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ZAP!

Zoo Activity Packet

The Web of Life

A Teacher's Resource
for Grade 4

The Web of Life

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Zoo Activity Packet

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Learning Objectives

The worksheets and activities in this Zoo Activity Packet are suggested to help students learn that:

1. Energy stored by plants moves through the ecosystem in a series of steps known as a food chain. The network of food chains within an area are connected to form food webs.
2. Animals of different species interact with each other in several ways, one of which is to eat or be eaten by another animal.
3. Predators usually take the old, weak, or sick members of a prey population, thereby keeping themselves and their prey species in top condition.
4. Without predators, numbers of prey animals would increase to the point of overpopulation. They might eventually starve to death or crowd out other species.
5. While hunting animals have efficient methods to capture prey, the hunted animals have equally effective strategies to avoid capture.

Indiana Academic Standards for Science

The Web of Life Zoo Activity Packet meets the following Indiana Academic Standards for Science:

The Scientific View of the World

4.1.1 Observe and describe that scientific investigations generally work the same way in different places.

Computation and Estimation

4.2.1 Judge whether measurements and computations of quantities, such as length, area, volume, weight, or time, are reasonable.

Communication Skills

4.2.4 Use numerical data to describe and compare objects and events.

4.2.5 Write descriptions of investigations, using observations and other evidence as support for explanations.

Interdependence of Life and Evolution

4.4.2 Investigate, observe, and describe that insects and various other organisms depend on dead plant and animal material for food.

4.4.3 Observe and describe that organisms interact with one another in various ways, such as providing food, pollination, and seed dispersal.

4.4.4 Observe and describe that some source of energy is needed for all organisms to stay alive and grow.

4.4.6 Explain how in all environments, organisms are growing, dying, and decaying, and new organisms are being produced by the old ones.

Systems

4.6.1 Demonstrate that in an object consisting of many parts, the parts usually influence or interact with one another.

4.6.2 Show that something may not work as well, or at all, if a part of it is missing, broken, worn out, mismatched, or incorrectly connected.

Models and Scale

4.6.3 Recognize and describe how changes made to a model can help predict how the real thing can be altered.

Constancy and Change

4.6.4 Observe and describe that some features of things may stay the same even when other features change.

Background Information for the Teacher

Living things grow, reproduce, and die. Their materials are reused over and over again in a complex cycle.

The general structure of an ecosystem is more or less like a pyramid. Each level influences the numbers of individuals in the other levels. Masses of plants (primary producers) are at the bottom and support the whole structure. Relatively small numbers of flesh-eating organisms are at the top. This arrangement is dominated by a feeding system called a food chain. If the plants that support the food chain are destroyed, the whole system will collapse. If an animal further up the chain is destroyed, that may cause a population explosion below and disrupt the balance of the ecosystem. All of this is even more complicated because the chains are entwined with each other in food webs.

A good way to look at the structure of an ecosystem is to divide the food chain into trophic (feeding) levels. Plants are primary producers and are at level one, followed by herbivores at level two and carnivores at level three (there may be several levels of carnivores).

The energy stored by plants is passed along through the ecosystem in a series of steps of eating and being eaten. However, no organism lives wholly on another. The resources are shared. For example, plants are eaten by a variety of insects, birds, mammals and fish; some of the animals are eaten by several predators. Decomposers are active at all levels. It's easy to see why this network is called a food web.

At each step in the pyramid energy is lost in the form of heat. Consequently, organisms at each level pass on less energy than they receive. This limits the numbers of steps in any food chain to four or five.

Sharp claws, powerful beaks, deadly stingers, slashing teeth--all are weapons used by various **PREDATORS**, animals that hunt other animals for food. Besides these well-known physical characteristics, predators also rely on their speed, stealth, and sometimes elaborate disguises to aid in their search for food.

PREY animals have developed equally numerous ways to avoid capture. Each prey species must have some defensive strategy against would-be predators or be wiped out completely. This, of course, would lead to a decrease in (and eventual elimination of) the predator species, as hunters would compete for fewer numbers of prey animals.

Climate conditions (temperature, rainfall, amount of daylight, etc.), soil and topography, and competition between species all play a role in determining the density of prey populations. In turn, the abundance of prey animals is the primary factor regulating the increase or decrease of predator populations. This creates somewhat regular up and down fluctuations of both populations.

For example, lemmings (small rodents found in the Arctic tundra) undergo violent population explosions and collapses due to complex weather and food supply cycles. The predatory owls and seagull-like skuas respond to an increase in lemming numbers by increasing breeding pairs or numbers or offspring. When many predators are present, the prey population drops, followed by a decline in predators. Out from under the pressure of predation (and if other conditions are favorable) the lemming population once again increases, allowing the birds to follow suit.

Predators that eat only meat are also called **CARNIVORES**. Meat is an excellent source of protein and

carnivorous animals generally do not need to eat as much as non-carnivores to obtain an equal amount of protein.

HERBIVORES, or plant-eaters, must spend large portions of their waking hours browsing on bushes and trees, eating fruits or seeds, or grazing on grass. Plants, in turn, get their energy from sunlight, which, when combined with water and carbon dioxide during photosynthesis, is converted into sugar. Plants form the base of an energy or food pyramid and are therefore called primary producers. Primary consumers (herbivores) make use of the energy trapped inside plants, but a great deal of plant matter must be eaten in order for the herbivore to grow. Likewise, one secondary consumer must prey on a much greater number of herbivores to survive. You can see that at each level of the pyramid, energy is lost and the numbers of organisms in each level declines from plants up to the top predators.

Of course, in real life, animals in each level don't stack up quite so neatly. Some predators eat both meat and plants, and are termed **OMNIVORES**. Foxes, for example, will eat nuts and berries as well as their preferred prey of small mammals, birds, and frogs. In fact, higher carnivores will frequently select prey from a variety of energy levels.

A predator's choice of food and in turn, the prey's food (and so on down to the primary producer level) can be thought of as a **FOOD CHAIN**. When linked together, several food chains become a **FOOD WEB**, which can dramatically illustrate the interdependence of all animals within a given ecosystem.

Many humans have trouble understanding the nature of predator/prey relationships. The baby rabbit that is carried off by a hawk receives our sympathy, while the hunter is labeled cruel and vicious. All too often, predators like wolves and cougars have been considered "bad" animals that attack defenseless victims. Only after these predators were nearly eliminated did people realize how necessary they are in keeping deer, prairie dog, and other prey species in check. Since predators take the easiest prey they can (usually the very young, the very old, or the sick) the animals that remain have a much better chance of surviving a harsh winter.

Whether animals are gentle plant-eaters or fearsome carnivores, they all have important roles in the balance of nature. It is important for people to learn how animals interact so that we can wisely manage our remaining resources.

Animals That Hunt

Predators have developed an amazing array of weapons and sensory adaptations to aid in finding and capturing prey. Only a few will be covered here, with special emphasis on those adaptations that are readily visible in our zoo animals.

WEAPONS

Teeth. The type of teeth an animal has is related closely to its diet. **INCISORS** are located in the front of

the mouth and in general are used for cutting or clipping. Carnivores use them mostly for gripping prey while herbivores can cut vegetation and tear grass. A strange adaptation of these teeth is found in elephants, whose tusks are elongated upper incisors.

Canine teeth are the mammalian predator's main weapons. They are long and slice meat. Members of the dog ("canids") and cat families have especially pronounced canines used to break a victim's neck or tear its jugular vein.

Molars are the rear side teeth used for grinding and chewing in most animals. The number of molars usually varies, with herbivores having many more than the meat-eating predators.

Fangs. True fangs are teeth that have grooves through which poison is injected into a prey animal to paralyze or kill it. These "hypodermic needles" are found only in venomous snakes and two species of lizard (the Gila monster and beaded lizard).

There are also many venomous invertebrates that use jaws, fangs, claws, or a tail sting to inject their poison. Tarantulas are poisonous, however their reputation as ferocious, deadly people-attackers is largely unfounded.

Beaks. Since birds have no paws or hands with which to hold things, their beaks, or bills, have been adapted for use as weapons and tools. Only eagles and their relatives (who use both beaks and claws as weapons), and parrots (who can hold food with their claws), use their feet as hunting devices.

Beaks are made of the same basic material as horns, claws, hooves, and fingernails. They grow continuously so are never worn out. Birds use their beaks as spears (kingfishers), chisels (oyster catchers), hammers and drills (woodpeckers), strainers (flamingos), and scoops (spoonbills), to mention just a few.

Turtles also have horny beaks used in eating fish and other aquatic prey.

Claws. Hunting animals generally have one of three different kinds of claws. Grasping claws are used by birds of prey (eagles, hawks, and owls) to hold down prey while tearing it with the beak. Fishing birds, such as ospreys, have talons modified for holding slippery prey.

Many large carnivores have tearing claws that can strike down prey and tear it open. All the cats except the cheetah have the ability to extend their claws for grasping and climbing, and to retract them while walking. Bears and wolves have their claws extended permanently for good traction (like spikes on an athletic shoe) and for holding prey.

Many animals use claws to dig after prey in burrows. The anteater, pangolin, and armadillo dig for insects, while badgers go for small mammals and reptiles.

THE SENSES

Efficient predators have developed very specialized senses to locate prey before being detected themselves.

Most animals have senses that are far superior to humans, and this allows them to pinpoint prey at a great distance or detect them under conditions that would normally provide protection.

Vision. Birds of prey have the most acute vision of any predator. The South American condor, for example, can hover at a height of five miles and determine whether an animal on the ground is dead or alive. Birds' eyes are relatively larger than humans' and have a retina more sensitive to color. Large eyes are also found in some nocturnal predators such as owls, bush babies, and nightjars.

Hearing. Most nighttime hunters rely on some sense other than vision when tracking prey. Usually this sense is hearing, in which case the ears are notably larger (e.g., the fennec fox). Bats almost certainly have the most sensitive ears, using bursts of ultrasound (sounds at a frequency much too high for humans to hear) to locate prey and navigate in the dark.

Smell. Odors are basically chemicals in the environment and can be carried in the air, in water, or on objects. Aquatic predators, like sharks and other fish, have very acute senses of smell, but they also rely on hearing and sight to track prey. Snakes are especially sensitive to odor, which they detect by flicking their tongues in and out. Odor particles are picked up and "smelled" with Jacobson's organ, a sensory pit in the roof of the mouth. Other land predators use their sense of smell to varying degrees, but virtually all use it in partnership with another sense, usually sight.

Other specialized senses developed by hunters include heat detection (pit vipers, pythons, boas), and electrical fields (deep sea and muddy water fishes can detect electrical activity in the muscles and nervous system of their prey).

DECEPTION

Camouflage. Staying hidden from prey can be a huge advantage for a predator. Good camouflage allows a predator to ambush its victim or to at least get in closer before attacking. And since most predators are themselves prey animals, camouflage also gives them added protection.

Careful movement is essential to predators if they are to remain hidden. Low crouches and small, slow steps are familiar in cats stalking prey, but dogs, snakes, amphibians, and even fish use this type of movement followed by a final strike.

Patterns of predator camouflage include:

- Counter-shading. Usually, light that comes from above an animal produces a dark shadow underneath, making it obvious. Many snakes, fish, and even penguins have a darker back than belly, which makes them appear flat and inconspicuous.

- Shadow elimination. Many predators, such as geckoes, skates and rays, and some fish, have flattened body shapes and flaps that eliminate shadows.

- Disruptive coloration. The tiger is an excellent example of coloration that helps to break up its easily recognized outline. The vertical stripes enable the cat to blend into the background vegetation.

- Color matching. Animals that live in a basically single color environment (the desert, the Arctic) have body colors that match their surroundings. Polar bears, snowy owls, and Arctic fox are good examples.

Mimicry. Hunters that look like a harmless object or even a nonpredatory animal may fool their prey into coming within reach. Some preying mantid species look like leaves or flowers, and one type of carnivorous fish, the saber-toothed blenny, resembles a harmless cleaner fish, the sea swallow. Fish that approach to be cleaned are instead attacked and eaten by the deceiving blenny.

ANIMALS THAT ARE HUNTED

It may seem like predators have developed such powerful weapons that they will always win in an encounter with prey. This is not the case, however, as predators generally come up "empty handed" many more times than they are successful in a hunt. This is because prey animals are also developing more elaborate defensive strategies that involve physical structure, physiology, behavior, and group interaction.

PASSIVE DEFENSE

Passive defenses protect an animal either before a predator attacks (as in camouflage, mimicry, or warning coloration) or immediately after an attack (turtle or snail shell, sea urchin spines, porcupine quills).

Camouflage. Also called cryptic coloration, camouflage is used by prey as well as predators to fool an enemy. Many animals resemble objects in their environment (leaves, sticks, tree bark, rocks, flowers) that would not attract attention or actually be shunned - several types of caterpillars look like bird droppings as they sit motionless on a leaf.

Some animals (certain geckoes, moths, fish and snakes) also have tails that resemble their heads, thereby confusing the predator into striking at a less vital area.

Mimicry. This protective strategy usually involves a harmless animal that looks like a harmful one to gain a kind of camouflage. Several types of beetles and moths resemble stinging wasps, viceroy butterflies mimic the bad-tasting monarchs, and poisonous coral snakes are mimicked by non-poisonous snakes striped with bright yellow, black and red.

Warning coloration. Animals that have dangerous or unpleasant characteristics often advertise this fact with bright colors or patterns. This way, an experienced predator will stay away after a run-in with one of these animals. Good examples include the black and white skunk, bees and wasps, South American poison dart frogs (red, yellow or orange and black stripes), nasty tasting red ladybird beetles, and electric rays that warn of their shocks with yellow and black spots.

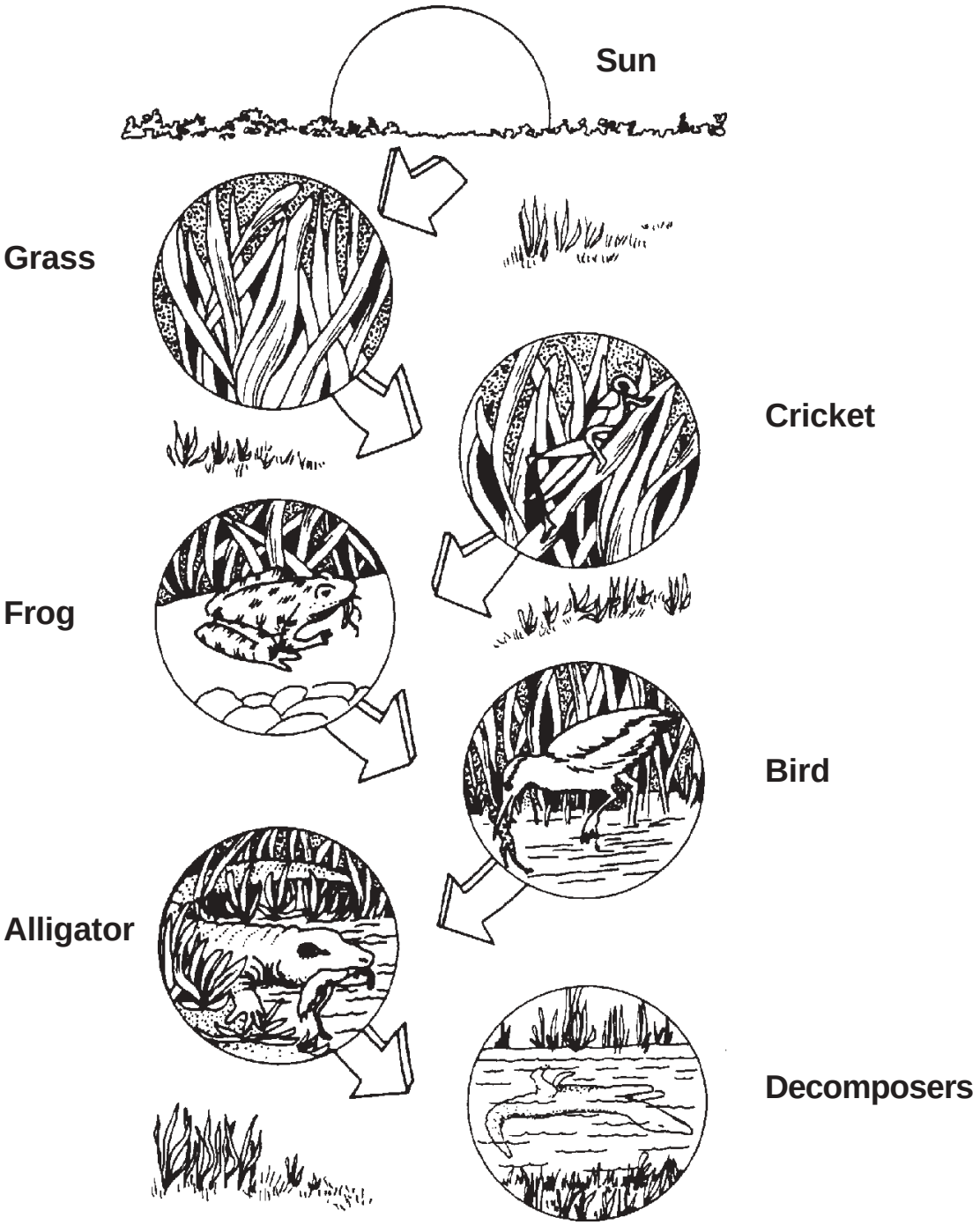
ACTIVE DEFENSE

After an animal has actually been attacked, active defenses may be used to prevent capture. An obvious response would be for the prey to run away, but other active strategies include spraying a noxious chemical (skunks, bombardier beetles), displaying fangs or "eye-spots" which startle a predator

(some caterpillars, butterflies, toads), playing "possum" (hog-nosed snakes, opossums), and using claws, teeth, horns, or hooves as weapons.

Prey animals that live in groups can also cooperate with each other to provide a strong defense. Musk oxen form a circle with calves in the center and sharp horns pointing outwards when attacked by wolves. Many kinds of birds (not necessarily even the same species) will recognize each others' warning calls and will "mob" or fly at the predator as a group.

A Food Chain



Vocabulary

Students can be expected to understand and properly use the vocabulary words listed below:

Adaptation: a physical or behavioral change in a species over a period of time that increases its chance for survival

Camouflage: the coloration or shape of animals which makes them hard to see against the background

Carnivore: an animal whose diet consists primarily of meat

Community: all of the plants and animals that live in an area

Consumers: name given to animals because they must eat food to get energy

Food Chain: an arrangement of the organisms in an ecological community showing what an animal eats and what in turn eats it

Food Web: the total of food chains in an environment

Habitat: the natural environment (home) of an organism

Herbivore: an animal whose diet consists primarily of plant matter

Niche: the ecological role ("job") of an organism in a community (what it eats, who eats it, where it lives, when it is active); no two species occupy the same niche in a community at the same time

Omnivore: an animal that eats both plant and animal matter

Predator: animal that hunts other animals for food

Prey: animal taken by a predator for food

Primary Producers: a name given to green plants because they can make their own food

Weapon: something used to fight with

Pre-Visit Activities

★ Create a list of features that help make an animal a predator or enable it to escape predation (e.g. claws, keen senses, coloration). Discuss how these features benefit both predator and prey.

★ Collect animal pictures and divide them into groups: predator / prey; carnivore / herbivore / omnivore. Make a bulletin board display or large collage of the pictures.

★ Ask students to select a particular predator and research what it uses as its prey. Draw or find pictures of all the animals involved in the food chain and make a mobile with the predator on top.

★ To reinforce the concept of animal adaptations, play a type of Animal Charades. Find pictures of various animals, particularly ones students might encounter at the zoo. Paste the pictures on index cards. Divide the class into two teams. Each team leader must select a picture card for their team. Each team must then act out the selected animal's movements while the other team tries to guess what animal is being represented. A time limit should be in place for guessing.

★ Extend the "Animal Charades" game above into a team relay. Divide the class into two or three teams. Mark off start and finish lines for the teams. Have each team leader select a picture from the card stack and show the selection to the rest of the team. At the designated signal, each team will run their course as they imitate the movements of their selected animal. The game can be repeated using different card selections for each team.

★ Complete the work sheets enclosed: *Is It A Bird?, Photo of a Komodo, Stretching to Survive,* and *Yipes, Zebra Stripes!*

★ Have each student assume the identity of a specific predator. Write a diary entry for one 24-hour period in the life of each predator. Students should describe where each animal might spend its day, what it hunted, how it hunted, whether it was successful in its hunt, or whether it remained hungry, etc. Encourage students to "become" predators that they don't particularly like, such as snakes or spiders. Some students may even decide to be a particular prey.

★ Play *Bird and Worms* and *The Coyote and the Skunk* (see enclosed instructions.)

★ Build a mini-ecosystem by constructing a terrarium in an old aquarium or large glass jar. Add animals to the terrarium so that predator/prey interactions can be observed. Possible predator/prey combinations could include: praying mantis/grasshoppers; small frogs or toads/cockroaches; anolis lizard/flies; gecko lizard/crickets; spider/insects

Observe and record the animal's behavior every day:

- How many prey animals are eaten?
- How much time does the predator spend eating? Sleeping?
- If you have more than one predator, do they fight over the prey?

★ Discuss positive and negative feelings about predators. What are students' attitudes? Discuss the same issue after your zoo field trip. Have their attitudes changed at all?

The Coyote and the Skunk

Materials Needed:
1. blindfold
2. spray-mist bottle

Hints:
Choose a fairly open, level site outdoors with a noisy walking area (i.e., dry leaves, plant litter, gravel, etc.).

How to Play:
One member of the group is the prey (skunk). The others are the predators. The prey stands in the center of the noisy walking site blindfolded, holding spray bottle. (Ears should not be covered.) The predators (coyotes) form a circle around the prey. When everyone is ready, the prey starts spinning around while the predators walk on the perimeter of the circle. The prey yells "STOP" and everyone stops moving. Teacher will then choose one predator to stalk prey. The prey protects himself by listening for the sounds of the approaching predator and spraying that person with a spray bottle. The predator must pause between each step to see if the prey has pinpointed his position. The teacher must act as referee to determine a hit or miss with sprayer. "Hit" predators return to the perimeter of the circle. The prey has survived and can play again or become a predator. If the skunk sprays, but does not score a hit, the stalking coyote continues until the prey is tagged. If the prey is tagged, the stalking coyote may then become the skunk.

Variations:
1. "Hit" predators leave the game by moving to a designated area outside of the stalking circle.
2. When the predator tags the prey, the successful predator moves outside of the circle while the prey then concentrates on remaining predators.
3. Simulate a hearing loss due to injury or age by placing ear plugs or cotton in one or both of the prey's ears.
4. Play the game on different walking surfaces: a quiet one (grass), noisy one, downhill slope, uphill slope.
5. Have the predators and prey get down on hands and feet to simulate four-legged animals.

Discussion:
1. How did the predator stalk the prey?

2. How did the prey successfully avoid a predator?

3. How would you change your bodies to be better predators/prey?

4. In this game the skunk used his sprayer as a defense against the predator. What are other defenses used by other animals for protection against predators?

5. How are the skills for a good predator the same/different from that of surviving prey?

6. Are stalking skills important for survival in nature?

Birds and Worms

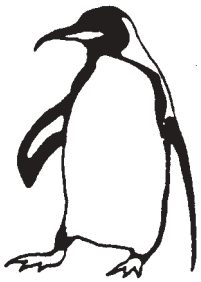
This game will introduce students to the concept of camouflage. Cut colored (green, red, blue, yellow, brown) pipe cleaners into three pieces and have students twist them into "worms." Scatter a known number of "worms" of each color over an area of playground, grass, or bare soil. Each student is given the name of a bird to impersonate, e.g., robin, thrush, flicker, sparrow, and crow. One at a time, call out the names of the birds, and have each bird "fly" over the area and pick up the first worm that he sees. As students return with a worm, they should lay them on a piece of white paper in the order they were picked up.

When all students have made at least one flight, have them consider the color sequence of the worms on the paper. Did any trends or patterns emerge? Did the color sequence depend on the background color? (Try the same exercise on a different colored background and note any differences.) Discuss the relationship between coloration and the usual habitat of real worms. What other animals depend on camouflage to keep from being preyed upon?

Is It a Bird?

Birds have adapted to their environment in order to survive. But, they all have common features that make them birds. Do you know a bird when you see one?

A bird:
a) has feathers
b) lays eggs
c) has a beak
d) has two feet
e) has two wings



Three of the animals on the right are not birds. List the three animals below and give two reasons why they are not birds.

1. Name of animal:_____
   It is not a bird because:
   a)_____
   b)_____

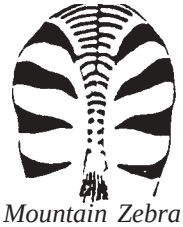
2. Name of animal:_____
   It is not a bird because:
   a)_____
   b)_____

3. Name of animal:_____
   It is not a bird because:
   a)_____
   b)_____

Yipes, Zebra Stripes


Plains Zebra

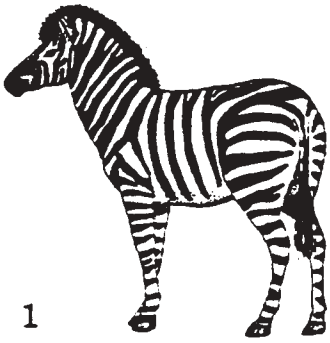

Grevy's Zebra


Mountain Zebra

Zebras are members of the horse family and live on the open grasslands of Africa. There are three main species of zebras. Each has a different kind of stripe pattern. Some even have brownish stripes between the black and white stripes.

When zebras are out in the open, the stripes are not a good camouflage. But when they're standing in shadowy bushes or are on the run as a herd, the stripes help confuse their enemies.

Look at the stripe patterns of the three main species of zebras. Then, write the name of the species under each picture to help you decide which two zebras are exactly alike.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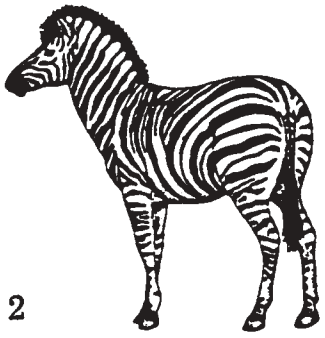
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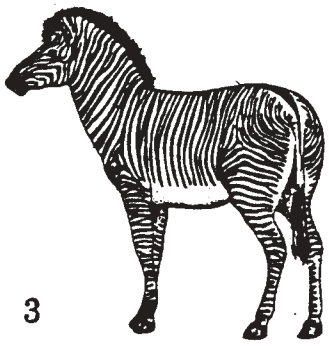
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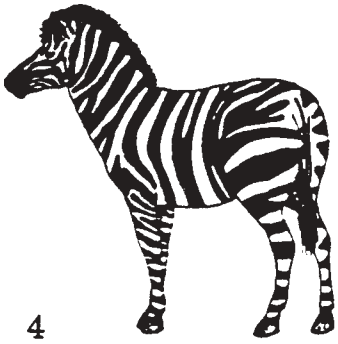
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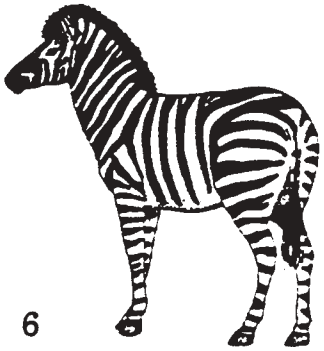
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Which two zebras look alike? _____ and _____

Photo of a Komodo

The Komodo dragon, which grows to a length of 10 feet, is the world's largest lizard. It is found only on some small islands in Indonesia, where it is the top predator.

