

**EXPLORE YELLOWSTONE
MARTIN CHILDREN'S DISCOVERY CENTER**

ANIMALS



MUSEUM OF THE **ROCKIES**

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Dear Educator,

Thank you for choosing to bring your students to the *Explore Yellowstone* Martin Children's Discovery Center at the Museum of the Rockies (MOR), where our mission is to inspire visitors to explore the rich natural and cultural history of America's Northern Rocky Mountains. A visit to the Discovery Center is a great way to help your students visualize concepts and spark their curiosity about a new topic.

Studies have shown that learning in museums is not limited to the time spent within their walls, but is heavily influenced by prior knowledge and experiences and continues long after the visit has ended. For these reasons, preparing your students for their museum visit and then extending their experience afterward will enhance the educational aspect of the field trip experience.

To aid you in linking this museum visit to your curriculum, the Museum of the Rockies' Education Department has created this guide. Inside, you will find details on the *Explore Yellowstone* Martin Children's Discovery Center, including a map of the exhibit and education goals. We have also assembled complementary classroom activities for various grade levels. We hope that these resources will help you prepare pre- and post-visit activities for your students that tie into your curriculum.

MOR is committed to providing the richest possible learning experience for your students and welcomes your questions and feedback. We look forward to seeing you at the Museum of the Rockies soon!

Sincerely,

Education Department
Museum of the Rockies

EXPLORE YELLOWSTONE GENERAL OVERVIEW

Exhibit's Appropriate Age Levels: Birth through 8 years of age (or 2nd grade)

Curriculum is appropriate for preschool through 5th grade students.

Exhibit Overall Goal:

Introduce children to the wonders of Yellowstone National Park in a hands-on, immersive environment that empowers children to discover a lifelong passion for nature, science, and the Yellowstone experience.

Exhibit Description:

Explore Yellowstone is an immersive exhibit. From the moment kids enter through the Roosevelt Arch, they are surrounded by landscape scenes from Yellowstone. Murals surround them while overhead clouds float in the blue sky. In one area, children can “fish” with magnetic fishing poles for cutthroat and lake trout that have ball bearings sewn in their snouts and learn which fish to return to the “lake.” Mammoth terraces and bubbling mud pots help teach the concepts of thermal features and a “smell tube” lets them get a whiff of hydrogen sulfide. In the campground kids learn campground etiquette like bear-proofing food and removing litter or listen to stories and sing songs around the “campfire.”

A tot area, framed by murals of the Grand Canyon of the Yellowstone, gives infants a safe place to play while their parents watch from benches made of polished logs. Older kids can climb the fire tower and use binoculars to look for smoke, or play in a life-size eagle’s nest and learn about habitats.

In the lodge, children can dress up and pretend to be people working in Yellowstone. They can “cook” with an authentic wood stove that has a fake fire burning in the coal box or sit on child-size lodge pole furniture in front of the fireplace and read. A big clock over the fireplace helps them time the next eruption of “Old Faithful,” the largest of three cloth geysers. At the end of their visits, children can make post cards or drawings to take home before they exit through the Roosevelt Arch.

Exhibit Layout:

Eight discovery zones, each with a focus on different area of Yellowstone, provide just enough design, detail and props to suggest a time and place for children to become a part of Yellowstone.



ANIMAL ADAPTATIONS

Students learn the role of adaptation as they attempt to tie shoes without using their thumbs.

APPLICABLE AGES:

2nd grade – 5th grade

LOCATION:

At the museum or in your classroom

RESOURCES AND MATERIALS:

- Shoes that tie or tighten with laces on at least half the group

PURPOSE:

This lesson will help students become familiar with the adaptations in animals.

OBJECTIVES:

Students will:

1. Explain what an adaptation is.
2. List at least one adaptation that humans have.

VOCABULARY:

Adaptation
Opposable

ACTIVITY:

Ask students to join you in a circle for a challenge! With the students sitting in a circle, ask the students to un-tie or loosen one of their shoes and re-tie or tighten it again without using their thumbs. Students with

no laces can try this on another students' shoe. Ask students who finish quickly to try it again. When everyone has tried at least once, go around the circle and ask students to demo what were their techniques. Ask if it got easier to tie or fasten their shoes the more often they tried. Discuss challenges and successes. Why is this difficult?

Opposable thumbs are essential tools for so many things in life. Ask students to imagine the world if humans did not have opposable thumbs. Discuss what other animals have a type of opposable thumb (the ape family, some birds such as raptors, sloths and koalas...)

Introduce the word adaptation and discuss prior knowledge of the term. Adaptations are special “tools” living organisms have that enable them to survive. Ask the students what adaptations they have that help them survive?

TYING IT ALL TOGETHER:

Apply the concept of adaptations to the larger world by asking students to identify adaptations in other organisms. Speculate on survival advantages due to adaptations.

EXTENSIONS:

Adaptation Study

Have one or more animal pelts available to show the students. Ask the students to practice using descriptive adjectives to describe the animal's adaptations. Ask the students to explain how the adaptation contributes to the animal's survival.

ANIMAL DETECTIVE GAME

A team guessing game using clues that are observations seen in nature

APPLICABLE AGES:

2nd grade – 5th grade

LOCATION:

At the museum or in your classroom

RESOURCES AND MATERIALS:

- Mystery Clue Cards
- Animal information
- Blindfolds

PURPOSE:

This lesson will help students become familiar with the signs animals leave in the natural world.

OBJECTIVES:

Students will:

1. Identify different types of signs that animals leave
2. Deduce from the type of sign which animal has been there
3. Describe predator/prey relationships and survival techniques.

VOCABULARY:

Scat	Track	Carcass	Prey	Adaptation
Sign	Print	Predator	Camouflage	

ACTIVITY:

Divide the class into two equal teams. Ask questions, giving one clue at a time. As soon as a team knows the identity of the mystery animal they can raise their hands to answer, but one wrong answer eliminates them from getting to guess again until the other team has had all clues read to them. Only after the second team has had a chance to come forward with an incorrect guess can the other team enter back into the game.

Mystery #1

Trees in your neighborhood are dying at an alarming rate.

When you examine the trees, you notice they are girdled, with a ring cut all the way around the base of the tree.

The girdle occurs only a few feet off the ground.

You notice a lot of debris and scat at the base of the dead trees.

When you pick up the scat, it is filled with sawdust, and little else.

You notice a tail print between some of the animal's tracks.

The stride of the animal is quite short.

You find some quills in the area.

The culprit is a porcupine.

Mystery #2

You find some scat that is covered by dirt.

Upon examining the scat, you notice hair in the scat, and no berries.

The scat really stinks. This animal is a meat eater.

You find a deer carcass.

You notice the stomach and hooves and hide are left behind, but buried by debris.

Nearby the carcass, you notice scraping marks in the dirt.

You see footprints, about the size of a large dog.

There are no claw marks visible.

The culprit is a mountain lion

Mystery #3

Chickens are disappearing from your chicken coop.

You notice scat that is tapered (or skinny) at the ends.

Most of the scat is right in the middle of the trail you often walk.

The scat has lots of hair in it, but also some berries.

The tracks look somewhat like a dog's tracks, but they seem somewhat narrower.

The culprit is a coyote.

Mystery #4

You live in town, but awaken to find a tree stripped of most its bark.

When examining the tree, you notice some hairs on the tree.

You also see a few scratches and bite marks on the tree.

You find the culprit's scat to be full of berries and hair.

You see the tracks, and they are much bigger than a wolf or mountain lion's track.

The animal's scat piles are huge.

The tracks aren't big enough to be those of a grizzly bear.

The culprit is a black bear.

TYING IT ALL TOGETHER:

Point out how much information students learned about the mystery animal from their signs. Explain that observational skills are powerful tools that can reveal many details and information.

EXTENSIONS:

Create your own mystery! Research about an animal's diet and lifestyle, create and share clues and have others solve them.

Adapted from: Sharing Nature with Children, Joseph Cornel, pg. 67

BAT AND MOTH

Students act as blindfolded bats trying to find moths in the center of the circle, using echo-location

APPLICABLE AGES:

Pre-K – 5th grade

LOCATION:

At the museum, in your classroom or outdoors

RESOURCES AND MATERIALS:

- Blindfolds

PURPOSE:

This lesson will help students use their sense of hearing and also learn about bats.

OBJECTIVES:

Students will:

1. Use their sense of hearing to find prey
2. Work in teams to play a game and accomplish goals
3. Explain how bats locate their prey

VOCABULARY:

Echolocation

Concentration

Moth

Adaptation

Bat

ACTIVITY:

Have the group form a circle and discuss echolocation. Choose a member of the group to be the bat and to be blindfolded in the middle of the circle. Designate one to five others to be moths and ask them also to come to the center of the circle. The bat tries to catch the moths. Whenever the bat calls out “Bat!” the moths call back “Moth!” Or you can use bells to be attached at different locations on each moth that jingles as they are running around the circle. The bat tracks down and tags the moths by listening to their responses.

It takes good concentration to be a successful bat. So this game is good for developing concentration, especially when the bat must chase several moths at the same time. Add some excitement by bringing two moths into the circle at once. Encourage the bats to hunt as a team.

TYING IT ALL TOGETHER:

Once everyone has had a turn in the circle, discuss adaptations of predators and prey. How is our hearing compared to animals’ with a keen sense of sound?

Ask students to talk about how it felt to not have their eyesight, but to use their hearing as their main sense. Did they adapt to using it: meaning did it get easier to catch a moth? Note that we as animals can adapt to new situations.

Adapted from: Sharing the Joy of Nature with Children, p.95-Joseph Cornell; and Nature's Playground, Fiona Danks and Jo Schofield, pg. 182

BEAR, TROUT, MOSQUITO

A running game based on Rock, Paper, Scissors

APPLICABLE AGES:
2nd grade – 5th grade

LOCATION:
Large open flat area

RESOURCES AND MATERIALS:
None needed

PURPOSE:

Students act out predator/prey relationships resulting in dynamic population fluctuations.

OBJECTIVES:

Students will:

1. Identify the predator/prey relationships of three species in an ecosystem.
2. Make judgment calls on which animal preys on the other.
3. Think quickly to make the correct choice.

ACTIVITY:

Divide the students into two teams. Let them choose sides or divide equally based on age/strength/speed/popularity, etc.

The Field:

Arrange the playing field so that there are two front lines across from each other, about 20-25 feet apart, and behind each front line is a back line, or home free line, about 30-40 feet away from the front line. Lines can be marked at the ends with piles of rocks, backpacks, coats, any natural feature, etc.

The Play:

Each team will go into a huddle and decide, as a team, on which of the three animals they will ALL act out. Like Paper/Rock/Scissors; each animal is eaten/bit/chased by another:

The Animals: Who eats Whom:

Bear eats Trout
Trout eats Mosquito
Mosquito stings Bear

The Animal Actions:

Bear raises arms overhead, makes claws with fingers and growls
Trout puts hands together in front of body, fingers pointing outward, and swims the hands back and forth,
Mosquito flaps arms to the side of the body and makes a buzzing noise

Each team decides what animal they will all be, and they also choose a backup animal in case the other team chooses the same animal. The teams then line up on the front lines facing the other team. On the count of 3, the teams act out their chosen animal.

Quickly, teams decide who is after who, and either start chasing to tag, or start running away. If chased, kids will run for the back line. If they are tagged before they cross the back line, they become a team mate on the chasing team.

If both teams pick the same animal, count to three again and the teams act out their backup animal. Play continues until everyone has had enough, or one team captures all of the other team members.

TYING IT ALL TOGETHER: Explain to students that they have enacted a real-life process: population numbers rise and fall based on many factors, often directly related to predator population numbers.

EXTENSION: This game is easily and creatively adapted to represent many different food chains.

CAMOUFLAGE!

A Hide and Seek survival game

APPLICABLE AGES:

2nd grade – 6th grade

LOCATION:

Large area, preferable natural, where kids can safely hide

RESOURCES AND MATERIALS:

- Blindfolds (optional)

PURPOSE:

This lesson illustrates the benefits of specific adaptations such as camouflage, keen senses, survival behaviors, etc.

OBJECTIVES:

Students will:

1. Be able to explain the advantages of specific adaptations
2. Describe how animals might use a natural area for survival
3. Use principles of good sportsmanship to play together fairly

ACTIVITY:

Blindfold one student who will be the “predator.” The predator slowly counts to 20 while the other students or “prey” hide. Hiding students must be able to see some part of the predator at all times.

After counting, the predator removes the blindfold and looks for prey. The predator can turn around, squat and stand on tip-toe but not walk or change location. The predator should see how many students he or she can find, identify them out loud by a color or shape, and describe where they are. When identified, the prey come to the predator’s location and sit or stand so they don’t block the predator, but do not tell the predator where anyone else is hiding.

When the predator cannot see any more children, a new round starts. The predator closes their eyes or puts on a blindfold and counts to 15 only this time. All the remaining prey must move closer to the predator. Those remaining prey still try to remain hidden. The predator removes their blindfold and begins pointing out students they can see by describing colors or shapes.

Play as many rounds as necessary until only one or two students are left hidden. At that time, have the remaining students stand up and identify themselves. It may be surprise how close prey got to the predator undetected. Both the ability to remain undetected and to detect others is an example of successful adaptations. Introduce the term “adaptation.”

Do the activity one or two more times, choosing different students to be the predator.

TYING IT ALL TOGETHER:

Discuss what made predators and prey successful. Were they quiet, clever, camouflaged, or good listeners? Ask students to identify animals that are adapted with similar characteristics to survive.

Ask the students how they could change to be more successful predators and prey. Some ideas that may come out are: changing color (clothes color); wearing clothing that doesn’t stick to plants; being quieter or smaller, climbing a tree. Ask the students if animals can make any similar kinds of changes.

Talk about differences between physical and behavioral changes. Have the students identify which adaptations related to predators and prey are behavioral, which are physical and which involve both.

Explain that physical and behavioral adaptations take time to evolve.

Ask students to summarize what they have learned. See if students can think of other examples of animal adaptations. Generalize that all animals are adapted to survive.

Adapted from: Sharing Nature with Children, Joseph Cornell pg.89

DEFENSE CONNECTION AND PANTOMIME PARADE

Two activities for making comparisons and acting out plant and animal defenses

APPLICABLE AGES:

K – 5th grade

LOCATION:

At the museum or in your classroom

RESOURCES AND MATERIALS:

- Photos of plants and animals
- List of pantomime topics
- Table of natural defenses and who they belong to

PURPOSE:

This lesson will help students become familiar with adaptations that certain plants and animals use to defend themselves. Students will also recognize that plants and animals can use similar defenses.

OBJECTIVES:

Students will:

1. Identify some natural defenses of plants and animals
2. Explain why plants and animals have natural defenses

VOCABULARY:

Natural Defenses

ACTIVITY:

Defense Connections:

Explain to the students that their goal will be to match up a plant and an animal with a similar defense for survival. Give them the example of a mushroom and a snake – see if they can make the connection (they

can both be poisonous). Divide students into partners or small groups and give each group a set of the animal and plant cards. Give them time to make the connections. Then have each group share one of its connections and the defense they share. After each group has shared go through the following list of defenses and see if they match their connections. Remember, they may have come up with different and even better ones!

Examples of Plant/Animal Defense Connections:

Plants	Type of Defense	Animals
Nettles	Sting	Bee
Blackberries	Prickle	Porcupine
Milkweed	Taste Bad	Toad
Poison Ivy	Itch	Mosquito
Nuts	Hard Coat	Turtle
Cherry Twig	Smells Bad	Skunk
Mullein Leaf	Fuzzy	Caterpillar

Challenge the groups to come up with some connections of their own and have them share.

Pantomime Parade:

Work as a large group or two small groups if you have another adult to help. Ask for volunteers to act out how some defenses might work. Have the students guess the defense.

You are picking a prickly rose

You smell a skunk

You are eating an onion

You are a frightened turtle

You are a cat afraid of a dog
 You are a goat using your horns
 You are walking through stinging nettles
 You are a dog with porcupine quills in your nose
 You are picking up a slippery fish
 You have been stung by a bee
 You are an opossum playing dead
 You have poison ivy.

Adapted from *Hands On Nature*; Vermont Institute of Natural Science, pg. 54

RESOURCES:



Nettle leaf close-up

STINGING NETTLE



HONEY BEE



BLACKBERRIES





Common Porcupine © Nick Saunders 2008

PORCUPINE



MILKWEED



(Milkweed Sap)



Western Toad (*Bufo boreas*)

Photo Credit: James Bettaso
U.S. Fish & Wildlife Service

WESTERN TOAD



POISON IVY



MOSQUITO



MULLEIN LEAF

DRESS AS A...**Bison, Fox, Bobcat, Otter, Grizzly Bear, Swan, Eagle, or Trout**

With the class's help, a student puts on the unique adaptations of a bear, trout, fox, etc.

APPLICABLE AGES:

K – 4th grade

LOCATION:

At the museum or in your classroom

RESOURCES AND MATERIALS:

- See each individual animal

PURPOSE:

This lesson will help students become familiar with the adaptations in animals by dressing as each type of animal.

OBJECTIVES:

Students will:

1. Describe various animal characteristics and adaptations
2. Demonstrate how the characteristics and adaptations help it survive

VOCABULARY:

Adaptation
Characteristic

ACTIVITY:

Begin by asking for “a brave volunteer, someone who will stand up in front of everyone, someone who is not afraid to be laughed at, someone who is not afraid of looking silly.” When a student is chosen, ask them to come up with you in front of the group.

Whisper to them that they will be dressed up as _____ and ask if that is okay before starting the activity. Ask the students, what is _____ (student's name)? “Well, he/she is not going to be a boy/girl much longer, we are going to turn him/her into _____.

What does she/he need? For each answer, add the appropriate prop to the student's costume. Discuss each adaptation and function-After every couple responses, check with the students to see if the volunteer is _____yet- “Is he/she a/an _____yet????”

Be sure to give the student volunteer a big round of applause at the end!!!

TYING IS ALL TOGETHER:

Generalize that adaptations help animals survive. Note that there are many, many different types of adaptations, and that some adaptations are physical and other adaptations are behaviors animals use.

Adapted from: Project Seasons, Shelburne Farms, pg. 237

RESOURCES:**Animal Adaptations:**

Animals at MOR: bison, fox, bobcat, otter, grizzly bear, great horned owl, swan, cutthroat and lake trout, bald eagle

Bison: Thick, shaggy fur between the eyes and a beard, horns, massive hump, pointed hooves, tail with fur ball on the end, eyes on the side of its head, flat teeth (herbivore), 4 -chambered stomach (rumen, reticulum, omasum, abomasum)

Fur: piece of shaggy brown fabric, tied like a cape around the neck

Hump: pillow inside a small backpack, worn under the cape

Beard: fake beard or small piece of shaggy brown fabric, attached with string around the head or behind the ears

Horns and Eyes: costume horns on a headband, or cardboard horns on a head band, with eyes drawn on cardboard, cut out and mounted on the headband below the horns

Hooves: elastic bands with cardboard hooves attached, sized to pull on over feet and hands to cover toes and fingers

Stomach: catchers breastplate or sheet of fabric with the four chambers drawn on it, tied around the neck to hang in front

Bobcat: thick camouflage fur, stubby tail, big paws, great hearing-can swivel its ears to pick up sound, sharp carnivorous teeth, retractable claws for silence, waits motionless for prey- then pounces

Fur: furry, appropriately colored fabric, tied or pinned as a cape

Paws: mitts made of same fabric

Ears: same fabric mounted on a headband

Tail: short little stub mounted on a string to be tied around the waist

Student imitates the motionless waiting and then pouncing that bobcats do when hunting

Fox: sharp teeth, strong hind legs to pounce on prey, claws, thick fur for warmth, large bushy tail to provide balance while jumping, large ears for an acute sense of hearing-to find small prey in tall grass, long legs and small bodies to run fast, good eyesight in low light conditions

Fur: orangey red fur, tied or pinned around the neck as a cape

Tail: bushy long red fur tail with a white tip, mounted on string to be worn around the waist

Ears: red furry ears with black rims, cut out and mounted on a headband

Eyes: a pair of binoculars

Paws: red fur mitts with claws attached, worn on the hands with arms extended to imitate long legs

Student imitates the pouncing motion of a fox catching its prey

Otter: coat is a combination of two different types of fur: outer layer of guard hairs to shed water and inner layer of short, dense fur for warmth, together they help it float. Nostrils on the top of the nose so it can breathe while most of the body is underwater, nostrils close underwater, very sensitive whiskers for hunting underwater, webbed feet for swimming, two styles of swimming: dog paddle and whole body twisting and turning.

Fur: two types of fur, one layered on top of the other, to simulate the outer and under coats

Face: nose created out of cardboard or other substance worn on a band like swimmer's nose plugs that has nostrils up by the eyes.

Feet: gloves with webbing between the fingers

Student does a dogpaddle motion and the whole body twisting motion

Grizzly Bear: big hump of muscle on its back, used for digging and running, strong arms that can swipe and kill prey, long claws for digging, very good sense of smell for tracking prey and finding food sources such as insects, fish, berries and carcasses, can stand on its hind legs to smell more

Fur: cape made of silvery grey long fur, tied or pinned around the neck

Hump: small backpack with a pillow in it worn under the cap

Paws: mitts of fun with large claws attached

Nose: long nose, found or constructed, attached to strings that are tied around the head

Arms: padding wrapped around the arms, covered with fur

Great Horned Owl: camouflage coloring, large wings on a small body with feathers are ruffled on the edges, that cuts turbulence so it flies silently, 14 vertebrae that help it turn its head 270 degrees, extremely good hearing enhanced by being set in a disc shape and large, light-sensitive eyes so it can see in the dark, set into a flat face so they can use both sounds and sight to catch prey, has 2 talons facing forward and 2 facing backward so it can grab and lock onto its prey,

Wings: large wings mounted with elastic to wear like a backpack

Ears: large discs mounted on a headband, with tufts mounted on top

Eyes: a pair of large sunglasses

Claws: a pair of tongs in each hand

Feathers: a grey shirt or sweater with mottling

Beak: curved, hooked shape mounted on elastic to be worn as a headband

Swan: Long, very strong wings have a bony spur on the elbow of the wing to fight off predators, webbed feet for swimming, long neck to reach food sources in deeper water, streamline body shape for swimming and flying, very thick (up to 5 am) under coat of down

Wings: white wing shapes, cut out and mounted with elastic, to be worn like a back pack, with wrist elastics and spurs at the pivot point at the elbow

Feathers: white shirt or sweater

Beak: two flat pieces pressed together, mounted on a string to be tied around the head

Neck: the sleeve of a white shirt or sweater, xxl or larger, stuffed with something soft, with a wire running through it to shape it, attached to the wings and to the beak.

Cutthroat Trout: highly developed sense of smell, lateral lines (a series of pores along the side of the fish) to feel vibrations on the surface of the water, 5 fins and a tail, dorsal: behind its head; pelvic, opposite the dorsal on the belly, which is used for steering, anal fin behind the pelvic fin, used by females to measure the depth of the redd, pectoral fin behind the gills-used to propel, and the adipose fin, between the tail and the dorsal fin, is found on all trout, One of the main color characteristics is two yellow or orange to red lines in the skin folds of each side of the lower jaw. Largish mouth with good sized teeth, spotted coloring for camouflage, elongated body for swimming

Body: a two sided apron, with fins created out of cardboard mounted on its front and back and a swim bladder, painted with the appropriate colors and spots

Tail: a cloth or cardboard cutout mounted on a string, to wear around the waist

Eyes: swim goggles

Nose and Face: a cardboard cutout of a fish face, with exaggerated nostrils, mounted on an elastic band and worn around the head

Cutthroat coloring: two pieces of fabric, orange and red, hanging down from the fish face band in front of the ears

Lake Trout: deeply forked caudal fin (tail), slate grey to greenish with a lighter underside, cream to yellow spots, large mouth and snout

See Cutthroat Trout above, with variations for the different tail and coloring

Bald Eagle: hollow bones; yellow hooked beak; white head; black/dark brown feathered bodies; eyes on the side of their heads so they have a large field of vision, eyesight 3-4 times more powerful than humans, with many more color-sensitive cones; three eyelids; large wings (up to 8') compared to other birds-so they can soar and hunt vast areas with a minimum of effort; large sharp, 2" talons and strong feet with spicules-little bumps that grip prey while flying; bony protuberances overhanging the eyes to provide shade and protection from injury

Wings: Long dark brown wing cutouts mounted on lightweight hollow plastic rods, with elastic loops to put arms through.

Claws: gloves with little bumps on them, holding some kind of pincer

Eyes: headband with eyes mounted on the side, bigger than human eyes

NATIVE FISH SPECIES GAME

In a game, students act out the impacts of an introduced species on the native species habitat

APPLICABLE AGES:

1st grade – 5th grade

LOCATION:

A large playing area

RESOURCES AND MATERIALS:

- Playing cards or poker chips in 3 different colors or patterns (enough for at least one of each color/pattern per student)

PURPOSE:

This lesson will help students become familiar with some of the challenges native species face when non-native species move into their habitat and ecosystem.

OBJECTIVES:

Students will:

1. Explain the needs of animals in an ecosystem
2. Explain how competition for food can cause population declines
3. Explain the effects of introduced species on native populations

VOCABULARY:

Ecosystem 4 Needs of Living Creatures
Habitat Introduced Species

ACTIVITY:

Have the students hypothesize what happens when non-native species are introduced into a local stream. Students should determine that there will be competition for food, shelter and space leading to a decline in the native population and possible extinction depending on the invasive species' characteristics.

Explain to your students that one of the most serious threats to the natural communities of plants and animals today is the introduction of non-native plants and species by humans. When certain non-native or exotic plant species is allowed to invade a natural native plant population, the results can be devastating for the natives. Often natural diseases or predators are not brought with the plants to their new homes, thus causing a great growth in population. This can lead to a decrease in native plant and animal diversity in a region as these uncontrolled species increase in number. The non-native often out-competes native in obtaining the essential requirements for growth.

This decrease in diversity affects many different food chains and may lead to a monoculture of plants and animals where once there was a variety. Loss of endemic or native species may mean loss of valuable genetic material, which could someday provide valuable medicines or foods. Loss of diversity makes our world a little less interesting and less beautiful.

The following game will introduce students to the dilemma of the deadly invaders.

Before Play Begins:

Designate a playing area by placing cones at edges/corners of the playing field. (30' x 60' area works well for 20 students.)

Scatter playing cards throughout the area (each different colored chip represents a different need for a native fish to survive. (White = Shelter/Space, Red = Food, Blue = Dissolved Oxygen)

Be sure to provide enough cards so each player may collect one card of each color during the first round in order to survive.

