



Vertebrates and Their Adaptations for Survival *for students in 4th grade*

Vertebrates and Their Adaptations for Survival is a multipart program that is generally scheduled over a 4-week period. The first three parts are scheduled at the school and the fourth part is scheduled at the Zoo.

School programs can be presented in the classroom or media center but **NOT in the school cafeteria** because of the live animals. Some programs involve a PowerPoint presentation, so please try to schedule us in a room that can be darkened. Also, if we are repeating the program, our docents really appreciate it if they do not have to pack everything up and move from one classroom to another.

By completion of this program, students will understand the concept of animal classification, will recognize the unique characteristics of each vertebrate class (except fish), will be able to identify different habitats, and will be able to determine what an animal eats and whether it is predator or prey by looking at a variety of morphological and behavioral adaptations.

Each program uses live animals and biofacts to emphasize the unique characteristics of one or more vertebrate classes, and to examine their habitats and adaptations for survival. The programs develop students' vocabulary and challenge their observation skills and their ability to make comparison and deductions.

Week 1: Herps.

Week 2: Birds.

Week 3: Mammals.

Week 4: Food Chains and a culminating Zoo tour.

**“Vertebrates and Their Adaptations for Survival” is aligned to 4th grade
Life Sciences Standard 1.**

1. All living things share similar characteristics, but they also have differences that can be described and classified.

**To schedule this program,
or for more information,
call 561-1452, ext. 125.**

Amphibians and Reptiles Vocabulary

Adaptation:	An alteration or adjustment in structure or habits by which a species or individual improves its condition in relationship to its environment.
Amphibian:	An animal that typically lives in an aquatic habitat breathing by gills as young, and primarily in a terrestrial habitat breathing by lungs and through moist glandular skin as an adult.
Carnivore:	An animal whose diet consists primarily of meat.
Classification:	In biology, the arrangement of organisms into a hierarchy of groups on the basis of their similarities.
Cold-blooded:	Ectothermic: body temperature that is largely dependent on the temperature of the air or water in which it lives.
Development:	The real life property of getting older.
Endangered:	In danger of becoming extinct.
Extinct:	Gone forever.
Flipper:	A flat limb used for swimming, such as in seals or whales.
Habitat:	The arrangement of food, water, shelter or cover, and space suitable to an animal's needs.
Herbivore:	An animal whose diet consists primarily of plants (leaves, grass, fruits, etc.).
Incubate:	To keep eggs warm so babies can develop and hatch.
Invertebrate:	An animal that does not have a backbone.
Metamorphosis:	The period during the life-cycle of many invertebrates, most amphibians, and some fish during which the individual's body changes from one form to another through a major reconstitution of its tissues (e.g., frogs are produced by metamorphosis from tadpoles).
Omnivore:	An animal that feeds on plants and animals.
Poisonous:	Refers to animals that are harmful when consumed or touched. <i>[Note: venomous should be used when referring to animals that inject venom into their prey.]</i>
Reptile:	Cold-blooded vertebrates that have hard-shelled, yolk-filled eggs that are laid on land and from which fully formed young are born. Includes snakes, lizards, crocodiles, alligators, and turtles.
Shed:	To let something fall or drop off. Many reptiles shed their skins over and over as they grow.
Venomous:	Refers to animals that inject venom into their prey. <i>[Note: poisonous refers to animals that are harmful when consumed or touched.]</i>
Vertebrate:	An animal with a backbone, such as a mammal, bird, reptile, amphibian, or fish.

Birds

Adaptation:	A change that a living thing goes through as it fits in with the environment. Feathers on the wings of a bird are an adaptation for flight.
Carnivore:	An animal whose diet consists primarily of meat.
Carrion:	The bodies of dead animals, usually found in nature in the process of decay.
Conservation:	Action taken to protect and conserve the natural world, usually from pollution, overexploitation, and other harmful features of human activity.
Contour feathers:	Feathers that give birds their outer covering and distinctive colors.
Crepuscular:	Active at dawn and dusk.
Dimorphism:	Two distinct forms: sexual dimorphism – male/female differences in color seen in some bird species, such as ducks.
Diurnal:	Active during the day (opp. of nocturnal).
Down feathers:	Soft, fluffy undercoat feathers that keep birds warm.
Endangered:	In danger of becoming extinct.
Extinct:	Gone forever.
Flight feathers:	The large, stiff feathers on a bird's wings.
Habitat:	The arrangement of food, water, shelter or cover, and space suitable to an animal's needs.
Herbivore:	An animal whose diet consists primarily of plants (leaves, grass, fruits, etc.)
Hover:	To remain in the air in one place.
Incubate:	To keep eggs warm so babies can develop and hatch.
Insectivore:	An animal or plant that eats insects.
Molting:	The process of gradual feather replacement with new feathers.
Nocturnal:	Active at night (opp. of diurnal).
Omnivore:	An animal that feeds on plants and animals.
Predator:	An animal that kills and eats other animals.
Preening:	Bird grooming behavior that keeps feathers in good order.
Prey:	An animal that is killed and eaten by other animals.
Raptor:	A bird-of-prey.
Scavenger:	An animal that habitually feeds on refuse or carrion.
Talon:	The sharp claw of a bird-of-prey, such as an owl, hawk, or eagle.
Vertebrate:	An animal with a backbone, such as a mammal, bird, reptile, amphibian, or fish.
Warm-blooded:	Endothermic. Having a body temperature that remains approximately the same, whatever the temperature of the surroundings.
Web-footed:	Feet that have a thin layer of skin stretched between the toes.

Mammals

Antlers:	Large, branching, bony structures on the head of a deer; shed each year.
Aquatic:	Growing, living in, or frequenting water.
Arboreal:	An animal that lives in trees.
Camouflage:	Colors or structures that allow an animal to blend with its surroundings to avoid detection.
Canine teeth:	The pointed teeth on each side of the mouth between the incisors and the premolars, used for catching and killing prey, and tearing flesh.
Carnivore:	An animal whose diet consists primarily of meat.
Carrion:	The bodies of dead animals, usually found in nature in the process of decay.
Crepuscular:	Active at dawn and dusk.
Diurnal:	Active by daylight (opp. of nocturnal).
Endangered:	A species that is in danger of extinction throughout all or a significant portion of its range.
Extinct:	Gone from existence.
Gestation:	Time spend in the uterus from conception to birth.
Herbivore:	An animal whose diet consists primarily of plants (leaves, grass, fruits, etc.).
Horns:	Hard, bony projections from the head of a hoofed animal; they are usually permanent.
Incisors:	Sharp teeth at the front of the mouth, used for biting or nibbling.
Insectivore:	An animal or plant that eats insects.
Mammal:	A class of vertebrates covered with hair or fur that produce live offspring and nourish them with milk produced in mammary glands.
Marsupial:	A pouched mammal.
Molars:	The broad, flat teeth at the back of the mouth used for grinding food.
Monotreme:	An egg-laying mammal (e.g., platypus or echidna).
Nocturnal:	Active by night (opp. of diurnal).
Omnivore:	An animal whose diet consists of a variety of plants and animals.
Placenta:	The structure in the uterus through which a developing mammal receives nourishment and eliminates wastes.
Prehensile:	Adapted for seizing and grasping, esp. by wrapping around.
Rodent:	A gnawing mammal.
Scavenger:	An organism that habitually feeds on refuse or carrion.
Terrestrial:	Growing or living on land (as opposed to water).
Undercoat:	Short, dense fur next to the skin; often covered by a longer coat.
Velvet:	Soft, smooth, covering of growing antlers; contains blood vessels that bring nutrients to the antlers.
Vibrissa(e):	Whisker(s). One of the stiff hairs that are located esp. about the nostrils or on other parts of the face in many mammals; often serve as tactile organs.
Warm-blooded:	Endothermic. Having a body temperature that remains approximately the same, whatever the temperature of the surroundings. Opposite of cold-blooded.

Food Chains – Colorado

Adaptation:	An alteration or adjustment in structure or habits by which a species or individual improves its condition in relationship to its environment.
Camouflage:	Colors or structures that allow an animal to blend with its surroundings to avoid detection.
Canines:	The pointed teeth on each side of the mouth between the incisors and the premolars, used for catching and killing prey, and for tearing flesh.
Carnivore:	An animal whose diet consists primarily of meat.
Carrion:	The bodies of dead animals, usually found in nature in the process of decay.
Cold-blooded:	Ectothermic. Having a body temperature that is largely dependent on the temperature of the air or water in which it lives.
Consumer:	Organisms that do not make their own food but must get it from other things.
Crepuscular:	Active at dawn and dusk.
Decomposer:	An organism that feeds on dead organic matter, returning nutrients to the soil.
Diurnal:	Active by daylight (opp. of nocturnal).
Ecosystem:	A community of living things and the environment with which they interact.
Endangered:	A species that is in danger of extinction throughout all or a significant portion of its range.
Endothermic:	Warm-blooded. Having a body temperature that remains approximately the same, whatever the temperature of the surroundings.
Energy flow:	The movement of energy from the sun through food chains to top carnivores.
Extinct:	Gone from existence.
Food chain:	A chain that represents a series of events in which energy is transferred from one organism to another in an ecosystem.
Food web:	Consists of many related food chains.
Habitat:	The arrangement of food, water, shelter or cover, and space suitable to an animal's needs.
Herbivore:	An animal whose diet consists primarily of plants (leaves, grass, fruits, etc.); gets its energy from producers.
Incisors:	Sharp teeth at the front of the mouth, used for biting or nibbling.
Migration:	Movement from one place to another.
Molars:	The broad, flat teeth at the back of the mouth used for grinding food.

Mutualism:	A relationship between living organisms that is mutually beneficial.
Nocturnal:	Active by night (opp. of diurnal).
Nutrient:	A substance an organism requires to live.
Omnivore:	An animal whose diet consists of a variety of plants and animals.
Organism:	A living thing, such as a plant, animal, or fungus.
Parasite:	An organism that lives in or on other living organisms and, in doing this, causes them harm.
Photosynthesis:	The process by which green plants use carbon dioxide and water in the presence of sunlight and chlorophyll to produce food and oxygen.
Predator:	An animal that kills and eats other animals.
Prey:	An animal that is killed and eaten by other animals.
Primary consumer:	Herbivore (animal that eats vegetation). Gets its energy directly from producers.
Producer:	An organism that makes its own food using the sun's energy.
Quills:	Sharp spines used for protection.
Rodent:	A gnawing mammal.
Scavenger:	An organism that habitually feeds on refuse or carrion.
Secondary consumer:	Carnivore that eats herbivores; gets its energy from primary consumers.
Talon:	A sharp claw of a raptor, such as an eagle, owl, or hawk.
Tertiary consumer:	Carnivore that eats other carnivores.
Top carnivore:	The final consumer in a food chain; is not prey in its ecosystem.
Warm-blooded:	Endothermic. Having a body temperature that remains approximately the same, whatever the temperature of the surroundings.
Wildlife:	Animals that are not tamed or domesticated; includes, but is not limited to, insects, spiders, birds, reptiles, fish, amphibians, and mammals that are non-domesticated.

Pre-Zoo Activity

Introduction to Classification

1. Sorting Building Blocks

Objective:

To provide students with a basic understanding of classification.

Materials:

Lego or other building blocks in assorted colors and sizes.

Procedure:

Divide class into teams of 3 or 4 students.

Give each group a variety of Lego blocks.

Tell each team to separate the Lego into groups with similar characteristics. It is likely that each team will do this in a different way (sorting by color, size, purpose...)

Each team then explains to the class how they grouped their Lego and why they chose to do it that way.

Note: There is no correct way to sort Legos!

