public lands** are public domain and can be visited by anyone. Setting aside land for the benefit of people and wildlife is a relatively new phenomenon in the United States, however, people in Eastern cultures began setting aside land for spiritual value as early as 500 B.C. The first park set aside in the United States was Yosemite State Park, established in 1864. In 1890, Yosemite State Park became Yosemite National Park and today is visited by over three million visitors annually. Yosemite is a large park covering over 1,000 square miles (2,590 sq. km), however, over 58 percent of the world's protected areas are relatively small. Most such areas cover less than 4 square miles (10.3 sq. km). This lack of space is one cause of **habitat fragmentation**.

Habitat is fragmented when isolated patches of land and or water result from resources being disrupted. Isolated patches reduce the ability for wildlife to interbreed, find food and move into new territories. According to Reed Noss, editor of the journal Conservation Biology, habitat fragmentation is one of the most serious threats facing conservation today. He claims that large carnivores and herbivores may need millions of acres of preserved land. These animals like mountain lions and wolves can have normal ranges that extend hundreds of miles. A **range** is the total area that a species occupies.

In nature, nothing is static. Things are constantly changing. Animals and plants immigrate into new areas and emigrate out of existing ones. The ability to move from place to place helps wildlife survive. Habitat fragmentation makes mobility more difficult.

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## Uniting Nature

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Today, many parks and preserves have human development like towns, freeways, and golf courses immediately outside their boundaries. These human centered places create barriers for wildlife. Park planners and managers of protected lands have in recent decades been shaken by the facts that many protected places do not adequately protect many of the animals and plants that live there. In one study, 13 out of 14 surveyed national parks lost some of the mammals that previously lived there because the areas put aside are too small. Over 11% of Earth's land area and .5% of the ocean is protected to some degree. Apparently, this degree of protection is not enough and protected places continue to be at risk.

World wide over 100 species become extinct every day. This adds up to over 30,000 species every year. The majority of these species live in the tropics, where forests are being cut down at an alarming rate. With every extinct species, gone is their unique genetic makeup and the role they had within the ecosystems where

they lived. Eons of evolutionary history disappear as well. Humans may never know the true value of the species that are lost.

Most evidence shows that the number one reason for species decline is habitat destruction. As people clear forests and grasslands for agriculture, habitat is lost. When places become too polluted for living things to exist, habitat is lost. When people build homes, roads or shopping malls, wildlife is pushed out. Fifty years ago, people living in and near the King Range NCA, were likely to see animals that are rare today, like martens, badgers and green sturgeon. As species become rare they become endangered. **Endangered plants** and animals are those whose numbers are so low, they are threatened with extinction. Land set aside to help prevent endangered species from becoming extinct is called **critical habitat**.

As humans become more aware of the threats imposed on animals and plants, steps are taken to save them. There are two main ways of solving the problem of local extinctions within protected areas. The first is to increase the size of the protected area and the second is to establish wildlife corridors. **Corridors** connect fragmented lands together reducing the number of barriers. Corridors act as bridges allowing animals and plants to freely move back and forth between areas. By giving animals and plants places to roam, their chance of survival increases along with their genetic fitness.

Humans have altered many habitats beyond repair, however, the future does not have to be all doom and gloom. Humans can ease the strains put on wildlife through better education, changing consumption patterns, and new technologies. Making wildlife corridors is one way people can reduce the negative ecological effects of habitat fragmentation. One serious proposal is to connect Yellowstone to the Yukon. This would make a corridor 2,000 miles long. With proper management, humans and wildlife can coexist. The choice is ours.

# Activity: Creating Corridors

## Preparation

Have the cards laminated and sorted ahead of time. Since this activity needs a large space, it can be done outside. Making space in a large classroom or in a multiple purpose room is also adequate.

## Procedure

**1.** Explain to the students that they are going to learn about the needs of wildlife and what happens sometimes in protected places. Begin asking questions to find out what they already know. You may want to show some pictures of wildlife and habitat fragmentation while asking questions. (Option: have the students take notes)

**2.** Hold up a picture of habitat fragmentation and ask them to describe what the picture is showing. What are the different features in the picture? (there may be a road or a town, etc.) What is happening to the habitat in this picture?

