

Owl Pellet Dissection

Adapted from: Hildreth, J (2002). Owl pellet dissection. Retrieved July 1, 2009, from Kidwings virtual owl pellet dissection Web site: <http://www.kidwings.com/owlpellets/flash/v4/index.htm>.

Grade Level: 9-12

Duration: 30-40 minutes

Setting: Classroom or lab

Summary: Students will dissect an owl pellet and determine the bird's diet and health. Students will learn about energy flow from one trophic level to the next.

Objectives:

Students will be able to accurately construct and identify a skeleton from the bones gathered from an owl pellet. Students will be able to theorize the food chain surrounding their specific bird of prey. Students will work on enhancing their recording and analyzing skills.

Vocabulary:

Pellet	Raptor
Regurgitate	Ecosystem
Food Chain	Pesticide
Pest	

Related Module Resources:

Bone Chart (Word)

Materials (Included in Module):

Bone Chart (Word)

Additional Materials (NOT Included in Module):

Owl Pellets

Rubber Gloves

Tweezers/Forceps

Tray

Magnifying Glass

ACADEMIC STANDARDS (ENVIRONMENT AND ECOLOGY)

10th Grade

4.5.10 A—Identify similar classifications of pests that may or may not have similar effects on different regions.

- Identify environmental effect(s) of pests on different regions of the world.
- Identify introduced species that are classified as pests in their new environments.

12th Grade

4.5.12 A—Research integrated pest management systems.

- Analyze the threshold limits of pests and the need for intervention in a managed environment.

BACKGROUND: Pellets are masses of teeth, bone, fur, feathers and the exoskeletons of the various animals preyed upon by birds of prey, **raptors**. Raptors hunt for food on the wing using enhanced vision and smell to locate their prey. Examples of raptors are hawks, eagles, owls and falcons. Their talons, beaks and claws tend to be large, powerful and designed to tear and/or pierce the flesh of prey animals.

Pellets form 6-10 hours after a meal is consumed. The best places to find pellets are under roosting or nesting sites, under coniferous trees, at the bases of cliffs, in barns and silos, and in marsh and field grass burrows. The location depends upon the species of bird.

These birds have no teeth to grind up their food, so they must swallow it whole. After a raptor ingests its prey, it **regurgitates** a pellet. The protein enzymes and acids of the raptor stomach aren't strong enough to completely break down the meal. Most bones are preserved unbroken in the formation of these pellets. When the bird regurgitates a pellet, it is also cleaning out its esophagus.

The pellets can serve as their own **ecosystem** too. Clothes moths, carpet beetles and fungi find food and shelter within the pellet. The moths feed on the fur and feathers while the beetles and fungi thrive on the decaying organic matter leftover.

Scientists use pellets to investigate the diet of these raptors. They can determine what the raptor ate, how healthy it is, how large it may be, if there are diseases present, and many other things. **Food chains** show how each organism gets the food it needs, the energy it uses,

and how those nutrients are passed from organism to organism. Many food chains begin with the sun, but every organism needs some source of energy. Because everything is connected in a food chain, if an organism on the bottom level consumes any chemicals or contracts a certain disease, the organisms in the upper levels often face serious issues. This becomes a major problem when pesticides are thrown into the mix. As we go up the links on the food chain (trophic levels), the concentration of the pesticide consumed becomes greater. So animals at the top of a food chain would be at the highest risk for pesticide ingestion.

Let's look at a simple food chain: Flowers → Insects → Mice → Hawk. The flowers may absorb some pesticide from the soil and the insect eats the flowers. The pesticide may or may not kill the insect, but remains in the insect's body. Dead or alive, the insect is eaten by a mouse who then has a greater concentration of the pesticide in its digestive system. The only effects may be a simple stomach ache or intestinal problems, but the mouse survives. He or she is then eaten by a hawk. Because the concentration of the pesticide has gotten larger, the hawk may get very sick and die. If the hawk doesn't die, that pesticide still remains in its system and can be passed on to chicks or influence the health of any offspring. When Dichlorodiphenyltrichloroethane (DDT) was used on crops, scientists found that it was entering the food chain of Bald Eagles. Some of those scientists concluded that the DDT was thinning the egg shells of the reproducing eagles, causing them to be crushed when the parents attempted to incubate them. Hence, the use of DDT was banned in the United States.

OVERVIEW: Students will work in pairs or small groups to determine the diet of the raptor by examining a pellet. While they dissect, they will classify the bones on a bone chart to the best of their ability. After the dissection, the teacher will lead a discussion of the results to help students understand the goal of the lab activity.

PROCEDURE:

Teacher Preparation:

1. Collect and prepare the pellets before the activity.
2. If you must order the owl pellets, do so at least one week in advance to ensure prompt arrival.
3. Though most owl pellets are sterilized to kill any bacteria if you order them, be sure not to dissect anywhere near food or place any of the pellet material near the mouth.
4. Encourage hand washing after the lab. Wipe down the desks, tables, and chairs afterwards as well.

Student Activity:

Physical Version

1. Set up owl pellet kits at each lab station or desk depending on the number of students and kits available.
 - a. Each kit should contain:
 - i. Owl pellet
 - ii. Rubber gloves
 - iii. Tweezers or forceps
 - iv. Dissection tray
 - v. Magnifying glass
 - vi. Bone Chart

2. Ask students to divide into groups (depending on class size).
3. Students should carefully examine and dissect the owl pellet filling in their bone charts while they dissect.
 - a. Gently pull apart the pellet—be sure not to break any bones
 - b. Use the tweezers or forceps to tease the bones away from the fur
 - c. Skulls and jawbones are the easiest bones to classify a species by, so take extra care if you find any
4. As they find bones, the students can tape them to their Bone Charts to show the rest of the class at the end of the activity.
5. Students should also take a guess at what type or species of animal(s) they may have found.
6. Students can also try to reconstruct the animal if they have enough bones.

Virtual Version

1. Set up the computers for the website below: <http://www.kidwings.com/owlpellets/flash/v4/index.htm>. Be sure to check the website before the students get to class.
2. Allow students to work in pairs or small groups (depending on class size) to dissect the virtual owl pellet.
3. Students should still fill in the Bone Chart worksheet as they are working. Have them identify the bones that they do find as they place them on the dissection map.

DISCUSSION:

1. How could a scientist determine if the raptor was in bad health?
If the pellet contained very little animal remains, it may not be eating enough. The coloration of the pellet may also indicate some health concerns. The consistency of the pellet also shows the level of health of the raptor. In addition, scientists can analyze the pellet composition down to a mineral and chemical level.
2. What other facts could be determined from examining pellets?
Health, animal diversity, when the raptor hunts, where it hunts, how much it eats, does the diet change with the seasons, and what the raptor's role in the food chain is.
3. How many different kinds of animals did you find evidence of in your pellet? From this data, what can you conclude about the diet of this raptor?
More bones in a pellet means that there was an abundance of prey in the area, while fewer bones means fewer prey animals available for the raptor to eat.
4. How would pesticide use come into play for the raptor food chain? Diagram the food chain below.
Depending on the raptor, if pesticides are consumed by organisms on the bottom of the food chain, the raptor would also be in danger of consuming those pesticides. Pesticide concentrations increase as the trophic levels increase.

Sample food chains:

Mice → Hawk → Eagle

Mice → Birds → Weasels
Worms → Moles → Birds
Beetles → Mice → Snakes → Hawks
Plants/grasses/roots/seeds → Insects → Mice → Owl

5. What would you expect to find in the pellet of a seagull? A vulture?

In the pellet of a seagull we would expect to find a lot of fish bones and possibly leftover exoskeletons of aquatic crustaceans. In the pellet of a vulture we would expect to find much the same material as an owl's, but less of it because the stomach acids are most likely stronger than the owl's stomach acids.

6. When a raptor like the hawk or the eagle eats, it tears its food into smaller pieces before swallowing. Stronger stomach acids also help to break down the ingested food particles. Would the pellet of a hawk or eagle be as helpful as an owl pellet? Why or why not?

Theoretically, a hawk or eagle pellet would not be as helpful as an owl's pellet because the weaker stomach acids of the owl allow for more bones to survive the digestive process, allowing scientists to better understand the raptor's diet and health.

7. What role would pesticide use have in the diet of a raptor like the owl?

Because pesticide intake becomes more concentrated as you progress on the trophic levels of a food chain, what the owl consumes from a mouse or small mammal with pesticides in its system may be much worse. The owl could easily die from the pesticide concentrations that only gave the mouse an upset stomach.

EVALUATION:

- Were the students engaged in the activity?
- Did the students complete the assignment as specified by the teacher?
- Were the students able to use critical thinking to analyze the results of their pellet dissection appropriately?
- Did the students stay on task during the activity?
- Did the students help one another?

EXTENSIONS AND MODIFICATIONS:

- If unable to use actual owl pellets, use the online dissection website.
- Order only one pellet to dissect under a camera projector while the class observes.
- Give students the option to write a brief story about the life of this particular raptor, or a diary entry of the raptor's diet for that day. Encourage creativity, but also make sure they are using the evidence they collected from the actual dissection.
- Allow students to compare bone charts and hypothesize about differences they found.
- Adapt this activity to best suit your group of students.

NOTES (PLEASE WRITE ANY SUGGESTIONS YOU HAVE FOR TEACHERS USING THIS ACTIVITY IN THE FUTURE):

Activity version: