NORTH CAROLINA NCCAP CENTER for AFTERSCHOOL PROGRAMS
Public School Forum of North Carolina

OWL EXPLORERS LESSON

DRIVING QUESTION: HOW CAN AN OWL'S SUPPER TELL US IF AN ECOSYSTEM IS HEALTHY?

Recommended Grades: K – 8; Adaptations for 9 – 12.

Classroom or Center Activities	*Outside or Larger Space Activities*	*Technology-Based Activities*	*Stem-to-Go Take Home*	*Field Work and/or Natural Area Needed*
X	X	X	X	X

Materials: Owl Pellets (1 pellet for 2 – 3 participants), paper plates or paper towels or newspaper, tweezers (forceps), and or toothpicks, participant handouts

Teacher Prep: <10 Minutes

Participant activity: 30 minutes to 1.5 hours

Objectives:

1. Use scientific keys to compare and contrast skeletons of prey animals. (K-8)
2. Classify organisms by the role they play in ecosystems/food webs. (K-8)
3. Graph the types of prey species found in owl pellets. (K-8)
4. Calculate energy transfer from prey to predator, as, adapted from Carolina Biological's Owl Pellet Food Webs: A model of Energy and Mass Transfer for grades. (5-8)
5. Calculate and infer the vulnerability of owls' eggs from biomagnification of pesticides. (7– 12)

STEM Skills

S: Classify organisms

T: Use tools to dissect

E: Reconstruct skeletons of prey animals

M: Analyze and interpret data through graphs

Teacher Tips: Exploring Owl Pellets

Plan ahead: Order pellets 2 weeks ahead of time.

Total prep: < 10 minutes to make copies.

Safety: Owl pellets that are purchased commercially have been sterilized to kill any bacteria/pathogens. Please note suggestions for the STEM To-Go owl activity for establishing boundaries and safe movement outdoors at night.

Sensory Integration Issues: Pellets are not "poop", instead they are the indigestible parts of prey that the owls expel or "puke." Participants who have cats may have seen hairballs that cats sometimes vomit, but owl pellets are not slimy. Pellets have no odor. Pellets are dry, crumbly, and feel like dryer lint with sticks inside them. Pellets generally come wrapped in foil, which may be a problematic sound/texture for some participants. Regarding the baby owl game, the hooting or calling might be overwhelming in a gym or echoing open area. Try prompting pairs to use "baby owl" voices or allow teams to hoot one pair at a time.

Cost: It is recommended that a group of 2- 3 participants share a pellet. Pellets usually cost around $2 – $3 dollars.

What else do I need? Participants can use their hands or tools like toothpicks and tweezers to break apart the pellets and separate out the bones onto a paper plate, paper towel, or newspapers.

Clean Up: At the end of the lab, everything can be disposed of directly into the trash, or bones can be glued to black construction paper (see X-Ray Art). Participants should wash their hands with soap and water. Any equipment used and surfaces can be washed with soap and water as well.

Owl Pellet Dissection Directions

1. Print it out:
    a. Make one copy per group of the Barn Owl Trust handouts about owl adaptations. https://www.barnowltrust.org.uk/owl-facts-for-kids/barn-owl-trust-lesson-plans/science-educational-resources/science-barn-owl-adaptations/
    b. Make one copy per group of the food web. https://www.barnowltrust.org.uk/owl-facts-for-kids/barn-owl-trust-lesson-plans/science-educational-resources/science-food-web/
    c. Make one copy per participant of the Carolina Biological Owl Pellet https://www.carolina.com/pdf/activities-articles/Owl_Pellet_Bone_Chart_grid.pdf
    d. Make one copy per group of the Lab Sheet.
2. Activate prior knowledge: Use the *Barn Owl Trust* handouts to prompt participants - What does an owl look like? What kinds of adaptations help it hunt other animals? What physical clues let you know that this bird, called a raptor, is a predator? How many different types of animals does a barn owl eat? Are they all on this handout from Carolina Biological? Why not?
3. Procedure:

a. Place one owl pellet per 2-3 participants on a paper plate or paper towel. Provide toothpicks, tweezers (forceps), and a place to segregate the bones from the rest of the pellet.

b. Unwrap the owl pellets and break them into thirds or in half so that each participant has a piece of the pellet. Ask participants to use their hands or tools such as toothpicks or tweezers (forceps) that you have provided.

c. Match the bones to the bone chart. How can they tell the difference between types of bones? Between kinds of animals?