Round One

All players will be native to the specific area. Everyone will line up along the edges of the playing field at the start of each round. At the designated signal, players will enter the playing field, collect one of the three different colored cards and return to the edge of the playing field. After all of the students have returned to the sideline, they return to the playing field and collect another card of a different color. Once again, they go to the sideline, returning a third time for the third colored card.

After a player has collected all three colored cards, he or she moves to the sidelines to wait for the signal to end the round. All players should survive the first round.

Round Two

This round will be played the same as Round One, but will now include non-native species. Two players wearing colored signs represent a non-native species. The non-native species are more aggressive and will be allowed to collect two cards per trip into the playing field. The non-native will also be allowed to return to the playing field as often as they are able but must collect three different colors in order to survive. The native species will be considered a survivor if he or she collects three different colored cards as they had done in Round One.

Give the signal to end Round 2. Identify the survivors. Evaluate by comparing population size and impact the non-native had on the natives.

Round Three

Native species that did not survive Round Two become non-native for this round. Give each new non-native a sign. Continue to play Round Three just like Round Two.

At the end of Round Three, most, if not all, of the native population should not survive. Evaluate as in Round Two.

After Round Three, discuss with your students what they observed as they were playing the game. As a group, have them begin to figure out how and why those students who played as the initial non-native species were not only able to survive, but to actually take over the entire playing field.

TYING IT ALL TOGETHER:

Consider your local ecosystem, and discuss what species may be non-native in your area. Analyze what native species may be, or have been, affected by the non-natives. List the steps being taken to mitigate the effects of non-native species in your local ecosystem.

Adapted from www.bugwood.org: Center for Invasive Species and Ecosystem Health at the University of Georgia

OH DEER!

Population numbers are affected by limiting factors in this running game and graphing activity

APPLICABLE AGES:

4th grade – 6th grade

LOCATION:

At the museum or in your classroom

RESOURCES AND MATERIALS:

- Chalk board or dry erase board
- Writing materials

PURPOSE:

This lesson will help students become familiar with how population numbers rise and fall, and can be limited, in response to environmental factors.

OBJECTIVES:

Students will:

1. Identify and describe food, water, and shelter as 3 of the 4 essential components of habitat
2. Define limiting factors and give 3 examples

ACTIVITY:

Outline:

A variety of factors affect the ability of wildlife to successfully reproduce to maintain their populations over time. Disease, predator/prey relationships, varying impacts of weather conditions from season to season (early freezing, heavy snows, flooding droughts, accidents, environmental pollution, and habitat destruction and degradation are among these factors.

Some naturally caused as well as culturally induced limiting factors serve to prevent wildlife populations from reproducing in numbers greater than their habitat can support. An excess of such limiting factors, however, leads to threatening, endangering, and eliminating whole species of animals.

The most fundamental of life's necessities for any animal are food, water, shelter, and space in a suitable arrangement. Without these essential components, animals cannot survive.

Details:

Explain that object of the game is to study a population of deer in a particular habitat.

Ask for a definition of habitat- be sure food, water, shelter and space- are recognized as key elements of habitat.

Have students count off into 4's. Explain the 1's will be deer in pursuit of elements for survival from within their habitat. Tell student to assume there is enough space in their habitat and their main concern is food, water, and shelter. The students numbered 2, 3, and 4 are the other habitat elements.

The 1's will line up near the visitor parking sign while the 2, 3, and 4's will line up across the open space near the thicket. Students will face away from each other upon signal- "Face Away". The deer will make a sign for the element they are searching for in order to survive. (Shelter-hands over head in a triangle; Water-cross hands over mouth; Food-hands on stomach)

At the same time the habitats are choosing the element they wish to represent using the same signs. When you say, "Go!" students will turn around and face each other and the deer will run to that habitat that matches their own sign. (Deer must maintain sign while running). If the deer match the habitat, then both become deer and return to the deer side. If the deer cannot find a habitat, then they become part of the habitat.

Play this way for 15 rounds. Each round equals one year.

While students are playing keep track of the numbers of deer that survive in each round.

After 15 rounds have students take out pencils and graph paper, graphing the # of deer vertically and the years (rounds) horizontally.

Once the students have figured out how to plot their points correctly, explain that their graph now tells a story of the deer population over a certain period of time. Direct students' attention to the peaks, valleys and plateaus found on their graph.

Have them turn their paper over and write about what happened to the deer.

TYING IT ALL TOGETHER:

Why would the population rise or fall? Were there cycles (the same pattern repeating more than once)?
What do plateaus indicate?

Share ideas:

What are some of the factors that can influence population numbers?

- enough habitat for survival and growth
- overuse of habitat
- weather- drought, fire, flood, cold, blizzards
- human encroachment
- disease
- balance of nature (plateaus)
- naturally occurring cycles

This activity is intended to be a simple but powerful way for students to grasp some basic concepts: that everything in natural systems is interrelated; that populations of organisms are continuously affected by elements of their environment; and that populations of animals do not stay at the same number year after year, but continually change in a process of maintaining dynamic equilibrium in natural systems. The major purpose of this activity is for students to understand the importance of suitable habitat as well as factors that may affect wildlife populations in constantly changing ecosystems.

