

Guess Hoo's for Dinner?

Rangers in the Classroom—Presentation Lesson Plan



Grade Level(s): 4th & 5th

Setting: Classroom

Duration: 1 hour

Standards Addressed:

4th Grade

° Science—Life Sciences:

2.b, 3.b

° Science—Investigation and Experimentation:

6.f

° Listening & Speaking:

1.1, 1.2

5th Grade

° Science—Investigation and Experimentation:

6.a, 6.b

° Listening & Speaking:

1.1, 1.2, 1.3

Vocabulary:

adaptation, analyze, aperture, binaural hearing, carnivore, cone, crepuscular, diurnal, ear tufts, niche, nictating membrane, nocturnal, operculum, predator, prey, rod, sclerotic ring

Introduction:

Welcome to the Rangers in the Classroom—Guess Hoo's for Dinner presentation. This program introduces students to the unique hunting adaptations of owls. Through the dissection of an owl pellet replica, students will learn what owls eat and how they rely on their senses for hunting.

Objective:

After completing this program, 4th and 5th grade students will be able to:

1. List and explain three unique hunting adaptations of owls.
2. Describe what an owl pellet is, why owls produce them and how they are produced.
3. Name at least three things that might be found in an owl pellet.
4. Demonstrate the vocalizations owls make and why.

Materials:

- ° Great Horned Owl puppet
- ° Wing simulations (2)
- ° Great Horned Owl skull
- ° Great Horned Owl talon
- ° Great Horned Owl egg
- ° 30 owl pellet replicas
- ° Petri dishes
- ° Real sample owl pellets
- ° Laminated images of owls (Barn, Screech and Great Horned)
- ° Guess Hoo's For Dinner Worksheet
- ° Laminated Sorting Activity Worksheet
- ° Park maps and student fee waivers



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Presentation:

Introduction

Owls are swift, silent hunters of the night. Throughout time, different cultures around the world have associated these mysterious creatures of the night with the forces of good and evil (usually evil). In more recent times, owls have become a symbol of knowledge and wisdom. How do you feel about owls?

Owls, like hawks, falcons and eagles, are called birds of prey. Birds of prey are carnivores or meat eaters that use their feet instead of their beak to capture prey. They have exceptional vision, a sharp, hooked beak and powerful feet with curved, sharp talons.

Owls also have a highly developed hearing/auditory system and are capable of virtually silent flight. These unique adaptations help owls hear the faintest movement or rustle of leaves on the ground, hone in on the critter's exact location, swoop in on silent wings and fly away with the creature held firmly within its talons...all in the dark. These adaptations also give owls a unique place or niche within Sequoia and Kings National Parks.

I. Has anyone in the class ever seen an owl? Ever heard an owl?

A. Owls are the hunters of the night: more likely to hear an owl than see an owl

B. Vocalizations

1. Owls are mostly known for making the classic "hoot" sound.

2. They also shriek, hiss, whine, bark, whistle and click their beaks.

3. Each species has a unique vocalization.

a. Most vocalizations are for claiming territory, attracting a mate or in warning.

b. Demonstration of three owls calls found within Sequoia and Kings Canyon.

Directions:

1. Show students photo of Great Horned Owl.

2. Discuss the feather coloration and camouflage.

3. Ask students why they think camouflage is important for an animal that sleeps during the day.

4. Produce the Great Horned Owl call and ask students to repeat it back.

5. Repeat process for the Barn Owl and Western Screech Owl.

**The goal of this demonstration is to introduce students to the idea that owls make unique sounds. Since owls have excellent camouflage, they may not be easy to see, but students can learn to identify owls in their area by learning their calls.

II. Ecological Niche

A. **Niche** describes the relational position of a species or population within an ecosystem.

1. Description of a niche may include descriptions of the organism's life history, habitat and place in the food web.

2. Shorthand definition of a niche is how an organism makes a living or its job.

B. What niche do the students occupy? (e.g. family/home, school, sports teams, clubs etc.)

1. Ask students to consider their place within their niche.

2. What chores do the students perform at home that nobody else does? Role they play within their team?

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C. Owls' niche or job within Sequoia and Kings Canyon National Parks

1. Owls are very effective **nocturnal predators**/ hunters.
 - a. Nocturnal means they are active at night.
2. Not in competition with other birds of prey for food because they hunt at night.
 - a. Most other birds of prey are **diurnal** or active during the day.
 - b. Some winged creatures, like bats, are **crepuscular** or active at dawn & dusk
2. Ask students when they usually eat (day, night or twilight). Do they have competition for food? (e.g. siblings)
3. Owls are **carnivores** or meat eaters.
 - a. **Prey** includes snakes, birds, voles, mice, squirrels, bugs, cats, small dogs—depends on the size of the owl and what is available to eat.
4. Within their niche or job they avoid competition with other types of owls by living in different places within the park or by hunting different things.
5. To perform their night hunting job well, owls have unique **adaptations** that make them especially skilled and efficient hunters.
6. How might you equip yourself for hunting at night?

III. Hunting Adaptations

A. Nocturnal Eyesight

1. Large eyes compared to the size of their skulls.
 - a. Improves their ability to see prey in the dark.
 - b. Account for 1-5% of owl's body weight.
 - c. If our eyes were proportionally the same size, they would be the size of a softball or a large apple.
2. How do owls see in the dark?
 - a. Inside the retina of our eyes, we have **rods** and **cones**.
 1. Rods are sensitive to light and movement, but do not react to color.
 2. Cones are the cells that react well to color.
 - b. Owls have very few cones and therefore limited ability to see color.
 1. At night, there is little need for seeing colors.
 2. Humans and animals active during the day (diurnal) have retinas that are dominated by cones, as we are reliant on color.
 - c. Owls have an abundance of rods.
 1. Large size and large number of rods give owls crisp, clear shapes of plants and animals in the dark.
3. Shape of Eyes
 - a. Owls do not have eye *balls*, but rather elongated tubes.
 - b. These large, heavy eyes are held in place by bony structures in the skull called **sclerotic rings**.
 1. For this reason, owls cannot "roll" or move its eyes.
 2. Can only look straight ahead.
 - c. Owls have three eyelids.
 1. Normal upper and lower lids, the upper closing down when the owl blinks and the lower closing up when the owl is asleep.
 2. Third eyelid is called the **nictating membrane**.
 - a. A thin layer of tissue that closes diagonally across the eye,

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from the inside to the outside cleaning and protecting the surface of the eye.

4. Binocular Vision

- a. Owls, like other predators have excellent depth perception (very important for hunting and capturing prey).
- b. Owls have a field of vision of about 110 degrees.
- c. Where the field of vision from each eye overlaps in the middle is called binocular vision.
 1. About 70 degrees of this 110 is in binocular vision.
- d. Demonstration of students' field of view.

Directions:

1. Ask students to extend their arms out in front of their bodies with their pointing finger extended on each hand.
2. Have the students pick a point directly in front of them to focus on.
3. Have the students start to move their extended arms out to the side, while still keeping their eyes forward.
4. Have the students keep moving their arms out to the side as far as they can while still being able to see their extended finger.
5. Reiterate a safety message to make sure the students are not hitting and poking one another with extended arms and pointed fingers.
6. Have the students put down their arms, but still keep their eyes fixed facing forward.
7. Ask them how it would feel to not be able to move their eyes around in their sockets.

**The goal of this short exercise is to introduce the idea of field of vision, how wide it is for most humans (about 180 degrees) and how owls cannot move their eyes.

- e. Since owls cannot move their eyes inside their head, they must swivel their heads to change their field of vision and the location of their binocular vision.

B. Flexible Necks

1. Owls have long and very flexible necks.
 - a. Can turn their heads almost completely around (about 270 degrees measured from a forward facing position) and almost upside-down.
 - b. The long flexible neck is not always obvious because it is hidden by feathers and the owl's posture.
2. Range of movement is due to the 14 vertebrae making up the neck.
 - a. Humans only have 7 vertebrae.
 1. Have the students feel the back of their necks. The pointy bone they feel is one of their seven vertebrae.

C. Hearing—highly developed auditory system

1. Ears

- a. Many owls have long feathers on top of their heads that are often called "ears" or "ear tufts" or horns.
 1. These "tufts" of feathers are not connected to the ears and are not used for hearing.
 2. They are simply display tufts to intimidate predators or to impress future mates.
- b. Owl ears are located on the side of the owl's head, behind the eyes.
- c. With some species (Barn Owl), the ears are asymmetrical - one ear is higher

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than the other.

1. Barn Owls also have a very distinct facial disk

a. The facial disk acts like a radar or satellite dish guiding sound to the ears.

b. Special muscles in the face allow the shape of the disc to be changed at will.

d. The ear openings called **apertures** are covered and protected by facial disk feathers.

1. The shape and size of the aperture and outer ear depends on the species of owl.

a. Some species have small, round apertures and others have oblong slits.

2. In some species the ear opening is covered/protected by a valve called an **operculum**.

a. Operculum comes from the Latin word meaning "little lid."

b. The operculum is movable—can be pulled flat against the head or stand out from the owl's head.

c. Movements of the operculum can help focus sound waves coming from different directions.

d. Same word is used for the hard flap over a fish's gill or the flap that a snail uses to seal its shell.

2. Range of Hearing

a. Owls' range of audible sounds is similar to that of humans.

b. Owls' hearing is much more acute at certain frequencies enabling owls to hear even the slightest movement on the ground or even underground.

3. Reliance on hearing for hunting

a. Depend more on hearing than sight for hunting.

b. **Binaural hearing**: when a noise is heard, an owl is able to tell from what direction because of the minute time difference in which the sound is perceived in one ear before the other.

c. For example, if the sound was to the left of the owl, the left ear would pick it up before the right ear. The owl then turns its head toward the sound. When the sound arrives at both ears at the same time the owl knows the prey is right in front of it.

1. This process of honing in on a sound and translating the up/down and right/left sound waves takes a fraction of a second and gives the owl a mental image of the space where the source is located.

2. Studies of owl brains have revealed that the medulla (the area of the brain associated with hearing) is much more complex than in any other birds.

D. Silent Flight

1. Owls are uniquely capable of virtually silent flight due to the comb-like or fringe-like leading edge of the primary wing feathers referring to as "fluting" or "fimbriae."

a. With a normal bird in flight, air rushes over the surface of the wing, creating turbulence, which makes a gushing noise.

b. With an owl's wing, the comb-like feather edge breaks down the turbulence

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into little groups called micro-turbulences.

c. This effectively muffles the sound of the air rushing over the wing surface and allows the owl to fly almost silently.

2. Silent flight gives the nocturnal owl the ability to capture prey by stealth.

a. This adaptation is not present in some owls that hunt in the daytime.

3. Silent Flight Demonstration

Directions:

1. Using the two wings simulators, show students the different appearance of a "wing" with a smooth edge verses one with a fluted edge.

2. Whirl the smooth "wing" around until you generate a whirring noise.

3. Ask students if they think a bird making that much noise with its wings would be able to hunt by stealth.

4. Whirl the fluted "wing" around.

5. Ask students to compare the sound generated by the two different "wings."

6. Ask the students which type of wing would they want if they were a hunter.

** The goal of this exercise is to demonstrate how this seemingly minor adaptation of fringed feathers make it possible for owls to fly virtually without making a sound.

E. Talons

1. Like all birds of prey, owls have sharp, powerful talons.

2. Each owl has eight talons: one talon per toe and four toes per leg.

a. They are widespread usually with three in front and one in back.

b. Talons clamp down tightly on a perch while the owl is sleeping.

3. The outer toe is highly movable and can "swing" around.

a. Toes can spread out in a wide arc in preparation of capturing prey.

b. Toes can move to a two in front-two in back talon arrangement for a better grip on wiggling prey.

1. Demonstration of how effective and helpful the moveable talon is on gripping prey.

Directions:

1. Have each student take out a pen or pencil and place it on their desk.

2. Have the students place their hands together palms facing each other.

3. Have the students hold up three fingers on one hand and one finger on the other in the shape of a claw.

4. Ask the students to try to pick up their pen/pencil with their 3 in front-1 in back talon arrangement.

5. Have the students switch to the 2 in front-2 in back talon arrangement.

6. Have the students try to pick up their pencils again.

7. Ask the students which way was easier.

**The goal of this exercise is to demonstrate how advantageous the moveable toe is for gripping prey.

4. The size of the talon is indicative of the size of the prey.

a. Great horned owls have enormous, piercing talons that enable them to take prey as large as a skunk.

1. Usually eat mice, rats, voles, moles and other small animals or birds.

F. Beak

1. Grooming

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- a. Owls use their beaks and talons to smooth and groom feathers.
- 2. Eating.
 - a. Owls have short, thick, pointy, hooked beaks.
 - b. Beaks are adapted for ripping flesh.
 - 1. The downwards pointed beak also helps increase the surface area in which sound waves are collected by the facial disk thereby assisting hearing.
 - c. Food is swallowed whole or if it too big, it is torn apart.

IV. Owl Digestion

A. Pellets

1. Owls swallow the entire creature when they eat...fur, bones, feathers etc.
2. The nutrients are absorbed in the stomach and the undigested parts are gathered in the gizzard, a muscular pouch in the owl's digestive system.
 - a. The gizzard operates like a trash compactor, pressing all the bones, fur, feathers, and other indigestible stuff into a firm, oval-shaped ball.
 - b. About 8-12 hours after eating, an owl will regurgitate (spit up) the pellet and let it drop to the ground below.
 - c. Not all of the bones will be in the pellet. Many of the tiny bones are actually digested providing a source of calcium.
3. Pellets are clean of flesh and are virtually odorless
4. These neat little packages of fur, bones, feather and other things the owl cannot digest tell us many things:
 - a. A pile of pellets under a tree indicates an owl roost site.
 - b. Scientists have used the bones left in owl pellets to determine what kinds of mammals are present in the area.
 - c. An examination of a pellet can tell us what the owl has been eating.

Owl Pellet Dissection Activity (20-25 minutes)

Directions:

1. Explain to the students that they will now have an opportunity to dissect a replica of an owl pellet to try to discover what the owl ate. *Emphasize that the pellet is not real.
2. Divide the students into groups of two (or groups of three in large classes) for this activity.
3. Pass out one Petri dish, one laminated sorting sheet, one worksheet and one owl pellet replica to each group.
4. Tell the students not to open their pellet packages until every group has all their materials for the activity.
5. Once all groups have their materials, have the students carefully unwrap their pellet.
6. The students should separate out the bones from the fur and feather and try to match them to the skeletons found on the laminated sorting sheet.
7. Once they have matched most of the bones found in their pellet, the students should start completing the worksheet.
8. Leave enough time at the end of the activity to discuss questions six and seven on the worksheet.
9. Have the students carefully re-wrap the pellets to ensure none of the bones fall out.
10. Collect the materials, but let students keep their worksheets.

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Vocabulary:

Adaptation—noun—a behavior, physical feature or characteristic that helps an animal survive and make the most of its habitat.

Analyze—verb—examine methodically and in detail the structure of something, typically for purposes of explanation.

Aperture—noun—ear opening on an owl.

Binaural hearing—noun—ability to catch sound in the near ear a split-second before sound reaches the far ear, this allows for an owl to determine from which direction a sound originates.

Binocular vision—noun—vision in which both eyes view the same scene from slightly different aspects; an aid to judging distance.

Carnivore—noun—an animal that eats only meat.

Cone—noun—a light sensitive cell in the eye that sees color.

Crepuscular—adjective—active at dusk and dawn.

Ear tufts—noun—extended feathers on the head of some owls that are often mistaken for ears but are not related to hearing.

Diurnal—adjective—active during the day.

Niche—noun—a position or role taken by an organism within its community.

Nictating membrane—noun—a third eyelid (in owls usually opaque), which cleans and protects the eyeball.

Nocturnal—adjective—active during the night.

Operculum—noun—small valve covering the aperture.

Predator—noun—an animal that kills another animal for food. Predatory birds are often called birds of prey.

Prey—noun—an animal that is fed on by other animals.

Rod—noun—a light sensitive cell important for seeing in low light that helps to distinguish between light and dark.

Sclerotic Ring—noun—bony structure in an owl skull that holds the eye.

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Sibley, D. A. *The Sibley Guide to Bird Life and Behavior*. New York, NY: Alfred A. Knopf, Inc., 2001.