## Materials

- 3 x 5 cards of 4 different colors . Every student needs one of each color.
- pictures of fragmented habitat and local or exotic wildlife
- a large area clear of tables
- tape or flagging to mark the park boundary
- time piece and a whistle
- rope, boards, and fabric to make obstacles and corridors.

**3.** Tell the students that as animals and plants become rare, they face extinction. Ask: What is the difference between something endangered and something extinct? Write these two terms on the board and a brief definition. Can anyone think of an animal that is extinct? Endangered? Mention the fact that some animals and plants play a vital role and without them an entire ecosystem can collapse.

Note: local extinct animals include: California condor, sea otter, and California grizzly bear. Local endangered animals include: Aleutian goose, coho salmon, northern spotted owl and Stellar's sea lion.

**4.** Next, briefly explain some of the purposes protected places have and give some examples of protected places both locally and elsewhere. (Yosemite, Community Park, Humboldt Redwoods State Park, King Range) Together come up with a list of how protected

- *Has anybody ever seen a bear? How about a mountain lion? How about a deer?*
- *Why do you think some animals are more rare than others?*
- *What type of animals are coyotes and mountain lions? (predators).*
- *What do all animals and plants need to survive? (food, shelter, water, and space)*
- *How much space do you think a small mammal needs (example: a mouse)?*
- *Is this amount of space big enough to escape some sort of disaster? What else do animals need space for?*
- *Does the size of an animal change how much space it needs? (in general larger animals need more space).*
- *What kinds of things reduce the amount of space animals and plants have?*
- *What do you think happens to wildlife if it doesn't get enough space? (get killed, starve, inbreed, overpopulate an area, etc.)*
- *Did you know that some animals like cheetahs are becoming inbred?*
- *What does inbreeding mean?*
- *What is the relationship between inbreeding and lack of space? (mention the role of genes)*
- *What type of areas give animals and plants the space they need? (wild places free of human activity)*
- *Is it important to set aside protected places to allow plants and animals to live?*



## Activity: Creating Corridors (cont.)

places are used and why they are important to both people and wildlife. List these on the board. Stress the fact that in some areas, especially those widely developed like Los Angeles or New York, most wildlife is gone. As more people populate the planet, less space becomes available for wildlife.

5. Take a moment to list the different needs animals and plants have for adequate space using input from the students (write these on the board). Take a few minutes to explain what genes are and why it is important to mix genes up to prevent inbreeding. Competition and mating force plants and animals to immigrate into new areas. Before they begin their activity, briefly discuss what a corridor is and what benefit it may have.

6. Next, explain to the students that they are going to perform an activity where they are going to be black bears living in a park. In this activity, they are not going to be tested on how well they can survive, but by how well they can exchange their genes. They don't want to become inbred. Hold up the colored pieces of paper and explain that these represent different genes. Don't tell them their overall goal yet.

7. Before handing out the colored cards, inform the students they are now a group of black bears that have just entered a park. Show them the boundary of the park using flagging, tape or imaginary lines. What they need to do is find a mate and exchange their genes. Explain, that for fun, time

is sped up in this activity so they will actually exchange their genes with four other people. Tell them that the park is surrounded by roads and development and if they leave the park they will die. (you can take the role of a truck that runs them over) Those that end up having all the same color become inbred and need to leave the game. Their goal is to exchange cards with 4 other people during each round before the time period is up Limit each round below to a few minutes. Inform them that when the whistle blows, they need to stop exchanging cards. To begin dispersing they will be given a sign. (come up with a gesture for this). The game is not a race so there is no need to run. Lay down some ground rules before beginning.

8. In the first round, congratulate any one who was able to get four cards of the same color. This shows their ability to disperse and their good genetic prospects. Next, ask students to raise their hands who were not able to collect four identical cards. If they keep the same four original colors, they are a product of inbreeding. As the rounds progress, alternate trading between identical cards and trading for differently colored cards.