Adapted from Project Wild Activity Guide, p. 107

SKULL SENSE WITH BINOCULAR CRAFT

Students compare herbivore and carnivore skulls and experiment with eye placement adaptations

APPLICABLE AGES:

1ST grade – 5th grade

LOCATION:

At the museum or in your classroom

RESOURCES AND MATERIALS:

- At least 3 skulls (one from each of the animal types listed above)
-examples:
Deer, bobcat and coyote;
Or elk, weasel, and black bear
- Pelts to go with the skulls
- Rolled cardstock or empty paper towel or toilet paper rolls (2 per student)
- Yarn
- Hole punch
- Scissors
- Craft decorations
- Air freshener

PURPOSE:

This lesson will help students become familiar with variations animals exhibit in skull bone structure and how the variations are related to their senses.

OBJECTIVES:

Students will:

1. Identify skull variations between predators and prey
2. Predict if a skull is an herbivore, carnivore, or omnivore
3. Match dominant sense organs to skull characteristics

VOCABULARY:

Herbivore	Carnivore	
Omnivore	Predator	Prey

ACTIVITY:

Begin the lesson by introducing yourself and walking around the students with a concealed air freshener. As the students begin to notice the scent, ask them about it. “Do you smell something? What do you think the smell is? What part of the body do you use for smelling? Introduce the students to several skulls pointing out and comparing the nasal cavities of different animals. “How does the sense of smelling help animals survive?” A longer nose suggests that the animal may have hunted using their sense of smell or used its nose to probe the ground for flowers. For herbivores, a grazer’s long nose also allows it eyes to scan for predators while eating. A browser’s long nose also helps to keep its eyes from being poked by branches.

Ask students to close their eyes. When the instructor says go, the students will begin counting everything they hear on their fingers. When the instructor says stop, students will open their eyes and share what they heard. “What sense did we just use?” Use the skulls to show students the auditory bullae. Ask the students to compare and contrast the auditory bullae on various skulls. “What is the difference between animals with large or small auditory bullies?” “Why is the sense of hearing more important to some animals than to others?”

“What part of the body do you use for seeing?” Use three skulls to introduce the placement of the eye orbits. By prompting the students with questions get the students to notice that the three skulls you are showing have eye orbits located in different areas of the animals’ skull. Eye orbits located towards the sides of the skull indicate herbivore (prey) animals. This placement provides a wide range of vision for herbivore (prey) animals. Eye orbits towards the front of the skull usually indicate carnivore (predator) animals. This narrow placement keeps carnivore (predator) animals from becoming distracted. Eye orbits between the sides and front of the skull indicate omnivores (predator/prey) animals. The short rhyme below will help students to remember the previous eye orbit characteristics.

Eyes in front, like to hunt.

Eyes on the side must run and hide.

Introduce students to the concept of binocular and monocular vision. Animals with binocular vision have eye sockets located in the front of their skull. These animals can see great distances. Animals with this type of vision would be called carnivore or omnivores (predators). Animals with monocular vision have eye orbits located on the side of their head. These animals have peripheral vision, seeing 180 degrees front to back on each side, ultimately seeing 360 degrees, a full circle around their head. Animals with this type of vision are called herbivores (prey). Ask the students to test what type of vision they have by raising both of their arms in front of their eyes and placing their index fingers together. Without moving their head have them move their index fingers apart. How far away from their eyes do their index fingers get before they can no longer see their fingers

Binocular Craft: Make binoculars! Use toilet paper rolls (tie two together), have students decorate.

TYING IT ALL TOGETHER:

Ask students to review the correlations they have observed between skull shape and sensory adaptations. Ask the students to describe animals that use their sense of hearing, smell, or vision as an adaptation to survival.

Have students look at each other and analyze the skull shape/senses correlation for humans. Ask what category humans fall into: herbivore, carnivore, omnivore, predator, prey, or do humans cross over between categories.

Have students speculate about the advantages and/or disadvantages of different sensory adaptations.

EXTENSIONS:

Camouflage! Game: Go outside and play Camouflage! with binoculars. For the first round have the predator hold up binoculars. For the second round have two students act as the predators, having them stand back to back. Each one gets only one binocular and can only look in one direction to imitate monocular vision.

Nature Walk: Go on a predator walk, have students use binoculars and pretend to be predators out hunting for prey.

TOO CLOSE FOR COMFORT

Students get a feel for the personal space needs of animals

APPLICABLE AGES:

K – 5th grade

LOCATION:

At the museum or in your classroom

RESOURCES AND MATERIALS:

Open area for students to gather and act out scenarios
Large pieces of paper to draw on and then post on walls

PURPOSE:

This lesson will help students become familiar with how much space different species need to be comfortable and survive.

OBJECTIVES:

Students will:

1. Describe possible negative consequences of people and wildlife crowding together
2. Identify behaviors that indicate stress from invasion of an individual's space, and what actions can be taken to reduce negative consequences

VOCABULARY:

Overcrowding	Negative Behavior
Consequences	Safety

ACTIVITY:

Introduce the concept of discomfort from crowding by asking one student to stand in front of the class. Approach the student slowly, asking the student to tell you when your closeness begins to make him or her feel uncomfortable. Ask the class whether they allow strangers to approach them as closely as they do their friends or family. Discuss physical reaction they may have in crowded conditions, such as avoiding eye contact, moving away, nervousness, sweaty palms, etc.

Talk about the idea that animals in the wild might also be uncomfortable if humans or other animals approach too closely. Discuss why - fear of predation, protecting their young, etc. - and if the animal can take action to reduce the discomfort- fly, swim, run, climb away or any other action. Discuss what action an animal can take if it has young or a nest to protect, or whether it is in a herd or alone. Have student make a list of animals they might encounter while out in nature, and estimate the distance they need to stay away to keep the animal safe and comfortable.