Draw a line to match the Komodo's traits on the left with its actions on the right.

Traits	**Actions**
ectothermic (cold-blooded)	weapon to kill prey
long, forked tongue	camouflage
powerful tail	sleeps at night
large, powerful claws	smells prey
scaly, greenish skin	climbs trees

Look at the patterns below. Which letter would go in the blanks and continue the patterns? Write the letter that comes next on each line. Then put the letters in the right order to answer the question "What factor causes so many unique animals (like the Komodo dragon) to develop on islands?"

A B B A B B ___

K K K I O K K K ___ O K

M S B M ___ B

L S O S L S ___

N N L N ___ L

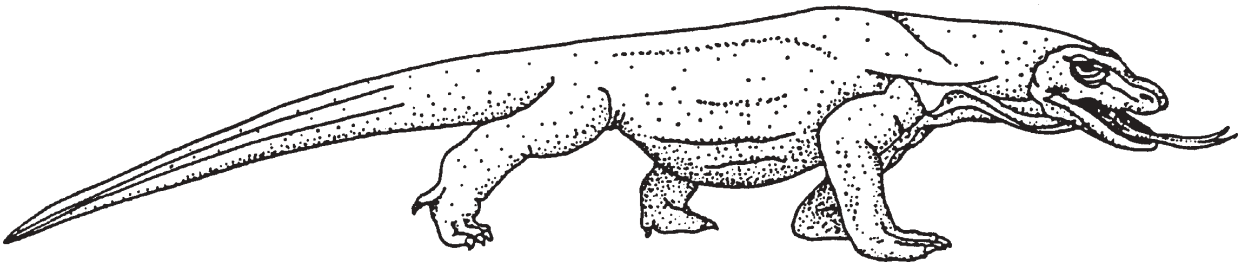
M R M L R M R M ___ R

r T R r ___ R

D I M E D ___ M E

O M O M ___

___	___	___	___	___	___	___	___	___
1	2	3	4	5	6	7	8	9



At the Zoo Activities

★ Have students fill in the *Who Eats What* chart as they tour the zoo in small groups.

★ Use math skills to complete the activity sheet *Summing Up the African Veldt*. Chaperones (not students) may want to have a calculator handy to double check answers.

★ Play the *Web of Life game* (see enclosed instructions) in a grassy, out-of-the-way area of Franke Park before or after your picnic lunch.

★ Take a closer look at the sea lions. Have students fill in the *Sea Lions: Surfing the Web* activity sheet. Note that sea lions undergo behavioral training sessions several times each day. These are good times to observe the sea lions in action. Ask at the main gate for a schedule.

★ Complete *Birds of a Feather* and *Bobcat Bingo* work sheets.

★ Have each child choose a zoo animal and observe it for 5-10 minutes. Have them draw its picture and describe its behavior (feeding, sleeping, fighting, grooming, etc.). Is the animal doing anything that might help the student determine its place in a food chain?

Who Eats What?

Fill in the chart with the names of animals you see at the zoo. Next to the animal's name, write whether it is a predator or a prey animal. One answer has been filled in for you. What do you notice about your chart when it is complete?

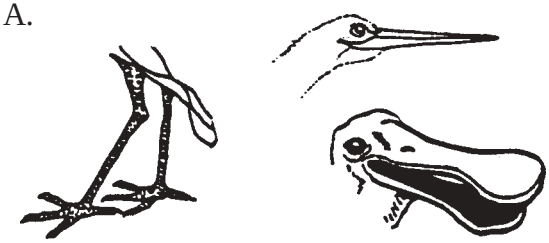
	HERBIVORE (plant-eater)	**CARNIVORE** (meat-eater)	**OMNIVORE** (eats meat and plants)
MAMMAL			
BIRD		**owl – predator**	
REPTILE			
AMPHIBIAN			
FISH			

Birds of a Feather

Birds have developed a variety of beaks and claws to help them adapt to their special living conditions.

As you walk through the zoo, keep an eye (and an ear) out for birds that belong to the following categories. Then, write their names on the lines below the sketches of their beaks and claws.

A.



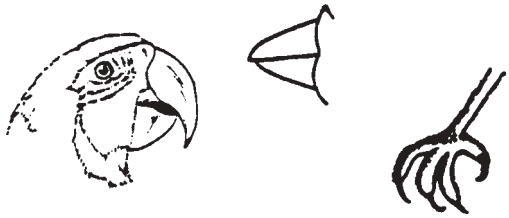
Names of birds seen with these features:

_____
_____
_____
_____

What types of food they might eat?

_____
_____

C.



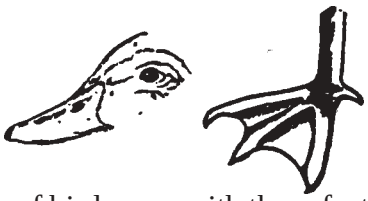
Names of birds seen with these features:

_____
_____
_____
_____

What types of food they might eat?

_____
_____

B.



Names of birds seen with these features:

_____
_____
_____
_____

What types of food they might eat?

_____
_____

D.

Names of birds seen with these features:

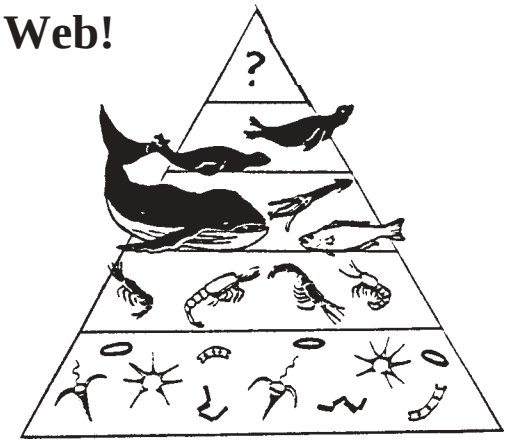
_____
_____
_____
_____

What types of food they might eat?

_____
_____

E.

Sea Lions: Surfing the Web!



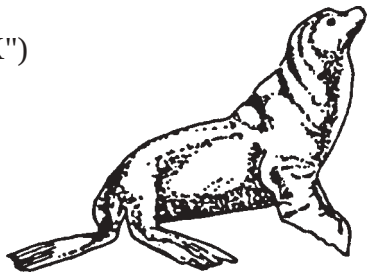
All living things need energy! As this energy is passed from one living thing to another, a ***food chain*** is formed. Interlocking chains make a ***food web.***

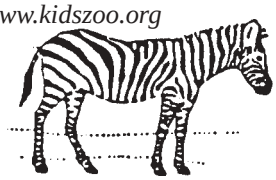
The pyramid diagram shows a ***food chain*** for the **SEA LION** at the zoo. One section of the pyramid is empty. To fill in the top of the pyramid with the name of the sea lions' predator, observe the sea lions for a while. Place an "X" on the line above the best answer to each observation. Then fill in the blanks below.

1.	ear holes	___ [K] yes	___ [C] no
2.	ear lobes	___ [I] yes	___ [H] no
3.	body weight	___ [E] thin	___ [L] fat
4.	fur	___ [L] yes	___ [E] no
5.	short whiskers	___ [T] yes	___ [E } no
6.	teeth	___ [A] yes	___ [R] no
7.	body shape	___ [H] ▭	___ [W] ⬭
8.	rear flipper	___ [H]	___ [S]
9.	tusk	___ [A] no	___ [L] yes
10.	breathes	___ [A] underwater	___ [L] at surface
11.	makes noise	___ [E] yes	___ [R] no

The main predator of the sea lion: (copy the letters beside each "X")

___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___





Summing Up the African Veldt

All animals have developed *adaptations* that help them find food and hide from predators. The sum total of all these adaptations equals SURVIVAL. Stalk the African Veldt at the zoo to see how many animal adaptations you can spot. It's guaranteed to multiply into a fun experience!

Fill in each line in the sentences with the total number of each animal seen during your visit. Calculate a solution to each problem and put your answer on the line to the right.

1. An average ZEBRA may have as many as 50 stripes.
   _____ zebras were spotted on the African Veldt today. _____ total stripes

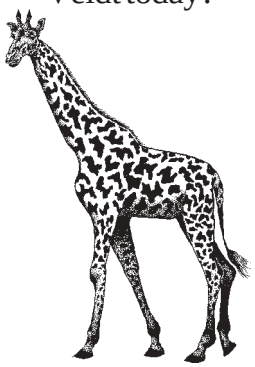
   If the average herd of zebras in Africa equals 1,000 animals, how many stripes would be found in a herd? _____ herd stripes

2. The drawing of an OSTRICH'S foot shows _____ toes.
   _____ ostriches were out on the Veldt today. _____ ostrich toes

3. Marabou, White, and Black STORKS, on the other hand, have _____ toes. Therefore, _____storks on the Veldt equals ..... _____ stork toes

4. GIRAFFES have long, flexible tongues to grab leaves off the thorny acacia trees in Africa. If the average giraffe is able to eat 25 leaves off an acacia tree in one hour, how many acacia leaves would be eaten by the giraffes on the Veldt today in one hour? (hint: how many giraffes are on the Veldt?) _____ acacia leaves

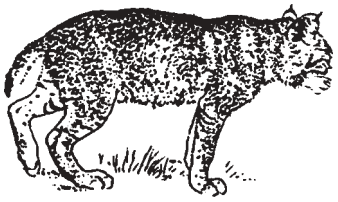
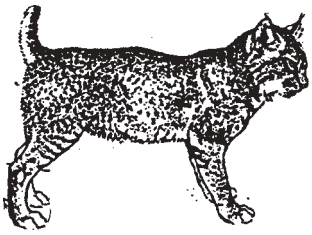
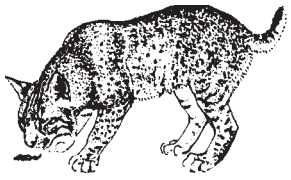
5. The WILDEBEEST eat grass and hay all day on the Veldt. If each wildebeest eats 20 pounds of grass and hay every day, how many pounds of grass and hay will be eaten by the wildebeest on the Veldt today? _____ pounds



Bobcat Bingo

Directions:
Cut out each Bobcat square and paste on a heavy piece of paper. Each square shows the behavior of the bobcat. Whenever you spot one of the pictured behaviors, place an "x" on the square. The first person to mark three pictures in a row, either across, down, or diagonally, is the winner.

However, the bobcat is the real winner! With its spotted brown coat, the bobcat can hide well among the leaves and litter on the forest floor. Endangered in Indiana, the bobcat may someday make a comeback.

 Sitting	 Stalking	 Threatening
 Climbing	 Turning ears to hear	 Scraping or scratching
 Attacking	 Wagging "bobbed" tail	 Marking territory

The Web of Life Game

Have the students sit in a circle in a grassy area. Each student should be a different plant or animal that might be found in an ecosystem (you may need to supply a list to choose from). Be sure to include many plants, several herbivores, a few carnivores and a few omnivores. Ask one “plant” to hold on to the end of a spool of string. Have the students determine which animal or plant might be connected in some way to the prior organism and pass the spool of string to that student. The second student wraps the string around one hand. Continue the process until all students are connected in a giant web.

The students should move back and out until the slack in the string is taken up; juggle the string to feel the system’s “vibrations.”

Ask the students which link in the system is least important and have that link drop out. Take up the slack again. Continue to remove "unnecessary" links or those which cannot survive when other links are removed.

As links are removed, discuss:

What happens when we remove a link in the ecosystem?

Can the system withstand the loss of these links forever? Why or why not?

What will eventually happen to a system which becomes less and less complex? Why?

Were the changes more dramatic when the system was composed of many parts (links) or when it had fewer parts?

Is an complex ecosystem more or less stable than a simple ecosystem?

Can you think of any systems which people have created which might be considered ecologically unstable because of their lack of diversity? What might be done to reduce the hazards of such systems?

What other webs of life might there be? What about webs of life within your school? Within your community? What about economic webs of life? Cultural webs of life? Worldwide webs of life?

Sample food chains:

African Grassland		***Indiana Woodland***	
Plant:	grass, acacia tree	Plant:	grass
Herbivore:	zebra, giraffe	Herbivore:	mouse, rabbit
Carnivore:	lion	Carnivore:	bobcat
Omnivore:	hyena	Omnivore:	raccoon

Post-Visit Activities

★ Complete the enclosed work sheets: *Predator-Prey Calculations, Missing Links, Web of Life Word*

* Complete the enclosed work sheets: *Predator-Prey; Missing Links; Web of Life Word Find; Food Pyramid; Frogs and Flies; Web of life Crossword; Pass Me By, Please; Those Pearly Whites;* and *The Zoo Restaurant.*

★ Review the completed work sheets and encourage discussion; some questions have several possible answers. Discussion topics:

- How is each link in a food chain important to other links?
- What would happen if all predators vanished?
- What does "predator prejudice" mean?
- How and why are animal habitats vanishing?
- How are humans predators (both directly and indirectly)?
- How do the food sources used by humans compare with the food sources used by other animals?

★ Have a spelling bee using zoo vocabulary and animal names.

★ Play animal charades. Divide the class into teams; each team must act out an animal's movements while the rest of the teams try to guess what it is. Keep track of the time for each team.

★ Create imaginary predators and their prey using milk cartons, pipe cleaners, egg cartons, fast-food containers, and other discarded materials. Construct specific predator devices (e.g., to catch a flying insect, to dig up roots, to break nuts, to catch burrowing animals).

★ Discuss with the class what they liked best about their zoo trip. Was there something they didn't like?

★ Black bears and cougars used to be found in this area. Find out how and why they disappeared. Discuss how the disappearance of these large predators has affected other animal populations. How do humans compensate for this loss in the balance of nature in the management of animal populations?

★ Have each student select a different predator. Try to represent predatory birds, mammals, insects, reptiles, etc. Plan an imaginary birthday party for each predator. Include the kinds of refreshments that should be served, where the party is to be held, what kinds of gifts would please it (and aid its survival), and what animal guests should be invited (kinship and community).

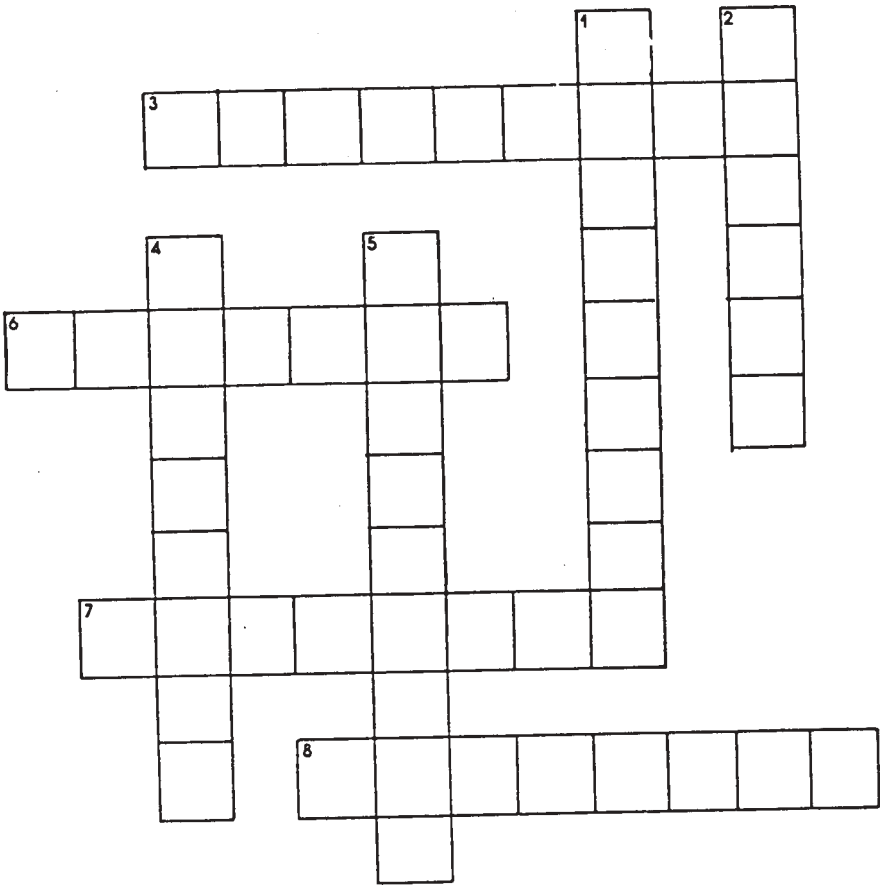
★ Organize a class poster contest using "food webs" as a theme. Each poster should include the sun, producers, consumers and decomposers. Arrange to post them in the school hallway or office.