4. Data Collection: Separate, identify, and classify the bones by laying them on top of the Owl Pellet Bone Chart.
5. Collaboration: Participants should count up tally and graph the number of bones for each pellet. Then participants should count up the total number of animals from types of bones found by the class. Multiple skulls or jaws would likely indicate multiple individual animals, as would different types of bones.

Type of Organism	Total number of Bones in my pellet	Total number of different individual animals in my pellet	Number of individual animals found in my group's pellet	Number of individuals animals found by the class
Rodent				
Shrew				
Mole				
Bird				
Insect/other				

6. Data Analysis: Then participants will collaborate by graphing the total numbers of bones found of each animal.
    a. Double Bar Graph: Y axis is number of bones or number of animals. The x- axis is for each possible type of animal. Then compare "mine" compared to "my group." Then "my group" compared to "class."
    b. Pie Graph: Calculate the percent composition of each type of animals, then use a pie chart to show the percentages of each of the types of individual animals. (Percent compositions should be rounded to the nearest whole number, and should add up to or nearly add up to 100%).

i. Rodents: % Composition = (Total number of rodents/Total number of individual animals) X 100.
ii. Shrews: % Composition = (Total number of shrews/Total number of individual animals) X 100.
iii. Moles: % Composition = (Total number of moles/Total number of individual animals) X100
iv. Birds: % Composition = (Total number of moles/Total number of individual animals) X100
v. Insect/other: % Composition = (Total number of others/Total number of individual animals) X100

7. Resources and Adaptation for 5 – 8th graders adapted from *Owl Pellet Food Webs: A Model of Energy and Mass Transfer*. In addition to the Owl Pellets and Bone Handout, Carolina Biological includes curricula for various ages.
    a. Graph the class average to the composition of a barn owl's diet, which according to Carolina Biological, is the following breakdown: 50% voles, 40% mice, 5% rats, and 5% shrews. For this pie graph, add mice and rats together to total rodents. Compare their breakdown to the class's breakdown.
    b. Experimental design extension: Sometimes and experiment leads to more experiments. Why do you think Carolina does not have birds and insects in these data? What may be possible hypotheses that you could test? For example: Are the pellets sourced from owls that are in captivity? How can you tell what kind of owl has regurgitated the pellet? Do all species of owls eat the same thing? Does an owl's diet vary seasonally?
8. Resources and Adaptation for 5th – 8th graders: *Owl Pellet Food Webs: A Model of Energy and Mass Transfer*. Owls have voracious appetites, but most species do not migrate, and continue to have to hunt for food. How much food does an owl need in order to survive? This activity uses owl pellet data to guide participants through energy transfer from trophic levels on food webs. https://www.carolina.com/teacher-resources/Interactive/owl-pellet-food-webs-a-model-of-energy-and-mass-transfer/tr46115.tr
9. Resources for and adaptations for 7th– 12th graders taken from Owl Pellet Biomagnification of DDT from Georgia Southern's Molecular Biology Initiative. Their explanation is concise and uses a project-based approach to teach about DDT, a pesticide that decimated osprey and bald eagle populations. Their biomagnification lab participant handouts are suitable for 7th - 12th graders. https://cosm.georgiasouthern.edu/mbi/owl-pellet-biomagnification/
10. Clean up and Conclusion: Dispose of the pellet remains in the garbage and wash hands and surfaces. For K – 3, use white glue and black construction paper to reconstruct their prey animals based on their skeletal remains. For 3 – 8th graders, send the bones home with the handout in a sandwich bag or envelope and the bone key. Place the pie chart for their results versus the class results inside the bags. For 7 – 12th graders, the more lab links listed above have full experimental write ups that help participants process their observations.

Resources utilized for the development of the Owl Explorers Lesson

https://www.barnowltrust.org.uk/owl-facts-for-kids/barn-owl-trust-lesson-plans/science-educational-resources/science-barn-owl-adaptations/
https://www.barnowltrust.org.uk/owl-facts-for-kids/barn-owl-trust-lesson-plans/science-educational-resources/science-food-web/
https://www.carolina.com/teacher-resources/Interactive/owl-pellet-food-webs-a-model-of-energy-and-mass-transfer/tr46115.tr
https://www.carolina.com/teacher-resources/Interactive/basic-information-on-owl-pellets/tr11103.tr
https://www.carolina.com/pdf/activities-articles/Owl_Pellet_Bone_Chart_grid.pdf
http://projectbeak.org/adaptations/build.htm
http://cams.allaboutbirds.org/channel/43/Barred_Owls/
https://www.audubon.org/news/learn-identify-five-owls-their-calls

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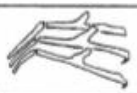
Driving Question: How can an owl's supper tell us if an ecosystem is healthy?

Procedure: Break apart the owl pellet to find and match the bones with the Bone Chart.

Owl Pellet Bone Chart

	Rodent	Shrew	Mole	Bird
Skull				
Jaw				
Scapula				
Forelimb				
Hindlimb				
Pelvic Bone				
Rib				
Vertebrae				

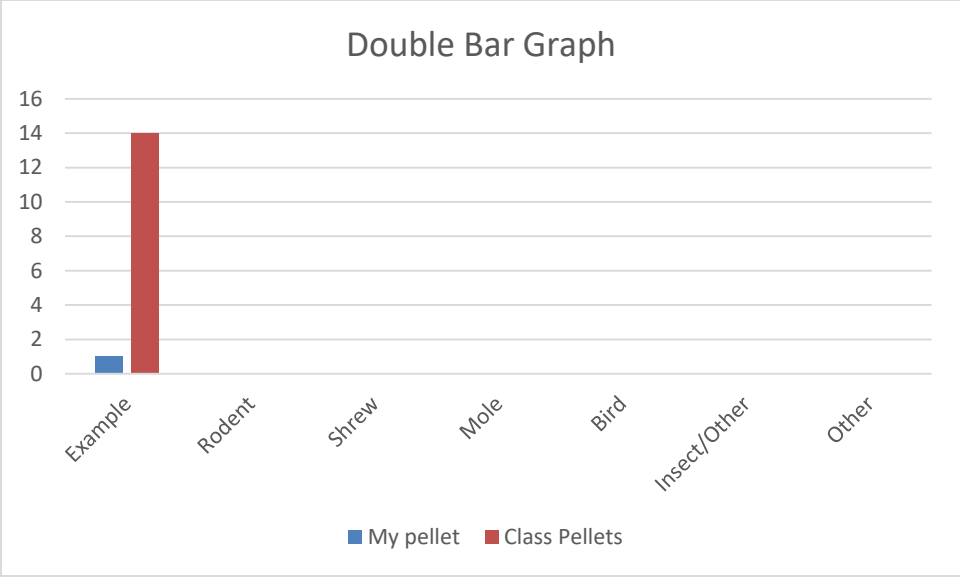
Data Table

Type of Organism	Total number of Bones in my pellet	Total number of different individual animals in my pellet	Number of individual animals found in our pellet	Number of individuals animals found by the class
Rodent				
Shrew				
Mole				
Bird				
Insect/other				

Graph It

Graph the total numbers of bones found of each animal.

a. Double Bar Graph: Y axis is number of bones or number of animals. The x- axis is for each possible type of animal. Then compare "my group" compared to "class."



b. Pie Graph: Calculate the percent composition of each type of animals, then use a pie chart to show the percentages of each of the types of individual animals. (Percent compositions should be rounded to the nearest whole number, and should add up to or nearly add up to 100%).
   i. Rodents: % Composition = (Total number of rodents/Total number of individual animals) X 100.
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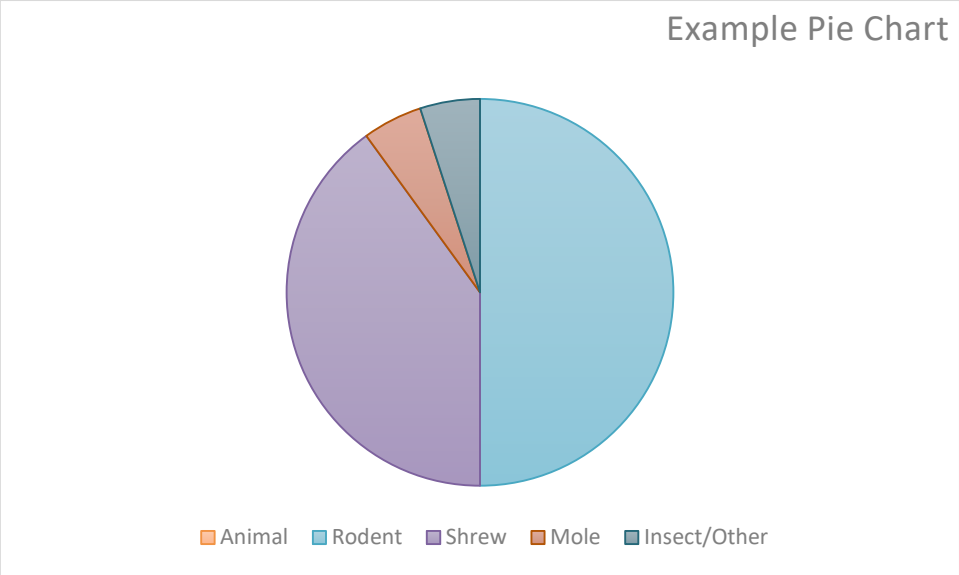
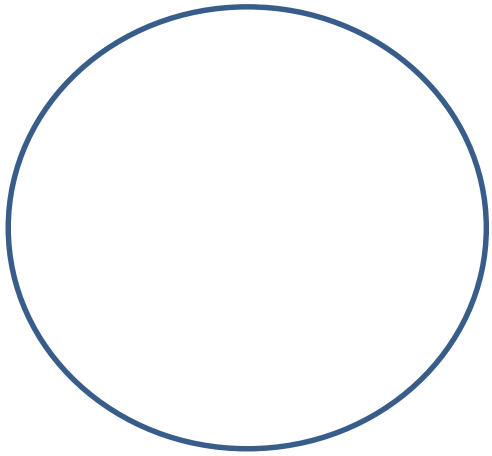
   v. Insect/other: % Composition = (Total number of others/Total number of individual animals) X100

Example of a pie chart by percentages

Animal	
Rodent	50
Shrew	40
Mole	5
Insect/Other	5





Think About It

Why might a scientist need many samples of owl pellets to tell about an owl's ecosystem?

How might a wild owl's diet be different from an owl that is in rehabilitation center?

Exploring Owls: WHOOT Is It?

 Barn Owl: Helen Steussy/Audubon Photography Awards	Barn Owl: "KRRRRick!" (Sounds like squeaky car brakes)
 Barred Owl. Photo: Mark Peck/Great Backyard Bird Count	Barred Owl: Who cooks for yooooooouuuuu? (Sounds like someone talking).
 Great Horned Owl. Photo: Christopher Schwarz/Audubon Photography Awards	Great Horned Owl: "Who who who? Whoooo Whooooo?" (Three quick & two long hoots.)
 Eastern Screech-Owl. Photo: Jen St. Louis/Audubon Photography Awards	Eastern Screech Owl: "Woohoohoohooohooohoo", (Like a horse whinnying, but on helium.)

Owl Mortality– tape one "mortality" onto the back of a mouse card

1. CAR: Oops, I was hit by a car while swooping.

2. Poison: Oops, this mouse was already poisoned by humans trying to get rid of it. I died, too.

3. Habitat Loss: Oops, this mouse disappeared before I could find it. I starved to death.

4. DDT/Pesticides: Oops, I ate DDT and it made my egg shells weak. All of my babies got squashed.

Resources utilized to develop Exploring Owls: WHOOT Is It?

https://www.audubon.org/news/learn-identify-five-owls-their-calls
https://www.inhs.illinois.edu/files/4114/8494/9183/MOONprotocol_2017.pdf
https://www.hunker.com/13425268/facts-about-owls-in-north-carolina
Project Learning Tree's Oh, Deer and Too Many Bears.