Hypothesize with the students what behaviors they might see if they did get too close to the animals they listed, such as foot stomping, raising on hind feet, nervously looking around, teeth grinding, and eventually running, hopping, or flying away. Lead a discussion about whether there are certain times of the year when animals need more space around them to feel comfortable.

Students can act out scenarios where they portray animals and humans getting too close together.

TYING IT ALL TOGETHER:

As a class, lead a discussion where the whole class comes up with the realization that humans need to keep a proper amount of distance from wildlife. As a class create a short list outlining the steps to take to keep from getting too close to wild animals.

EXTENSIONS:

Students can draw life-sized animals on a wall, and then measure out the recommended distance that humans should stay away from specific animals, establishing a 'comfort zone' around each type of animal.

Adapted from [Project Wild curriculum guide](#), pg. 300

PLASTER TRACKS AND TRACK PATTERNS

Students make plaster casts of hooves and learn track patterns

APPLICABLE AGES:

2nd grade – 6th grade

LOCATION:

At the museum or in your classroom

RESOURCES AND MATERIALS:

- 2 – 25lb bags of plaster
- 4 – gallon buckets for mixing plaster
- 6 mixing sticks
- 5 gallons of water
- 15 shallow boxes (bottom of pop cases)
- Sand (enough to fill 10-12 of these boxes)
- Track cut outs (see drawings below – 6 tracks per pattern)
- 1 box toothpicks
- 100 labels
- Pens/pencils
- Rag and water for cleaning

PURPOSE:

This lesson will help students become familiar with animal signs, including the 4 categories of track patterns.

OBJECTIVES:

Students will:

1. Identify four animal tracks
2. Describe four ways animals move and how this is shown in their track patterns
3. Make plaster tracks

VOCABULARY:

Long-leggers/Straight Walkers
Hoppers/Overstriders

Short-leggers/Bounders
Fatties/Waddlers

ACTIVITY:

Take a look at how you sign your name. Now look at your neighbor's name. Do you sign your names the same way? Look at a few other people's names, are any names written the same? Animals have signatures too.... their tracks and sign!

Types of Sign- (scat, tracks, hair, antlers, rubbings, blood, bones, scrapings, beds, browsing, bugling...)

What do these signs tell us? (Species of animal, birthing time, predators present, antlers = males and approx. age, preferred habitat, food preferences...) If students have a difficult time getting to these ideas, give them an example scenario and see what they can tell you about it (i.e.: when I was walking through the woods I saw... found... heard...)

Tracks- Feet generally leave tracks. Some animals walk on their flat feet, tiptoes, and even their toenails! We can tell some animals apart by their feet and by the patterns they leave- think of these patterns as the animals 'signatures'.

We will investigate 4 types of tracks (*use cut-out pictures or specimens to show the animal when mentioning a species below*):

Long-leggers/straight walkers:

ungulates (animals with hooves), cats and dogs

Leave a 'zig-zag' pattern. Hind feet are placed in area where front feet were picked up.

```

O           O           O           O = hind and front foot in same spot
           O           O
    
```

Short-leggers/bounders:

weasel family

Feet land side by side, leaving a 2x2 track. Hind feet land where front feet have left.

```

d     d     d     d           d = hind and front feet
d     d     d     d
    
```

Hoppers / overstriders:

rabbits, mice, squirrel

Big hind feet, little front feet, generally hop, large hind feet hop to the outside and beyond the front feet (overstriders). Hind feet are the powerhouse of the hop.

```

      H           H           H           H = hind foot
    h           h           h           h = front foot
    h           h           h
      H           H           H           Direction of travel ->
    
```

Fatties/waddlers:

porcupines, bears, beavers, badgers

Walk in a pigeon-toed zig-zag fashion. They are so fat, that their bodies waddle as they walk. Sometimes drag their tails, leaving a brushed zig-zag mark in between foot prints.

```

X     x     X     x     X           X = hind foot
X     X     x     X     x           x = front foot
    
```

Birds:

most bird tracks on the ground will have three toes in front, one behind. Song birds and corvids (ravens, magpies, jays) may often hop, otherwise feet are placed one in front of the other, like walking in a line (grouse, pheasant, sometimes turkey).

```

qq hopping   q walking
              qq           q
              qq           q
    
```

Plaster Tracks:

Introduce the idea of being able to 'save' a track. Each person will make one track. Choose a foot for your track, make a track label (toothpick tag: name & track species). Demonstrate how to make a track, and have students pour the plaster into the track. Use damp sand in shallow boxes for track imprint. Make a sand wall about 1" high around the track imprint to hold in plaster. Pour enough plaster into track to cover it about 1". Place toothpick into plaster and let sit in sand until dry. Brush off loose sand using a toothbrush. It is possible to run the dried plaster under water very briefly to get off stubborn dirt. To take the tracks home: wrap in newspaper & place into a paper bag labeled with name.

Plaster ratio: 2 parts powder to 1 part cold water. Consistency should be like pancake mixture (not too runny and not too gloppy).

TYING IT ALL TOGETHER:

Discuss what types of tracks students might find where they live. Have students begin to correlate body shape and skeletal structure with type of track – can generalizations be made? Take the discussion further by discussing survival strategies that relate to skeletal structure and movement patterns.

FEEDBACK

Please contact the Education Department with any questions, comments or suggestions regarding this curriculum.

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