★ Use the enclosed form (page 30) to have students write a cinquain about their favorite endangered animal. Cinquain (sing-KANE) is a five-line oriental poetry that will help students capture the essence of an animal in just a few words. For example:

Ostrich
Long-necked
Always looking confused
You seem so silly
"Stretch"

Polar Bear
Shaggy, white
Swims in ice-water
Brrr, a cold life
Arctic

Web of Life Crossword Puzzle



Word Bank

Herbivore
Producer
Food Web
Omnivore
Consumer
Food Chain
Carnivore
Energy

ACROSS

3. The path by which energy passes from one living thing to another (2 words)
6. Something that shows how all the animals in a community get energy (2 words)
7. Any animal that eats both plants and animals
8. Any living thing that makes its own food

DOWN

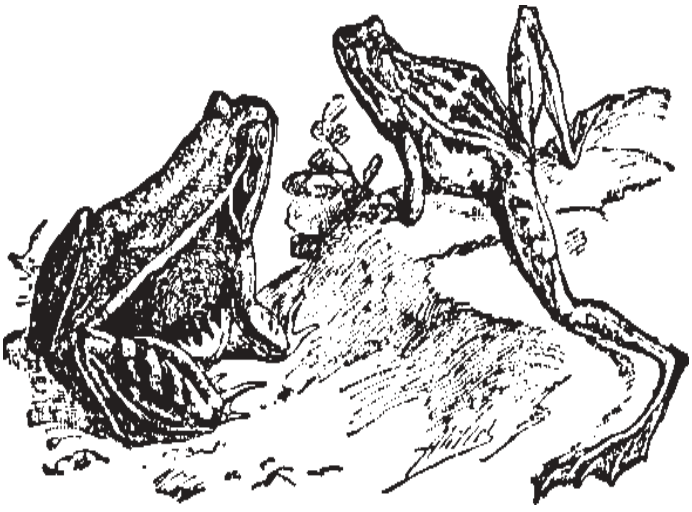
1. Any animal that eats only meat
2. Something all living things need
4. Any living thing that cannot make its own food
5. Any animal that eats only plants

Frogs and Flies

In this activity, students will count and estimate to illustrate the role of frogs in maintaining population levels of flies or other insects.

Discuss the role of some animals in controlling the populations of other animals. Use frogs and flies as examples. Prepare a chart with five columns to be used in estimating the fly population remaining after each time interval in the game below. Prepare and have ready strips of paper representing flies to be fed to frogs.

Five students are frogs and sit in the center of a circle formed by other students who are supplied with paper "flies." One child is selected to represent pollution. As teacher claps slowly for one minute, flies are fed to frogs on each clap. When clapping stops, all freeze, and "pollution" eliminates a frog by taking one child from the center of circle. When clapping resumes, students continue to feed flies to the space where the frog used to sit. At next pause, numbers of paper flies left on floor will be counted and recorded. Students will then estimate how many flies will remain at the next interval when another frog will be eliminated. This will continue for 5 intervals, until all frogs are eliminated. Discuss results. What might life be like for humans if there were no more frogs and the fly population grew unchecked? What would life be like for other animals under the same circumstances (e.g., horses, dogs)?



This activity courtesy of Cincinnati Zoo Education Department

Predator-Prey Calculations

Problems

1. What is the minimum number of square miles of habitat needed to support one deer? (Round UP to the closest whole number.)

   _____

2. If each deer weighs 150 pounds, how many deer are needed to feed one lion for one year? (Remember that the lion eats only half of each deer.)

   _____

3. How many square miles of deer-lion habitat are necessary for one lion to survive?

   _____

Other questions to think about:

1. In general, do predators or prey animals require the most land area to survive? Carnivores or herbivores?

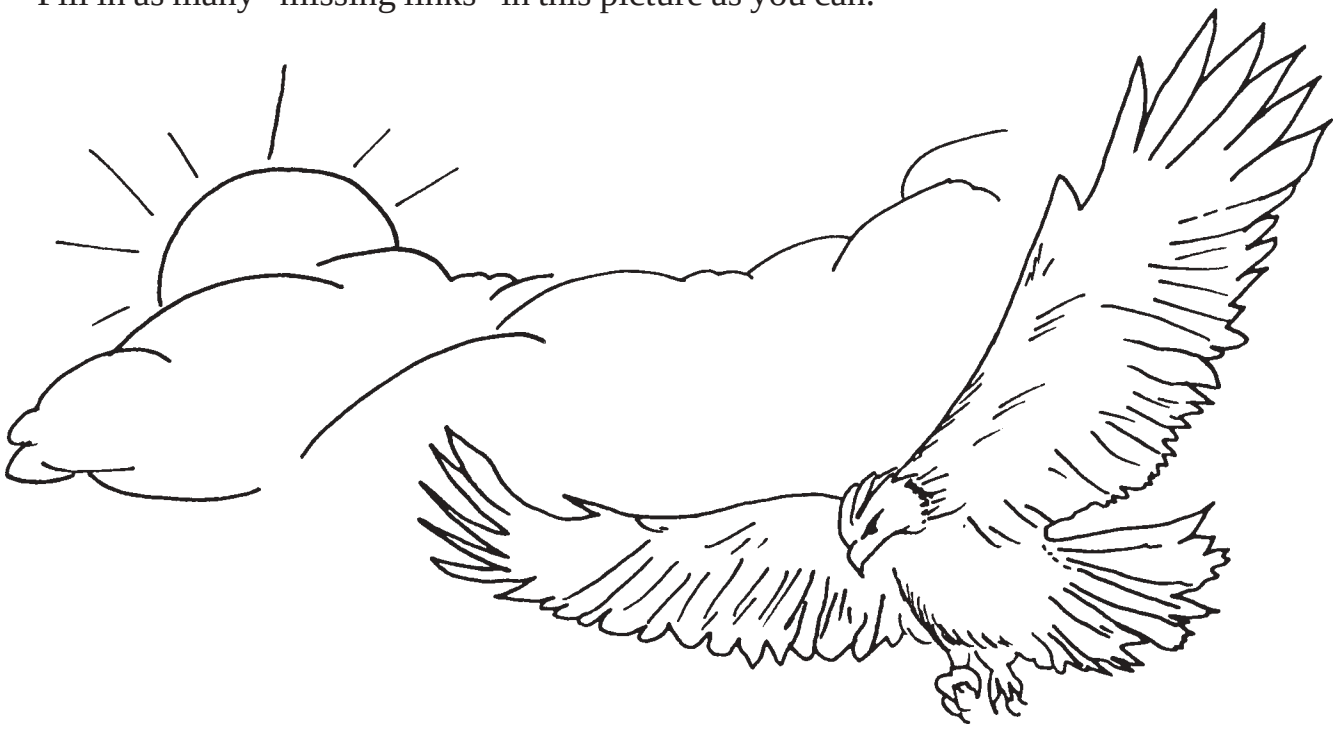
2. Even with all the development present in the United States, there are more deer in this country now than when the first settlers arrived. How can you explain this fact?

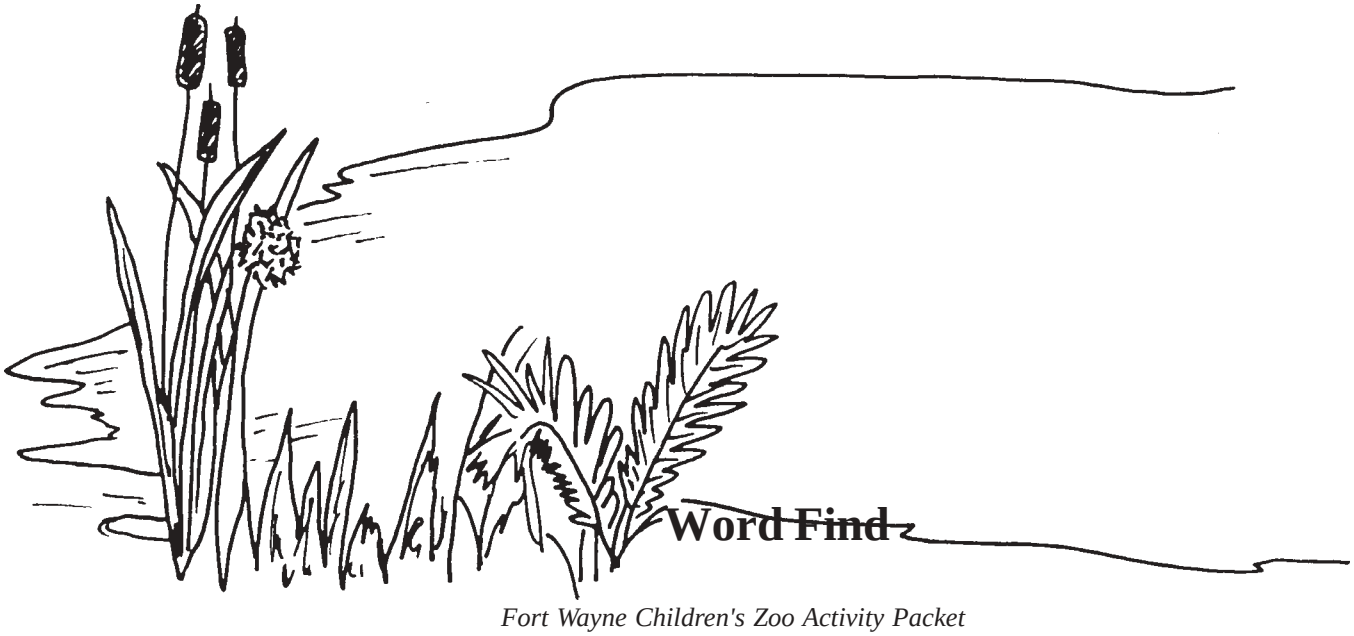
Facts to help you answer questions:

1. One mountain lion can eat about 1000 pounds of venison (deer meat) each year (in addition to rabbits and other small animals). The lion probably eats only half (50%) of each deer it kills; scavengers get the rest.
2. One deer eats about 3,500 pounds of vegetation (grass, brush, and leaves) each year.
3. One square mile of deer habitat produces 800 pounds of vegetation that can be used by deer.

Missing Links

Fill in as many “missing links” in this picture as you can.





Word Find

ANIMAL CINQUAIN

(1 word – an animal)

--- ---
(2 words that describe it)

--- --- ---
(3 words expressing action)

--- --- --- ---
(4 words telling how you feel about it)

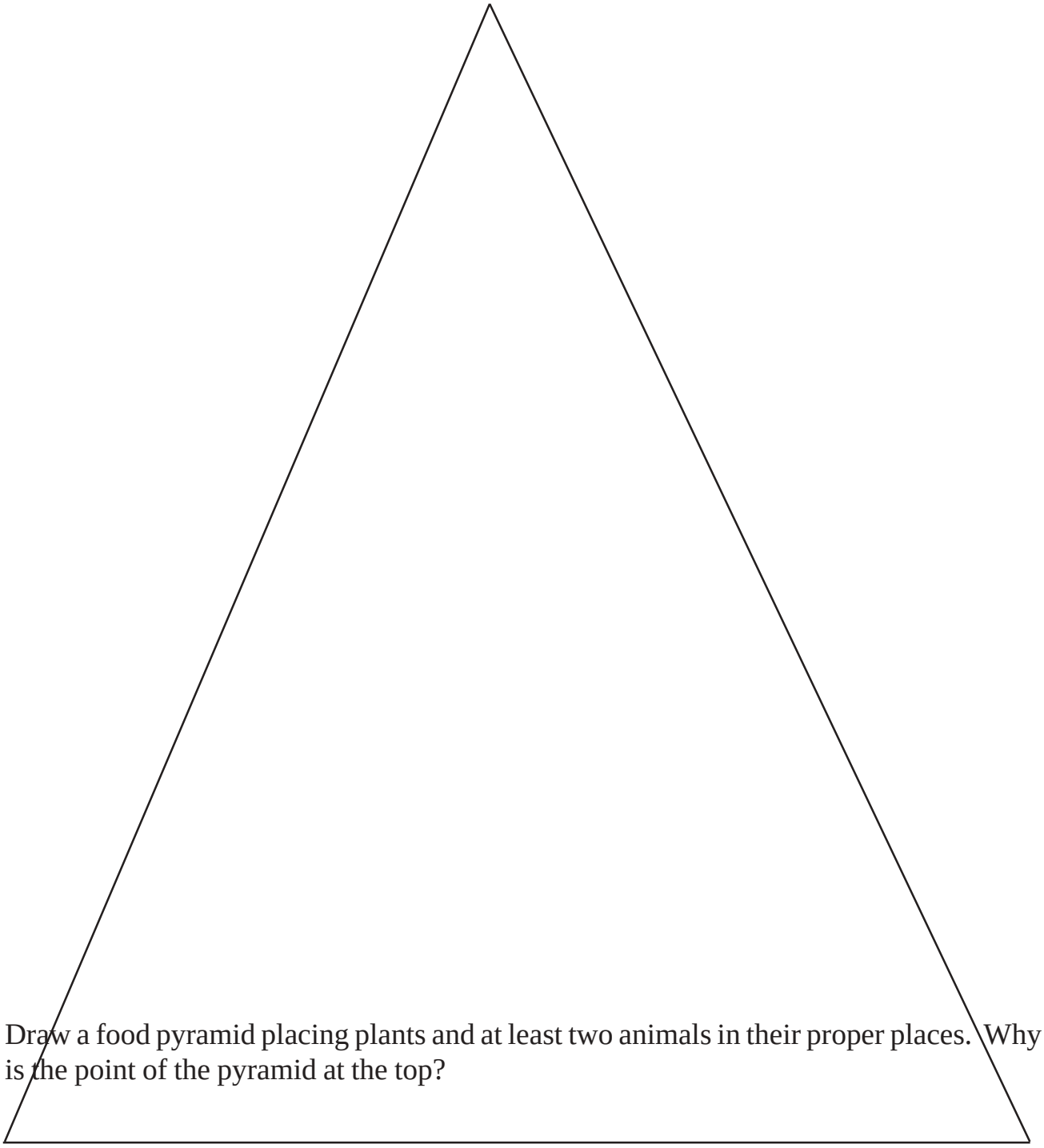
(sum up with 1 word)

Hidden below are some words about animal connections. They may be written forward, backward, up, down, or diagonally. Circle each one as you find it.

M E S K V H E R B I V O R E Z X T
Q J E X F O N H U E T Z R M E U A
U A N O P A E W F C D O P X B V T
B T V C Z S M T H S V F J U N P I
L U I P A N G I A I N C I S O R B
N C R Q U M A L N T V N D B F N A
P D O H G B O R K Y P T X C S W H
F N N S D R A U W P R E D A T O R
T E M F K C Z D F H Q U A R Z C Y
P R E Y J F Q R G L K D P S N O M
Y O N W H E I U C J A H T E I X S
S V T O M V N H D I V G U J C K T
G I P U S O X I J G W D E B H D Y
F N Q X C A L E N B A B D H E A B
S M V U R B S A P A X P L K P Z E
T O N D S K L T R D C E F O O D W

habitat
predator
prey
weapon
camouflage
carnivore
herbivore
omnivore
food web
niche
environment
canine
molar
incisor

Food Pyramid



Draw a food pyramid placing plants and at least two animals in their proper places. Why is the point of the pyramid at the top?

The Zoo Restaurant

Animals that eat only vegetable matter are called **herbivores.**
Animals that eat other animals are called **carnivores.**
Animals that eat both vegetable and animal foods are called **omnivores.**

Three new sidewalk cafes have opened at the zoo FOR ANIMALS ONLY!
The animals pictured below are hungry. At which "eatery' should each animal dine in order to get the type of food it needs?

A.
Herb's Salad Bar
Lite Menu

*Tossed Grass Salad with Alfalfa Seed Dressing

B.
Carny's Grill
Today's Specials:

*Grasshopper Soup with Spider Leg Garnish
*Broasted Bunny Basket

C.
Zoo Country Buffet
All You Can Eat!

*Spinach & Raisin Omelet smothered in Beetle Butter

_____
Leopard

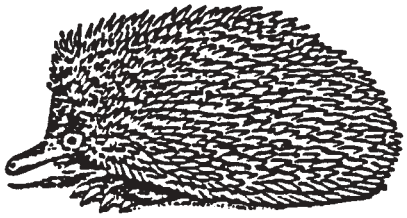
_____
Kangaroo

_____
Lemur

_____
Prairie dog

_____
Zebra

_____
Bobcat



_____
Echidna
(spiny anteater)

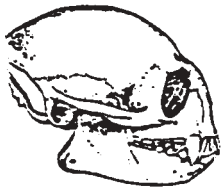
Those Pearly Whites

"The better to eat you with, my dear!" Even the Big Bad Wolf knew that an animal can only eat certain foods if it has the right mouth parts.

Look at the mouths on the left. Select which kind(s) of food each animal might eat. Place the chosen letter(s) on the line beside each animal name. Some animals may eat more than one type of food.

___Parrot

___Bat

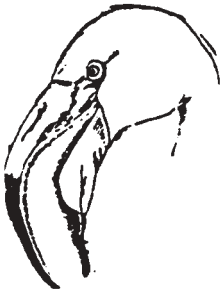


___Monkey

___Sea Lion

___Red Panda

___Deer



___Flamingo

__Bobcat

___Lemur

A. Insects

B. Grasses

C. Fish and squid

D. Fruit

E. Mice, rabbits, and birds

F. Leaves

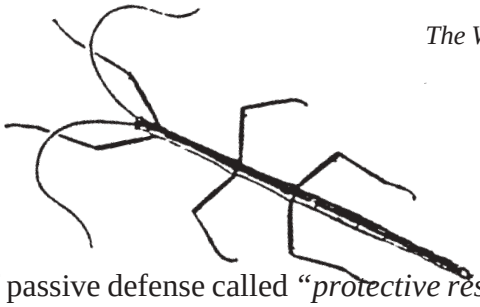
G. Seeds

H. Krill, small shrimp

I. Frogs, crayfish

J. Nuts, acorns

Pass Me By, Please



Many animals, particularly insects, use a type of passive defense called *"protective resemblance"* to protect themselves from predator attack. Their bodies actually take on the shapes and colors of objects in their environment so that they will not attract attention.