**Round 2:** State the fact that a visitor center and campground has been developed inside the park. Lay out a large fabric covering no more than 20% of the total park area. In order

- *What do you suppose a habitat corridor is? (accept all answers)*
- *Who can define what a corridor is? (focus on the fact the a corridor is a narrow strip that things are able to travel back and forth in).*
- *Who can give an example of a corridor? (road, valley, hallway, bridge, etc.)*
- *How does a corridor that you or I might use differ from a wildlife corridor?*
- *What are types of wildlife corridors? (ridge tops, stream beds, trails, etc.)*

to get to the campground, a road is made. Lay down a rope from a park boundary to the campground. Tell the students that roads and campgrounds are not safe for bears and they can not enter these places or they will be run over by you. You play the role of a truck. Give the signal for dispersal. Once a student gets all 4 colors, they can raise their hand. You may want to congratulate them on their ability to disperse and maintain good genetics.

Play 6 or 7 more rounds incorporating the changes listed below.

**Round 3:** Add stores and restaurants to the campground to give people something to do while they are there. Double the size of the fabric.

## Activity: Creating Corridors (cont.)

**Round 4:** Add a golf course just outside of the campground and shops. Add more fabric in an area outside the campground.

**Round 5:** More habitat fragmentation occurs. A town emerges just outside the park boundary and a new road is put in. Place more fabric adjacent to the park boundary and put more rope down from the town to the shopping center. Pull a little bit of the fabric inside the park boundary. This part of the fabric represents the zone of influence. Once again, any bear seen on fabric or crossing rope will be run over.

**Round 6:** Inform the students that an environmental group has proposed building a wildlife corridor (an overpass) so that animals have a way to cross the road safely. Place a board across a road to show them what it would look like. Ask the bears if they are in favor of this proposal. Take the board away and inform them that the government turned down the proposal without asking for the bears for their opinion.

**Round 7:** A small airport strip is put in because the campground and shopping center is becoming very popular. Because of the airport, the government has doubled the width of the road but has installed two different wildlife corridors across it. Place another piece of fabric down for the airport. Add a second rope to double the width of the road. Add two boards across the road for corridors. The bears can now cross the road safely.

**Round 8:** Expand the town and add a larger zone of influence inside the park boundary. Make the fabric for the town bigger and bring some of it into the park boundary.

**Wrap-up:** The main intent of this simulation is to demonstrate how incremental development in a park causes habitat fragmentation. Habitat fragmentation makes it more difficult for genetic mixing to take place. Ask the students if they think it would get easier or more difficult for the bears in future rounds. Explain that things could go either way. Areas within the park could be closed, like the airport, or more development might occur. Remind them that we usually think of parks as places that protect wildlife, but even in these places wildlife is pushed out. Explain that people often have a difficult time saying “that’s enough”. We love our parks and like to visit them. Large corridors in some places are being developed to connect places together. This may also be a good time to mention the fact that many of our parks are closing down due to lack of funding. Ask them if they think this is this a good or bad thing for wildlife. Have the students share what they learned.



## Extensions

- Have the students draw a park of their own design following this activity.
- Research different endangered species and have the students write a brief report about one.
- Invite a local park ranger into the classroom to have them share some of their experiences.
- Have the students make classified ads from an animal's point of view. They should list what they need and want to survive.
- Have the students graph statistics about species decline and/or habitat loss in certain areas.
- Relate animals and plants to each other by studying how seeds are dispersed. Many seeds travel on the feet and fur of animals.
- Take a field trip to a local protected area.

## References

- Amos, Jonathan, Study Highlights Global Decline, BBC, <http://news.bbc.co.uk/2/hi/science/nature/4391835.stm>, 2005
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- SRL and BLM Management extended corridor of protected lands from redwoods to the sea, <http://www.savetheredwoods.org>, 2008
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**Rainforest fragment in Mata Atlantica, Brazil**

[http://www.ufz.de/export/data/1/27865\\_mata\\_atlantica\\_steinicke\\_waldfragment.jpg](http://www.ufz.de/export/data/1/27865_mata_atlantica_steinicke_waldfragment.jpg)



**Hydro-Fracking Drill Sites in Dimock, PA**

[http://www.cedclaw.org/wp-content/uploads/2010/10/Drill-Sites\\_Habitat-Fragmentation-650x330.jpg](http://www.cedclaw.org/wp-content/uploads/2010/10/Drill-Sites_Habitat-Fragmentation-650x330.jpg)