On the Brink Pre-Visit Guide: 2nd to 9th Grade

Students will explore the different threats facing animals and why many are endangered, as well as what they can do to help.

These resources will help you and your students prepare to make the most of your zoo experience!

In-Classroom Activities

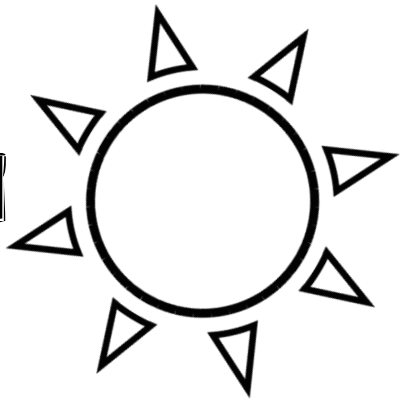
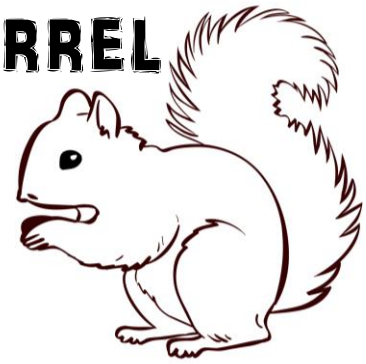
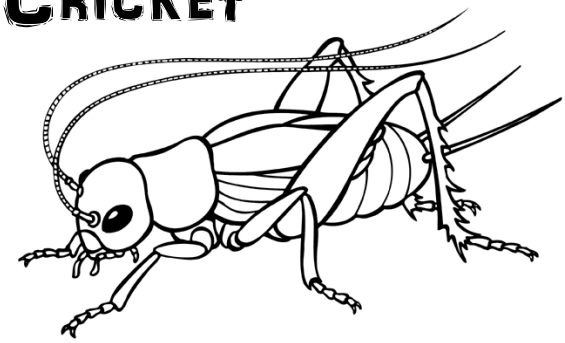
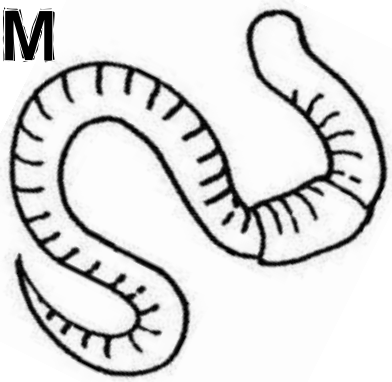
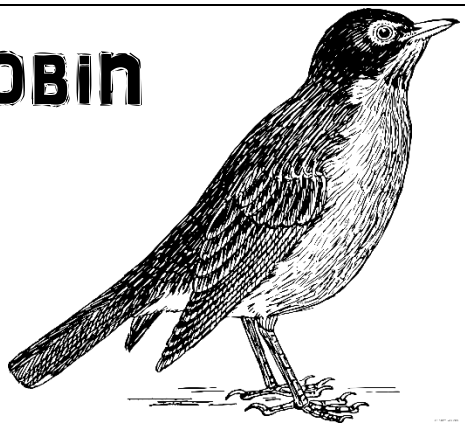
Introduce the concept that the natural world is made up of many **ecosystems**, communities of living things interacting with their physical environment. Explain that in an ecosystem all animals and plants are connected, and when even one species starts to decline it can have negative effects on many others.