Several insects featured in the Fort Wayne Children's Zoo's Indonesian Rain Forest use this type of camouflage. Their bodies so closely resemble twigs and leaves that you have to look very closely to see them!

Go outside and select an object, such as a twig, leaf, stone, etc. Bring it back inside and use available materials (colored paper, scraps of material, yarn, sand, etc.) to design an animal that closely resembles the object you found outside. Then answer the questions below.

1. Common name of your animal_____

   Scientific name (make-believe)_____

2. What does your animal eat?_____

3. What eats your animal?_____

4. What time of day is your animal the most active?_____

5. What conditions does it need to survive? (moisture, temperature, light)

   _____

6. Other important information about your animal:_____

   _____

   _____

Place your animal outside in a camouflaged spot. Give your description paper to another person. Ask them to go searching for your animal.

Teacher's Answer Key

Is It A Bird?: not a bird: butterfly; bat; flying squirrel

Yipes Zebra Stripes! *:* 1 & 6

Photo of a Komodo: ISOLATION

Birds of a Feather:

A. spoonbills, ibis, storks, egrets, etc. EAT: small aquatic animals; insects
B. ducks, geese, swans, etc. EAT: aquatic plants, grain, insects
C. macaws, parrots, cockatoo, parakeet, lorikeets, lovebirds, etc. EAT: fruit, nuts, seeds
D. ostrich (2 toes); emu (3 toes). EAT: grasses, leaves, fruit, flowers, insects

Sea Lions: Surfing The Web: killer whale

Predator Prey Calculations:

1. 5 square miles
2. 14 deer
3. 70 square miles

The Zoo Restaurant: lemur - C; leopard - B; kangaroo - A; prairie dog - A; zebra - A; bobcat - B; echidna - B.

Those Pearly Whites: macaw - G; bat - D & A; monkey - A, D, F, J; sea lion - H; red panda - F, D, G; deer - B; flamingo - H; bobcat - E; lemur - D & F

Animal Facts
Komodo Dragon

Class: Reptilia

Scientific Name: *Varanus komodensis*

Range: Several small islands, including Komodo Island, in the country of Indonesia

Habitat: Grasslands, open forests near water

Natural Diet: Carrion (dead animals), deer, pigs, eggs, young of their own species. Young dragons eat insects, birds, and rodents.

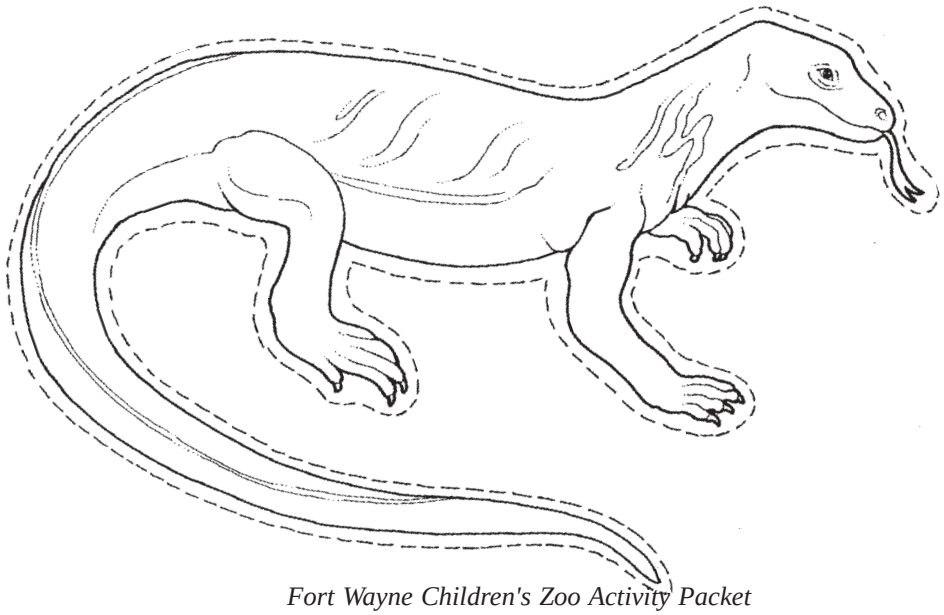
Zoo Diet: Mice

Physical Characteristics: Largest of all lizards, the Komodo dragon can reach a length of 10 feet and weigh 330 pounds. They have a heavy body, large head, long neck, and five-toed feet with sharp claws. The dragon's teeth are jagged and can inflict painful wounds. The saliva is septic and can cause infection in a bite victim. They reach adult size in about five years.

Behavior: Komodo dragons are fast-moving, as well as good climbers and swimmers. They hide and wait to ambush their prey. A lash from the tail can cause bone fractures in victims; their bites are powerful.

Reproduction: Clutches of 7 to 60 eggs are laid in hollow trees or termite mounds. The incubation is usually 130 to 220 days.

Notes on the zoo's Komodo Dragon: Hatched in February 1994 at the Cincinnati Zoo, our dragon was one of a clutch of 18, and part of the third clutch to be hatched in the United States. The Fort Wayne Children's Zoo is part of a breeding/conservation program administered by the National Zoo in Washington, D.C.., and supports studies of the 3,000 - 5,000 Komodo dragons remaining in the wild.



Animal Facts
Reticulated Giraffe

Class: Mammalia

Scientific Name: *Giraffa camelopardalis*

Range: Northeast Africa, Somalia, northern Kenya

Habitat: Grasslands

Natural Diet: Leaves, twigs, and bark of acacia tree and other trees and shrubs.

Zoo Diet: Hay and exotic ruminant pellets

Physical Characteristics: Giraffes are the world's tallest mammal, averaging 14-19 feet high and weighing 1,700 to 2,800 pounds. Their long necks have only seven vertebrae, just like humans. Giraffes have a prehensile (grasping) upper lip which is used to pull leaves off trees. The black tongue is 20" long. Giraffes are usually quiet but can make low moans and grunts.

Behavior: Giraffes live in herds of up to 40 animals, led by a female and dominated by a large bull. They have excellent sight and hearing and prefer grasslands where they can have a clear view of predators. Giraffe babies may be attacked by lions; adults may be attacked when they bend down to drink. Giraffes defend themselves by kicking.

Reproduction: Mother giraffes are pregnant for 15 months and give birth to one baby. The baby is born while the mother stands. Baby giraffes are about 6 feet tall and weigh about 100 pounds at birth.

Animal Facts
Chilean Flamingo

Class: Aves

Scientific Name: *Pheonicopterus chilensis*

Range: Temperate areas of southern South America

Habitat: Shallow water, mud flats

Natural Diet: Blue-green algae and microscopic animals

Zoo Diet: Trout chow and duck grower (commercial diets) supplemented with pigments to maintain pink feather color.

Physical Characteristics: Flamingos have long necks, long legs, pink feathers, and webbed feet. The beak is curved and filled with hairlike structures. To eat, flamingos scoop up mud and close the beak. Mud and water are pushed out of the beak, while the tiny food particles remain inside and are swallowed.

Behavior: Flamingos stand on one leg when they are resting. When they fly, they do so with their legs and neck extended. Sounds flamingos make include honks and gobbles.

Reproduction: Flamingos breed and nest in large colonies. Nests are volcano-shaped cones of mud. A single egg is laid in a "crater" on top of the mud cone. Chicks are fed regurgitated food by both parents.

Animal Facts
Sea Lion

Class: Mammalia

Scientific Name: *Zalophus californianus*

Range: Pacific coast of North America

Habitat: Aquatic marine

Natural Diet: Squid, fish, and shellfish

Zoo Diet: Fish

Physical Characteristics: The sea lion's sleek, streamlined body is covered with short, dense fur to protect it in cold waters. A thick layer of blubber helps, too. Sea lions, unlike seals, have external ear flaps and can "walk" on their flippers. (Seals flop along on their bellies.) Sea lions can weigh from 150 to 800 pounds.

Behavior: Sea lions live in large groups on rocky islands. They are expert divers and can stay under water for up to 20 minutes. Sea lions are very intelligent and are the creatures we often see performing in shows.

Reproduction: One pup is born early each summer and is nursed by its mother. It learns to swim within a few months and hunts for its own food.

Evaluation Form
Zoo Activity Packet

Dear Teacher:

Please take a few minutes to fill out and return this evaluation form. Your input will help us improve our teacher resource materials in the future.

Return in the envelope provided or mail to Education Department, Fort Wayne Children's Zoo, 3411 Sherman Blvd., Fort Wayne, IN 46808. Thank you for your time and effort!

SCHOOL or GROUP NAME: _____

GRADE LEVEL: _____ DATE OF VISIT: _____

1. Were the materials and activities appropriate for your grade level? _____

_____

2. Which work sheet did you use? _____

_____

3. Which activities did you try? _____

_____

4. Which of these were enjoyed most by your students? _____

_____

5. Did you create or modify any activities to supplement this packet? If so, we would appreciate receiving a copy to include in future packets or to distribute to teachers on request.

6. What other materials would you like to see included in the packet? _____

_____

7. Additional comments: _____

_____

_____