2. Sorting toy animals

Objective:

To provide students with a basic understanding of animal classification.

Materials:

An assortment of plush or rubber toys. Try to have representatives from all the major vertebrate classes: fish, amphibians, reptiles, birds, and mammals. An invertebrate group would also be good. Each student could bring one toy from home.

Containers (boxes, buckets, drawers, circle on floor) for placing sorted animals.

Procedure:

Pick up a toy and ask the students in which container the toy should be placed. (Any container is fine).

Pick up the next toy and ask again.

Continue with the other toys.

The students will intuitively classify most animals correctly, although they may have trouble with amphibians and reptiles. (*Teacher: These could either be left together, and the Zoo Docent will introduce the differences*).

When all the toys have been classified, lead the students in a discussion of how they knew where to put each toy. Write answers on a chart or blackboard and soon, the students will have created their own definitions for the major vertebrate classes.

Cold-blooded creatures

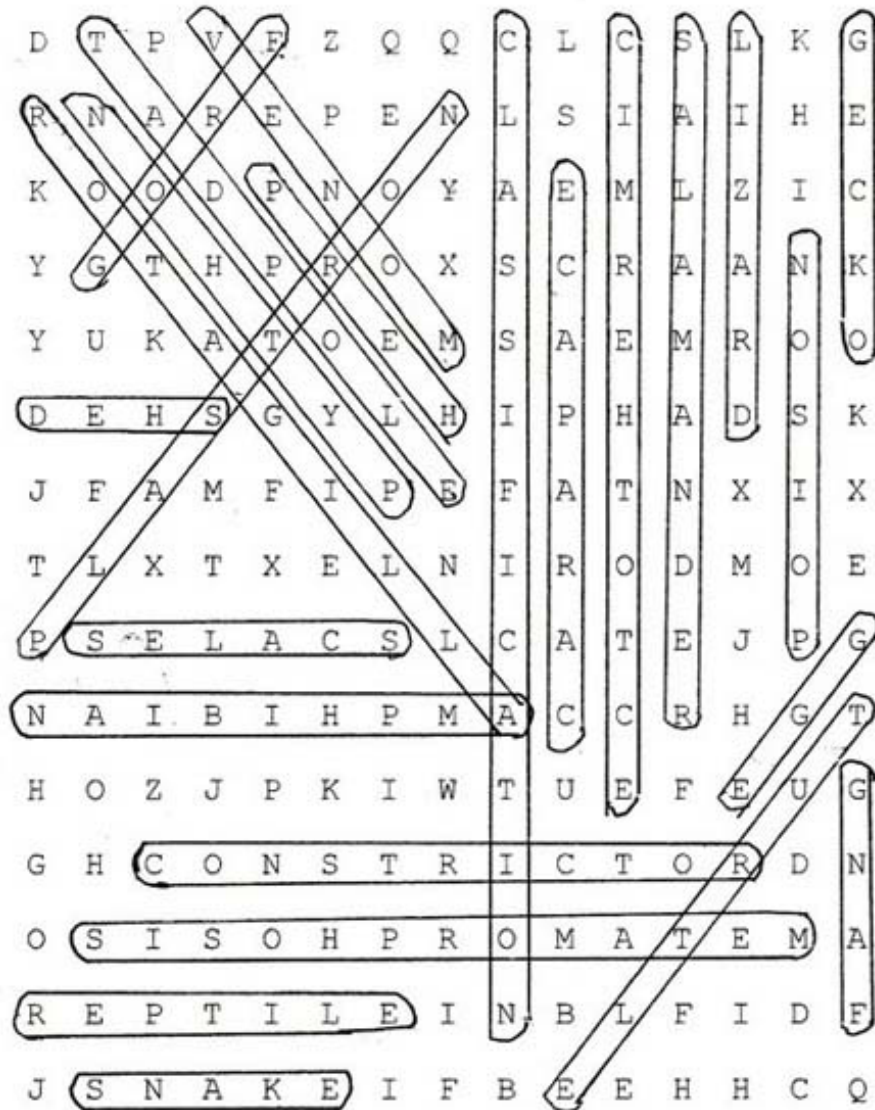
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ALLIGATOR
 CLASSIFICATION
 EGG
 GECKO
 METAMORPHOSIS
 PYTHON
 SCALES
 TADPOLE

AMPHIBIAN
 CONSTRUCTOR
 FANG
 HERP
 PLASTRON
 REPTILE
 SHED
 TURTLE

CARAPACE
 ECTOTHERMIC
 FROG
 LIZARD
 POISON
 SALAMANDER
 SNAKE
 VENOM

Cold-blooded creatures



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CARAPACE
ECTOTHERMIC
FROG
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POISON
SALAMANDER
SNAKE
VENOM

WHAT DO I EAT?

Beak

Purpose / Food

Example



flat strainer



long, pointed



Long, thin, pointed



short, conical



Long, rounded










Long, flattened
pouchlike



strong hooked

WHAT DO I EAT?

Beak	Purpose / Food	Example
 flat strainer	- to filter out small plants and animals in the water food: - small plants, bugs	Mallard
 long, pointed	- probing for insects often under the tree bark. - grubs and insects	woodpeckers
 long, thin, pointed	- to get deep into flowers food: nectar	hummingbirds
 short, conical	- very strong, can crack seeds food: thistle seed, sunflower seeds	cardinal blue jays chickadees
 long, rounded	- probe in the mud and water. food: worms, crustaceans other small creatures	Curlew kiwi snipe
 long, flattened pouchlike	- used as a scoop food: fish and other aquatic creatures.	pelicans spoonbills
 strong hooked	- tearing beak	eagles hawks - other raptors

What's your mammal IQ?

Name a mammal that:

1. can fly_____
2. is a herbivore_____
3. is extinct_____
4. is a marsupial_____
5. can run more than 50 mph_____
6. lives in social groups_____
7. is related to wolves_____
8. has a pouch_____
9. has a special way of protecting itself_____
10. is the largest member of the deer family_____
11. has fins_____
12. is a rodent_____
13. is found only in Australia_____
14. is native to South America_____
15. is aquatic_____
16. hibernates_____
17. migrates_____
18. stands almost 20 feet tall_____
19. is the largest animal ever to live on the earth_____
20. is born blind and helpless_____
21. is up and running within a short time of birth_____
22. can hold its breath for an hour_____
23. is diurnal_____
24. eats insects_____
25. has tusks_____

Food Web Game

Objective:

To show interdependence of all living things.

Materials:

Hat or nametags for each of the following living and nonliving things:

Nonliving: water, sunlight, air, soil

Plants: leaves, grass, flowers,

Herbivores: grasshopper, dove, deer, rabbit,

Carnivores: frog, snake, coyote, mountain lion,

Big ball of string or yarn.

Procedure:

Each student draws a nametag from a hat and puts it on.

Students stand in a big circle.

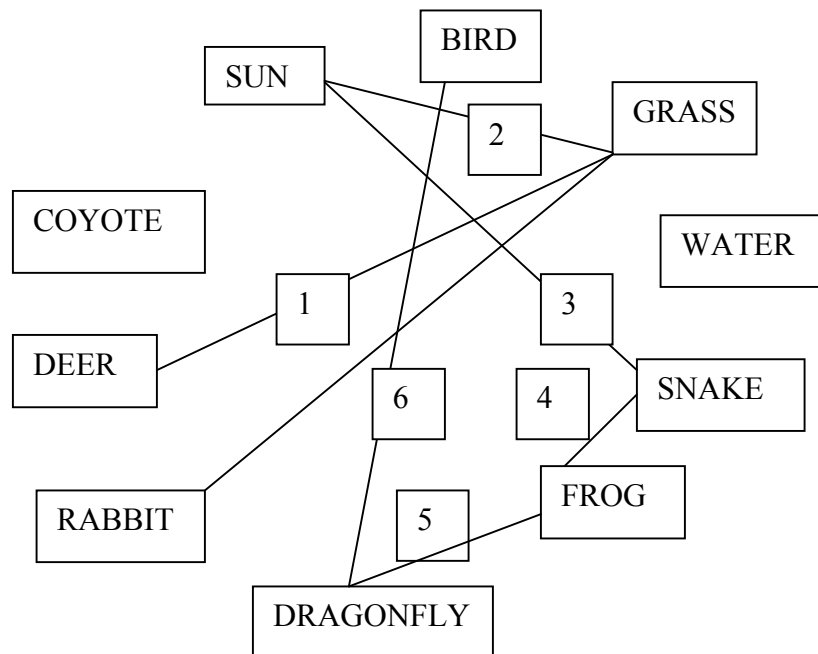
Give the ball of twine to a student, e.g., deer.

“Deer” keeps hold of one end of the twine, then passes the ball to the another student, naming the relationship. Example: Deer eats grass (1).

“Grass” then keeps hold of his twine, and passes the ball to another student, again naming the relationship. Example: Grass needs sun (2); sun warms snake (3); snake eats frog (4); frog eats dragonfly (5); dragonfly is eaten by bird (6) etc.

Continue until a web is created.

Then, remove one item. Let that student drop the twine. Observe the effect on the web.



Dissecting Owl Pellets

This is great activity, well worth the effort required to plan it!

Objective: Students will examine owl pellets and what their diet consisted of, specifically rodents. This will further their understanding of simple food chains as well as bone structure and identification.

Materials:

- Owl pellets: can be ordered from many teacher resource organizations, such as:
Project Wild, P.O. Box 59, Portland, OR 97207
- Paper plates
- Egg cartons to hold discoveries
- Sharp dissecting tools
- Tweezers
- Latex gloves
- Dust masks
- Pencil and paper
- Diagram of a rodent skeletal system, photocopied for every student

Method:

1. Hand out owl pellets and place on paper plates.
2. Ask students to examine their owl pellet. What do they notice?
3. Ask students to carefully pull apart owl pellets with their hands, then separate the bones and other fragments with tweezers. Place separated items in egg cartons.
4. Using the diagram of the rodent skeleton, students should then try to identify the bones. Ask them to record all bones found. Which student has the most bones?
5. Ask students to identify all the other items found in the pellet and record them.
6. Share the discoveries with the class by having every student walk around and examine each other's work area.
7. Pool all of the bones that the students found and try to assemble a complete rodent skeleton.
8. **OR** ask the students to arrange the bones into some imaginary creature and name their creation. This can be a great Halloween time activity because the created creatures are always SCARY!

(This idea was contributed by Thane Worm, teacher)

Post-Zoo Activity

Build a Colorado Food Web

Procedure:

Step 1.

Research: Allot each student one or more Colorado animals to research.

Ideally, students should gather the data for this activity while at the Zoo. They should use the Zoo Exhibit plaques to find their information.

Alternatively, students should research one or more Colorado animals in the library or on the Internet.

Have each student look for the answers to the following questions on one or more animals of their choice:

1. Is this animal a carnivore, herbivore, or omnivore?
2. Is this animal an arthropod (insect, spider, etc.), amphibian, reptile, bird, or mammal?
3. Is the habitat of this animal plains, shrub land, mountain, or aquatic?
4. Is this animal nocturnal or diurnal?
5. To what extent does this animal depend on camouflage?
6. What are this animal's predators?
7. What are this animals's prey items?

Step 2.

Each student should construct several possible food chains for their chosen animal(s). Remember, the arrows will follow the direction of energy flow: sun; producers (plants); primary (herbivore), secondary, and tertiary consumers. They should draw a different color box around each and write a key (e.g., green box: producer; yellow box: primary consumer; etc.)

Step 3.

Divide students into groups of 4 (each with different animals) and ask them to use their food chains to compile a Colorado food web (in poster format, using pictures from magazines etc., or hand- drawings, not words).

Step 4.

Groups share their food webs with the class.