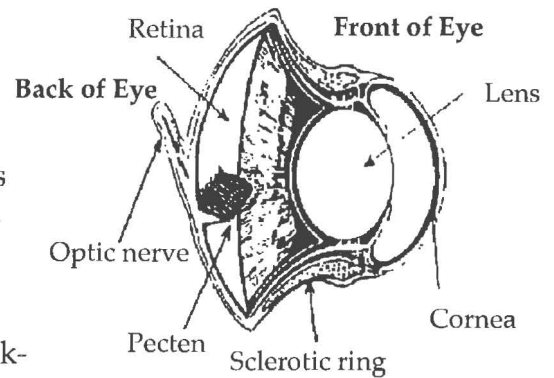




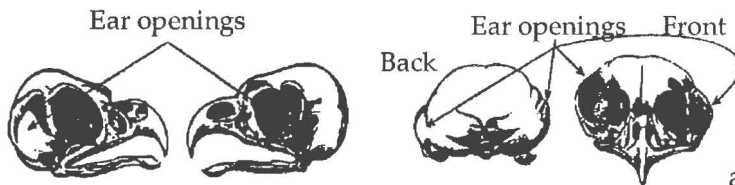
Owls

Owls are nocturnal, meaning they are active at night. They have specially-designed eyes, ears, claws, and wings that allow them to be experts at catching prey.

Owls' eyes are bigger than most other animals' eyes which allows all available light to enter their eyes. This feature makes them the creatures with the best night vision. Because there are so many rods (rods are receptors for light) packed into their large eyes, there is no room for muscles. Therefore, the owl's eyes remain fixed in their sockets. To compensate for this, the owl rotates its head. It can easily look directly over either shoulder. The owl's eyes do not contain cones (cones are receptors for color detection), so it sees only in black-and-white. Owls, like people, have three-dimensional vision which helps locate prey.



The owl's ears are also crucial to hunting in total darkness. The feather arrangement of the facial disc helps gather sound waves and directs the sounds to the ear holes on the edge of the disk. Owls' left and right ears are at different levels so they can catch sounds at slightly different times. This "binaural" hearing allows the owl easily to locate its prey.



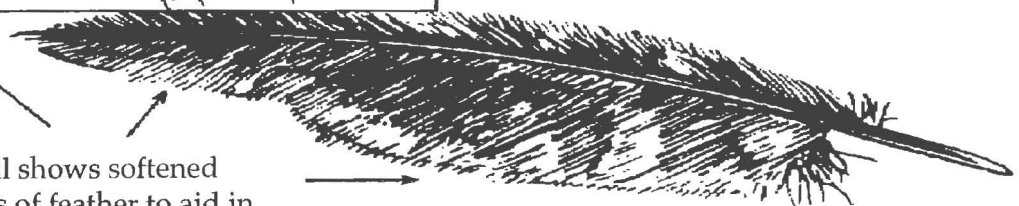
The claws of the owl are called talons. They are sharp and curved. There are four toes on each foot. At the moment of attack, an owl spreads all eight toes fully to better grab onto its prey. Most owls have feathers all the way down their legs to provide warmth in the winter and to assist them with silent flight.

Most birds have feathers that make noise when they fly. But the owl's feathers are fringed along the edges. This reduces air disturbances and reduces the noise of flight so that the owl can hear its prey moving. After capturing its prey, the owl flies back to its roost to eat. It usually swallows its prey whole. If the prey is too large, the owl can tear it into smaller pieces with its sharp, curved beak. The owl's digestive juices cannot break down the fur,



Feather adaptation for silent flight

Detail shows softened edges of feather to aid in silent flight



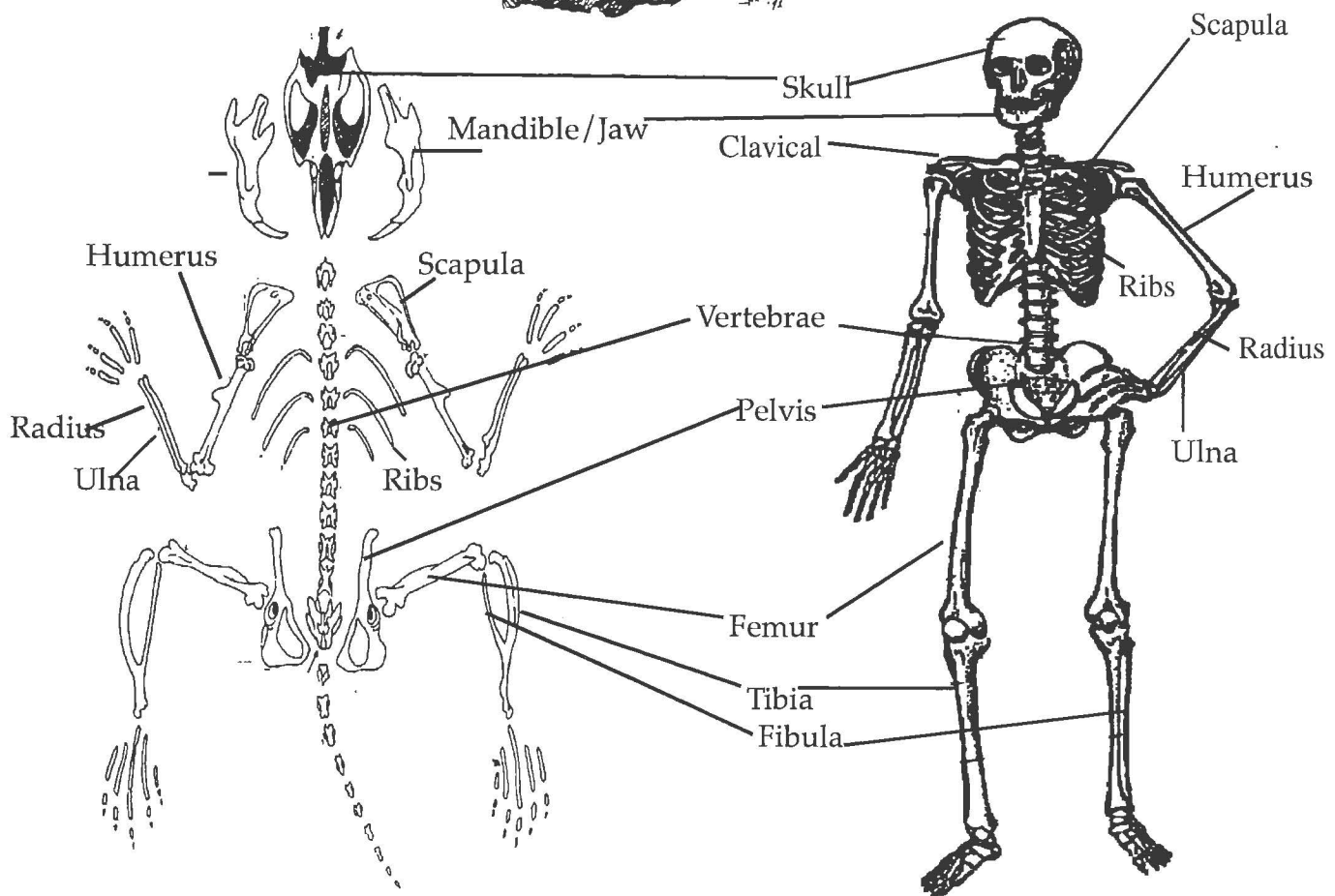


feathers, or bone that it swallows, so those undigestible materials are clumped together in the stomach and then regurgitated through the mouth. These clumps are called pellets and can be very useful in determining an owl's diet which can help determine the distribution of rodents in a given area.

The skeletons of animals such as reptiles, birds, and mammals contain bones that are very similar to humans' skeletal bones. Compare the bones of the small mammals in an owl's pellet to human bones.



Owl Pellet



Mouse Skeleton

Human Skeleton

Adapted from *Material On Owls* from the AIMS newsletter and is used with permission from the AIMS Education Foundation (P.O. Box 8120, Fresno, CA 93747).

Artwork is used with permission from *Owl Pellet Teacher's Guide* from Mountain Home Biological (P.O. Box 1142, White Salmon, WA 98672).



Activity: Owl Pellets

Objectives: Students will identify the animals whose skeletons are found in owl pellets. Students will investigate a food chain by dissecting and exploring owl pellets.

Materials: Owl pellets, dissecting tools, identification handout sheets, and paper masks. (Owl pellets are easiest to find in the winter when they stand out against the white snow background. Often an owl or groups of owls will use the same tree as a feeding site for many weeks. On a winter outing, encourage students to watch for pellets and save them to use in this exercise later in the year. Dry the pellets and store them in a container. Add a moth ball to control insect larvae living in the pellet. To obtain pellets, contact a local rehabilitator or raptor care clinic. They may also be purchased from some scientific supply houses such as Mountain Home Biological (Box 1142, White Salmon, WA 98672, 509/493-2669, fax 509/493-4321.). Pellets purchased from Mountain Home Biological are sterile. The company also supplies charts, skull sets, and videos.



Background: Many birds-of-prey or raptors produce pellets. Owls are best known for this practice, but some hawks, eagles, gulls, and other birds also produce pellets. The soft parts of their prey are digested in the stomachs of these birds. The fur, bones, feathers, and other hard items are not digested and form a pellet in the gullet of the owl. This pellet is regurgitated from the mouth and can be found under a tree, barn, or wherever the owl may have roosted that night. Owl pellets are made up of bones, teeth, hair, feathers, scales, and insect exoskeletons.

Owl pellets vary in size according to the owl's size, but they are generally oblong in shape and one to two inches in length. The pellets are dry and odorless. They do not contain any fecal matter.

You can often tell where an owl lives or hunts by observing what kind of animal skeletons appear in the pellets. For example, short-eared owls hunt in open fields at dusk, so their pellets contain skeletons of meadow voles, mice, and small birds. Long-eared owls that hunt in the forest eat short-tailed shrews.

Procedure: Lead a general discussion about the foods of birds-of-prey or contact a local naturalist or rehabilitator to talk about owls or hawks with your students. Work in groups of three or four students per pellet. It is recommended that a paper mask be worn to avoid breathing pellet dust. Put the pellet on a white sheet of paper. Ask the students to inspect their pellets and note the size and shape, bones or feathers present, or any other clues that will help the students identify the contents. Begin by gently pulling the pellet apart using a



dissecting needle. Toothpicks also work. Carefully separate the bones from the fur or feathers. Use the identification sheet to lay out and reconstruct the skeletons of the animals. Try to clean the skulls as thoroughly as possible since these are the easiest to identify. Use the types of teeth and their markings to identify the animal. Not all bones and skulls can be identified. After working with the pellets, instruct the students to wash their hands thoroughly with soap and warm water.

Optional:

If proper facilities are available, hair and feathers can be removed more completely by dissolving the pellets with sodium hydroxide (NaOH). Please use appropriate caution when working with NaOH. This method requires adult supervision.

For this technique, 50 gm of NaOH crystals are dissolved in 500 ml of water. Place the pellets in this solution for two to four hours and stir occasionally. This process will sufficiently dissolve hair so that washing the solution through a kitchen strainer completely frees the bones of fur and debris. Washing should be done over a pan to catch any fragments that may pass through the screen. Even very small, delicate bones are unharmed by this process. As in the dissection technique, bones and teeth are sorted by species and are later examined using a hand lens or dissecting microscope and reference materials to identify the specimens.

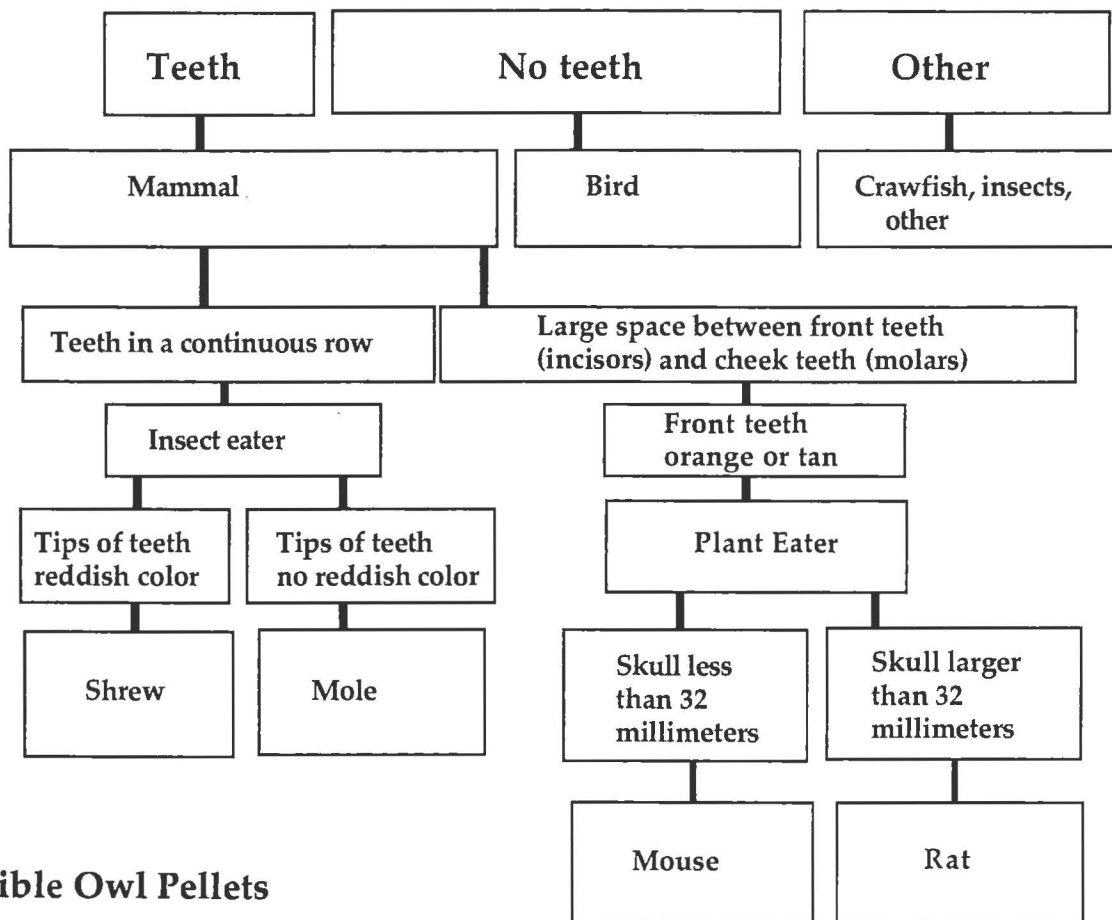
Follow-up: Assume one owl produces one pellet a day. Because owls often swallow their prey whole, each pellet contains virtually complete skeletons of the animals which the owl ate the day before the pellet was formed. Great-horned owls often do not swallow their large prey whole but tear it into chunks to swallow. Find out how many animals your owl has eaten by counting the number of skulls and pairs of jaws. Estimate the owl's annual food consumption. Make a list of the types and quantity of bones the students found (skull, rib, leg bone, etc.) and the number of each. How many individual animals does this represent? How do you know this? Assume that the following types of food are available in the area where this owl lived: grasses, vole, decaying plants, pillbugs, shrews, seeds, and sparrows. Use these creatures to build a picture of the food chains in the owl's habitat.

A word of caution: Many people recommend using masks so students don't breathe the dust from owl pellets. It is also recommended that owl pellets be microwaved at high for 20 seconds or baked for 20 minutes at 350 degrees F. to kill any microbes that might be active. Pellets purchased from Mountain Home Biological have been sterilized by autoclave.



Activity: Owl Pellet Analysis Bone Chart

Pellet Sorting Key: Using skulls found, identify prey consumed.



Edible Owl Pellets

Follow up this activity by making edible owl pellets. Have the students follow the recipes and add an assortment of noodles, fruits, and nuts to represent prey items. These can be sorted and keyed just like actual owl pellets.

Recipe 1

Mix:
2 1/4 cups of Bisquick baking mix
2/3 cup of milk
black food coloring
Add various shaped bits of pasta.
Cook 8-10 minutes at 450 degrees F.

Recipe 3

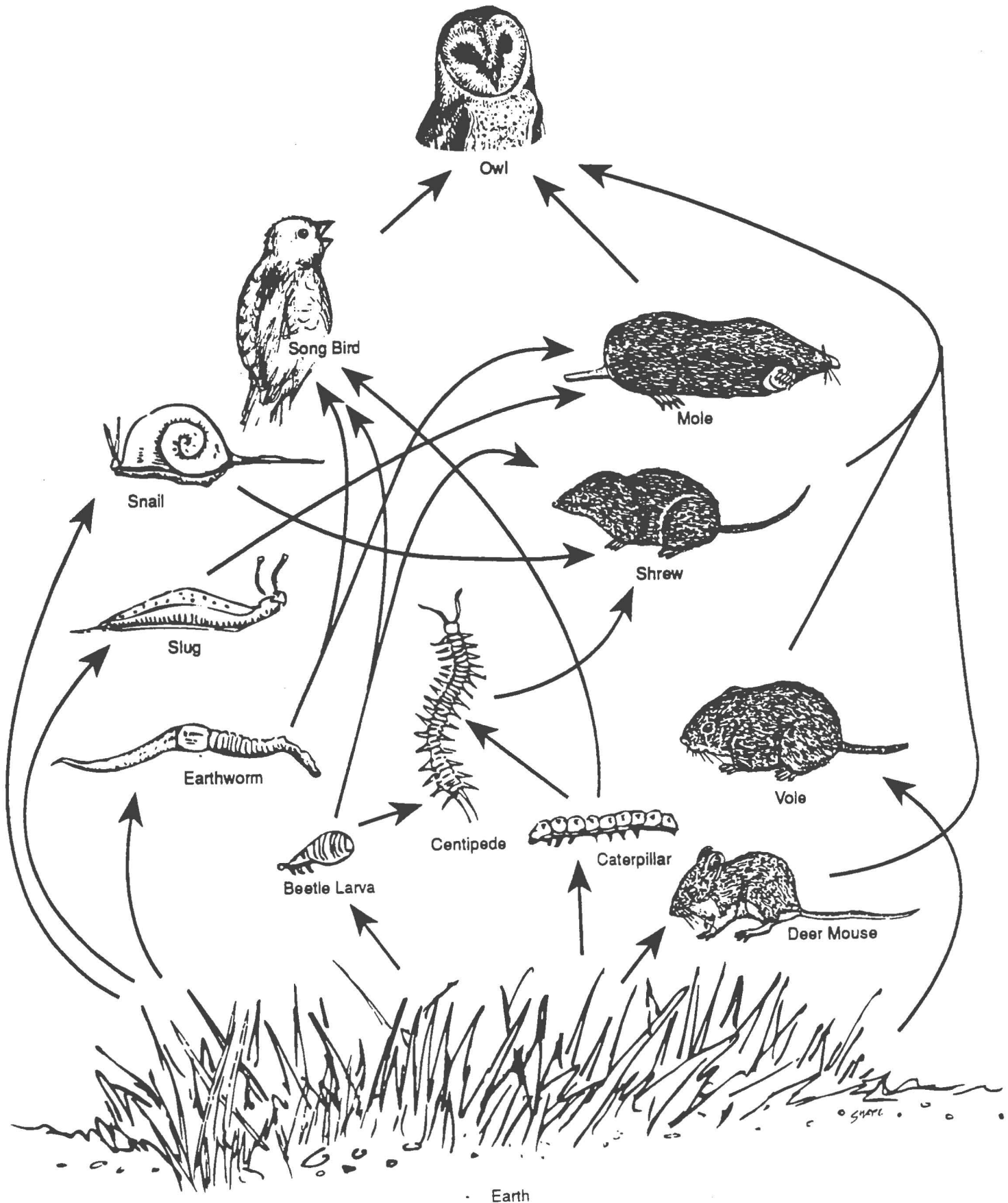
Mix equal parts of peanut butter and honey. Add an assortment of dried fruits, nuts, coconut, and chocolate chips. Shape into pellets and refrigerate until hardened.

Recipe 2

2 1/4 cups of Bisquick baking mix
2/3 cup of milk
1/2 cup of powdered sugar
black food coloring
Mix and add chow mein noodles and bits of Teddy Grahams and animal crackers.
Shape and cook 8-10 minutes at 450 degrees F.



FOOD WEB





Activity: Owl Pellet Analysis Sheet

1. Size of your pellet: length _____ width _____
2. How many skulls were in your pellet? _____
3. What kind of skulls were they? (mammal or bird) _____
4. By looking at the skull, what kind of mammal did the owl eat?

5. What were the diets of the animals whose skulls you found in the pellet?

6. What kind of habitat does this prey animal inhabit (woods, grassland, etc.)?

Class Record

8. Total number of prey animals found (count skulls) _____
9. Total number of pellets examined _____
10. Average number of prey animals in each pellet _____

Tips on Identifying Prey Animals

House mouse - rounded teeth in skull; rear teeth have three rows of cusps



Deer mouse/White-footed mouse - rear teeth have two rows of cusps, one on the outside and another inside

Meadow vole - looking down on the teeth, they form a zigzag pattern



Short-tailed shrew - longer skull; red-stained teeth



Birds - look for their feet and beak in the pellet

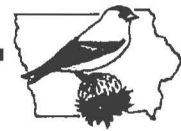
Insect parts - the hard backs of beetles and insect mouth parts are often found

Rabbit - larger bones are often broken

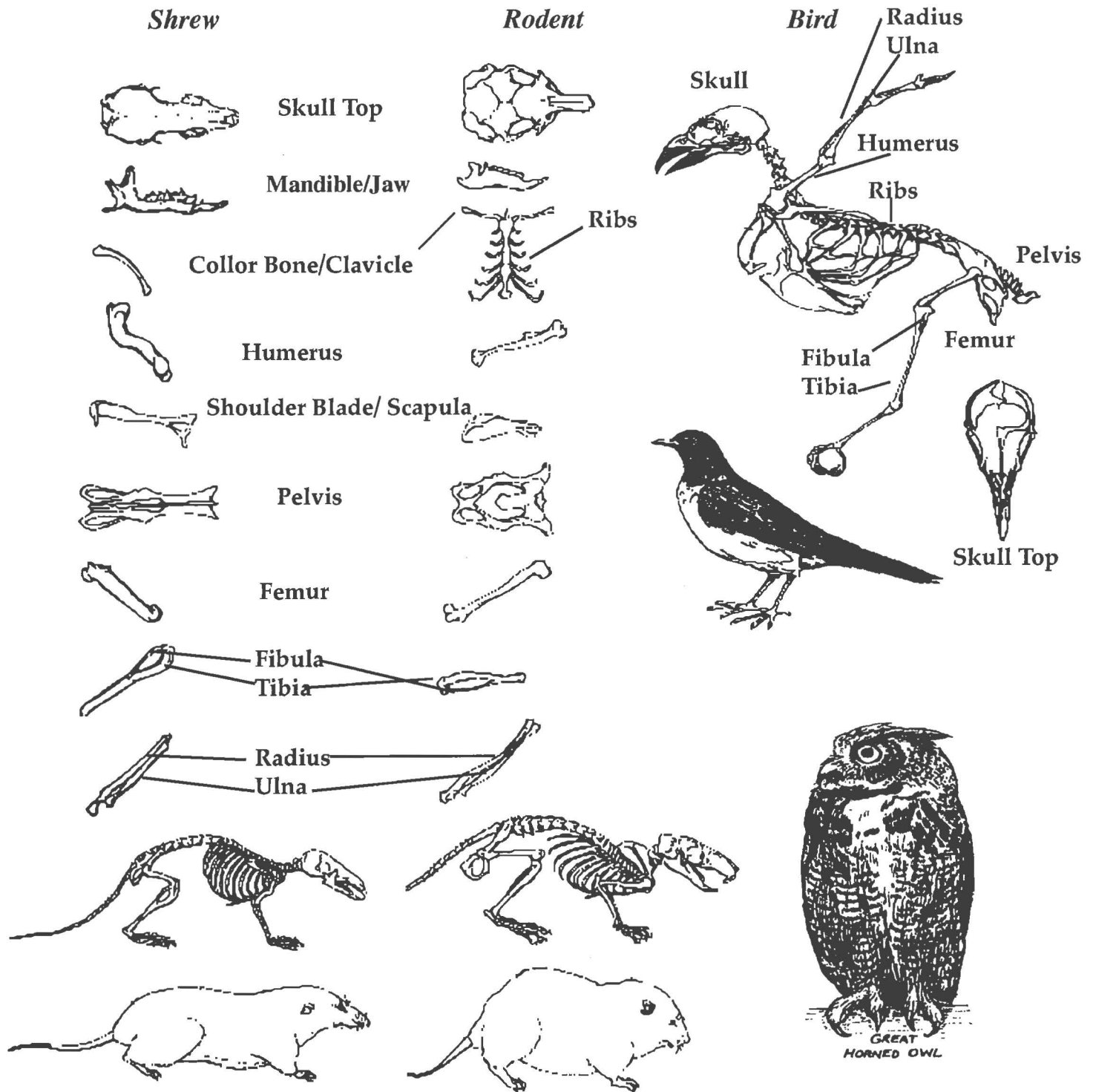


Activity: What I found in my owl pellet:

Object	Drawing	Name of Animal	Number Found	Details/ Comments
Skulls and mandibles (jaw bones)				
Leg bones (ulna, radius, humerus, femur, fibula, tibia)				
Ribs				
Pelvis				
Shoulder blades (scapula)				
Vertebrae (back and tail)				
Feet (metacarpals and metatarsals)				
Clavicle (collar bone)				
Other				



Activity: Bone Sorting Guide



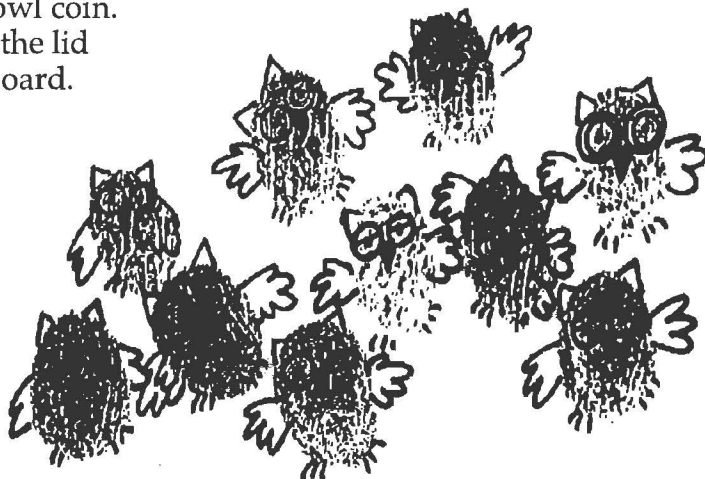


Owl Extras

Long ago, owls were thought to possess magical powers. Some people feared owls, while others worshipped them. Many people have called the owl wise but owls are no smarter than any other bird. The idea most likely came from Greek mythology. Athena, the goddess of wisdom, had an owl as a constant companion. An owl is even pictured on ancient Greek coins dating back to the fifth century B.C.! Discuss the owl and its wisdom. Encourage the students to explain why they think the owl is considered a wise animal. Challenge them to create an owl coin. Recycle margarine lids and use them to draw a circle on tag board. Ask the students to cut out the circle and design an owl coin. When completed, press their designs inside the lid and display the coins on a shelf or bulletin board.

Finger Plays

There was an old owl ("whoo-who")
 Who lived in an oak. (stand like a tree)
 The more he saw, (point to eyes)
 The less he spoke. (point to lips)
 The less he spoke, (point finger to lips as "shhh!")
 The more he heard. (cup hand behind ear)
 Why can't we be (point to self)
 Like that wise old bird? (tap temples)



Book To Read: Read *Owl Moon* by Jane Yolen, a 1988 Caldecot Medal winner (Philomel Press, 1989). In this poetic story, a young girl describes the anticipation and excitement of a night spent owling with her father. The trek through the snow-filled woods, the sighting of the great-horned owl, and the return home all add up to a magical winter evening. John Schoenherr's illustrations are the perfect match to Yolen's storytelling.

Listening Skills: Before beginning to read *Owl Moon*, teach your students to listen carefully and take note of what one needs to go owling: nightfall so that owls are awake, warm clothing to keep warm in the woods, a full moon to help light the way, quietness so you don't scare the owl, bravery so you aren't afraid of night sounds and shadows, patience so you are not disappointed if you don't see an owl, lessons on how to call an owl, hope that an owl will show up, and a flashlight to shine on the owl when it appears. How many different things can you name?

An Owling We Will Go: Plan an imaginary owl hunt. Take the class outside and set a scene similar to the one in the story. Walk the students through an owling adventure, letting your imagination and descriptions provide the scenery. Teach the students how to call an owl and encourage their listening skills.

In Iowa, the barred owl is easy to imitate and will often respond and fly in for a look. Their call sounds like "Who cooks for you? Who cooks for you all?"

This activity is used courtesy of *Copy Cat* (September/October 1992).