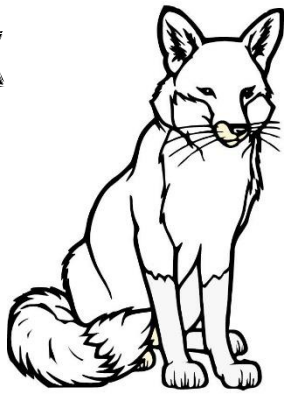
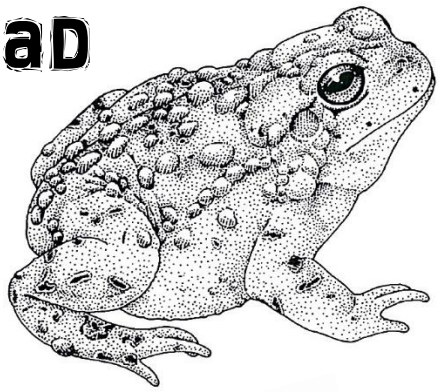
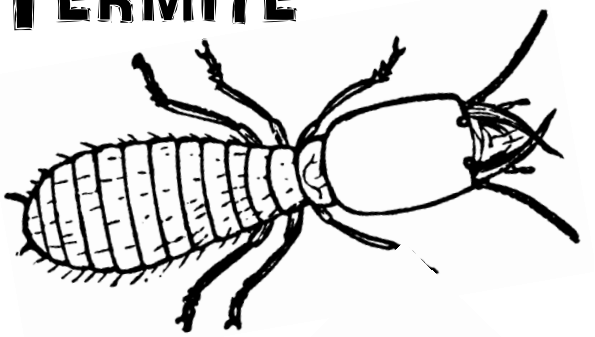
An **endangered species** is a plant or animal that is in serious risk of extinction, disappearing from the earth forever. There are many factors that can cause an animal to become endangered, and sometimes extinctions are the result of natural changes. But in recent history the rate at which animals and plants are disappearing has increased rapidly. Human impacts over the past 500 years are thought to have led to the loss of over 800 species—pollution, habitat destruction, overhunting, and climate change are just some of the issues that put many species at risk.

Web of Life

Assign each student a plant or animal found in the forest ecosystem. Have the students form a large circle and hold their card up so that their classmates can see their assumed identity. Explain that the ball of string will represent the connections between plants and animals. Stand in the middle of the circle and start the game as the "sun", and model how the game will work by saying, "I am the sun. I am passing the ball to the tree because the sun gives the tree energy to grow." Hold on to the end of the string and pass the ball to a student with the "tree" card. The "tree" now chooses a plant or animal in the circle to connect to (i.e. a deer eats the acorns, or an owl roosts in its branches), holding on to the string and passing the ball. Continue until all the students have been connected in the web, making sure the string is pulled tight. Show the power of these connections by asking what might happen if the sun suddenly stopped shining, and briefly discuss the consequences. Then ask everyone to stand very still as you begin to gently tug on the string. Tell the students that when they feel movement they should also begin to tug gently and ask them to watch as the tug moves through the web until the whole web is shaking. Everything is connected to the sun.

Explore other connections by starting the tug at different plants or animals (what happens if they mushroom disappears? The caterpillar?). Have students call out their represented plant or animal when they feel the tug and how the loss of the other species has affected theirs.

SUN 	MAPLE TREE 
SQUIRREL 	MUSHROOMS 
CRICKET 	WORM 
ROBIN 	GARTER SNAKE 

Fox 	Toad 
Fern 	Hawk 
Termite 	Raccoon 
Bat 	Luna Moth 

Explore how human-introduced pollutants can enter the food chain through plants or small prey species but may be passed on and build up over time in larger predators. At a certain level these toxins, like mercury or pesticides, can cause illness, reproduction failure, and even death for many different species. This buildup of toxic substances in organic tissue is known as **bioaccumulation**, and as it moves up the food chain and increases this is called **biomagnification**.

Biomagnification Blitz

Have students model how a toxin accumulates and magnifies in an aquatic food chain. Mark off a boundary area large enough for students to move quickly. Designate 2-3 students to be fishermen, choose 4-5 students to be salmon, and the rest (should be the majority) are krill. Use beads, beans, or some other small items to represent a toxin and distribute the pieces among the krill unevenly (some may have 4 pieces, some only 1). In the first round, put the salmon and krill in the game zone. (Fishermen stay off to the side now.) At "go", the salmon should run around and try to eat (tag) the krill. They should link arms with the krill they catch. Once all krill are eaten, begin the second round. In the second round, the fishermen now go in and try and catch (tag) as many salmon as they can (keep the salmon linked to the krill they have tagged so everyone is now in the game zone and in the game). After all the salmon/krill have been caught, sit them in groups together: fishermen, then the salmon they caught, and the krill eaten by the salmon. Have each krill say how many pieces of toxin they have, then pass their pieces to the salmon who caught them. Then, have the salmon say how many pieces of toxin they got from the krill, and pass their pieces (now piles) to the fishermen. At this point each of the fishermen should have a significant pile of pieces in front of them. Discuss what happened to the amount of toxins as it moved up the food chain, and what the implications could be for the health of both the salmon and the humans.

How do you think chemicals like mercury or lead end up in the environment in the first place? Are there ways we could prevent this?

Wildlife biologists do their best to study the habits, needs and population dynamics of different species so that we can take action to prevent their loss or bring them back from the brink of extinction. The information they gather helps in the creation of protective laws, preservation of habitat, and the reduction of destructive human behaviors.

Become A Citizen Scientist

Have students assist in identifying species found in trail camera pictures from the Gorongosa Wildlife Preserve with this project! The observations they record will build a data set that scientists can use to better understand which animals exist in Gorongosa, where they are, how they behave, and how the ecosystem is responding to restoration efforts. This information helps them monitor the park's recovery and identify key challenges.

https://www.wildcamgorongosa.org/#/

Population Growth Study
Allow students to explore and analyze the factors that influence population growth by interpreting data collected by scientists on the unique Ngorongoro Crater lion pride. With this real-world scenario students can gain a better understanding of the different types of growth and how they can be predicted, as well as how a habitat's resources can naturally limit a population.
https://learn.concord.org/resources/102/african-lions-modeling-populations

Recommended Reading

- Can We Save Them? By David Dobson
- The Journey Home by Frann Preston-Gannon
- Hoot by Carl Hiaasen
- The Case of the Missing Cutthroats by Jean Craighead George
- Stake Out by Bonnie J. Doerr

Discussion/Research Topics

Are there species in your local environment that are considered endangered or threatened? What are some threats they face?

Look in to some of the animals that have been able to come back from the brink of extinction thanks to conservation efforts. What steps were taken to help them? What changes in human behavior had to occur for this success? Are there any issues still threatening these animals today?

What are the natural factors that can affect the growth of a species? Explore some of the major extinctions in the earth's history and the contributing factors.

Student Worksheet

Ghost of the Prairie: The Black Footed Ferret

Read the following story to learn about one of the most endangered species in North America, then answer the following questions using the keywords underlined below.

Less than 200 years ago, the Great Plains of North America were described as an ocean of grass. Herds of bison thundered over the land and huge prairie dog towns covered the landscape, creating habitat for other burrowing species, including black-footed ferrets.

Black-footed ferrets are adapted to life on the grasslands, and they depend on prairie dogs for both food and shelter. They use their burrows and tunnels to hide, sleep, and raise their young. They were once found across the plains of the US from Canada to Mexico, but now there are very few left. They suffered habitat loss due to the arrival of settlers, who began to plow and farm the grasslands. Farmers and ranchers also began getting rid of prairie dogs, since they saw them as pests because they dig holes in grazing areas, fields, and disturb crops. In addition to losing their primary food, ferrets were hit hard by diseases including canine distemper virus and sylvatic plague.

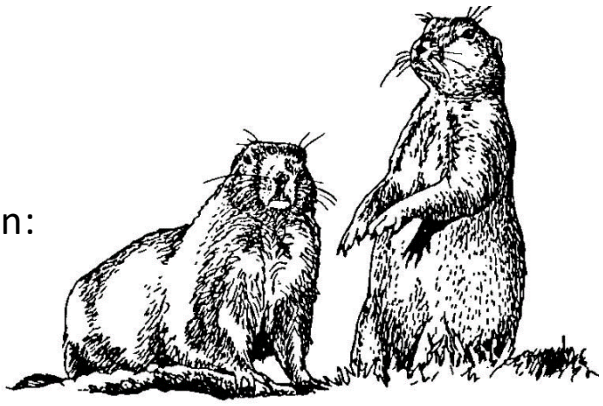
With their food and habitat disappearing, black-footed ferret numbers dropped steadily, and by 1974 the species was thought to be extinct. Most scientists gave up hope of ever finding another black-footed ferret until 1981, when a family dog brought home a ferret to a farm in the state of Wyoming. Another 18 ferrets were found in the area, so scientists captured them and used them as the founding members of a captive breeding and recovery program.

Since that time, the black-footed ferret has made an astonishing comeback. Years of research and commitment by zoos and other organizations to captive breeding has produced thousands of offspring. By 1991, there were enough captive offspring to begin re-introducing black-footed ferrets to their native habitat.

Student Worksheet

1. Black footed ferrets are found in a prairie habitat called the:

2. The favorite food of the black-footed ferret is the:



3. Ferrets hide, sleep, and raise their young in:

4. The ferret population started to decline due to:

5. When they hadn't been spotted for many years, scientists believed that the black-footed ferret was:

6. With help from several environmental agencies and zoos, black-footed ferrets were successfully reintroduced into the wild through this program: