

Crime Scene Detectives

Rationale

Students are engaged by a mystery. The plethora of crime scene shows on television speaks to the popularity of this type of learning. In this lesson, students will be presented with a mystery which will help develop their concepts of energy acquisition and the interrelationships between members of a community.

MI GLCE's

- L.OL.06.51 Classify producers, consumers and decomposers based on their source of food.
- L.OL.06.52 Distinguish between the ways in which consumers and decomposers obtain energy.
- L.EC.06.22 Explain how two populations of organisms can be mutually beneficial and how that can lead to interdependency.
- S.IP.06.13 Use tools and equipment appropriate to the scientific investigation.
- S.IP.06.15 Construct charts and graphs from data and observations.
- S.RS.06.25 Demonstrate the relationships between populations through various illustrations.

Objectives:

1. Students will investigate and classify animals based on an owl pellet.
2. Students will mathematically determine energy needs based on numbers of animals eaten.
3. Students will create a food pyramid based on a local ecosystem's food chain.
4. Students will describe the interrelationship between various animals in a community.

Key Concepts

Population	Community
Consumers	Producers
Predator	Prey
Source of Energy	Ecosystem

Materials

Owl Pellets (enough for every two students)
Probes (to help take apart pellets) – toothpicks can work just fine for this
Owl Bone Chart
Calculators

Strategies

Engage:

Use powerpoint presentation to begin class.

Slide 1: SCENE SLIDE:

It was looking to be a bright day on the beat when we got a call at 11:53 to respond to a missing species call.

On arriving on the potential crime scene, we discovered that this was not going to be an easy task. Over 72 hectares needed to be covered, but the time was diminished when we came upon evidence at the circled location.

The old dilapidated barn contained evidence of a potential predatory crime of the most heinous type. All of the evidence that remained was this. (click)

Slide 2: EVIDENCE SLIDE:

Your job is to figure out who the victims of this crime might be.

Explore:

Pass out the pellets and have the students dissect them for about 25 minutes. They should seek to separate the bones from the fur by carefully pulling the pellet apart. One of the key features they will be searching for will be the skulls of the prey species, but these are easily crushed, so they should proceed carefully. They also may wish to use probes to help separate the fur from the bones. **Safety Issue: Whenever a tool, such as a sharp tipped probe is used should let the students know that these instruments can cause bodily harm and that they should be used with caution.**

When you see that most of the students have finished dissecting their owl pellets, have them take their bones and match them with the bone key (attached from Carolina).

When the students have keyed out their animals, have them come up to the board and record with tally marks how many of each kind of animal they found in their pellets (Example below)

<u>Critters</u>	<u>Count</u>
Rodent	1111111
Shrew	111
Mole	111
Bird	1

Explain:

VICTIM SLIDE:

Mr. and Mrs Deer Mouse and Mr. Short-tailed shrew plus others were found to be the victims in this crime. However, further evidence has led us to believe that this may be only the beginning of this investigation.

Ask students to share their findings. Did they find more than one animal in a pellet? How could that be? What animal do you think is responsible for all of these deaths?

On returning to the crime scene we were able to take into custody the potential suspect in this crime (click)

SUSPECT SLIDE:

Mr. Barn Owl. When brought in for questioning *Mr. Owl* had this to say in his defense. (click) Unfortunately, our interpreters were unable to translate his confession and he is being held without bond.

We need you to help us determine what the head count might be in this crime using math skills to solve some outstanding questions in this crime.

Put on the board:

IF THE:

Average Weight of Owl = 310 g

Average Weight of Prey = 27 g

Pellets used = (get count from class)

Average Pellet Weight = 8 g

Each pellet represents the daily food intake of one owl. (This is a general representation for this exercise. With the smaller pellets, there may have been two or three per day.) From this we can calculate some information about the owl.

Calculations (Write on board):

$$1) \frac{\# \text{critters}}{\# \text{pellets}} = (\quad) \text{ critters/pellet/day} \quad \times \quad 365 \text{ days} = \{ \quad \} / \text{year}$$

$$2) \{ \quad \} / \text{year} \times 27 \text{ g} = \{ \quad \} \text{ total weight of critters eaten/year}$$

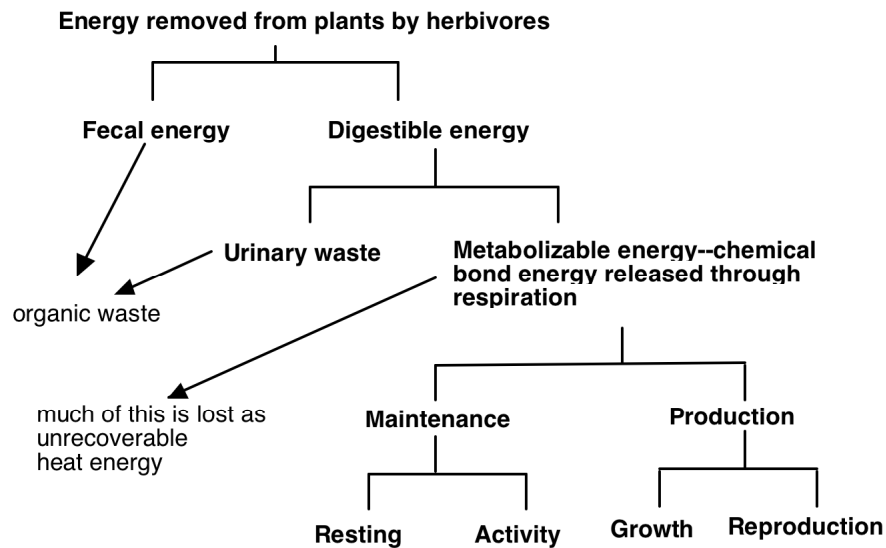
How many animals is the owl eating every year?

How much weight of animals is this?

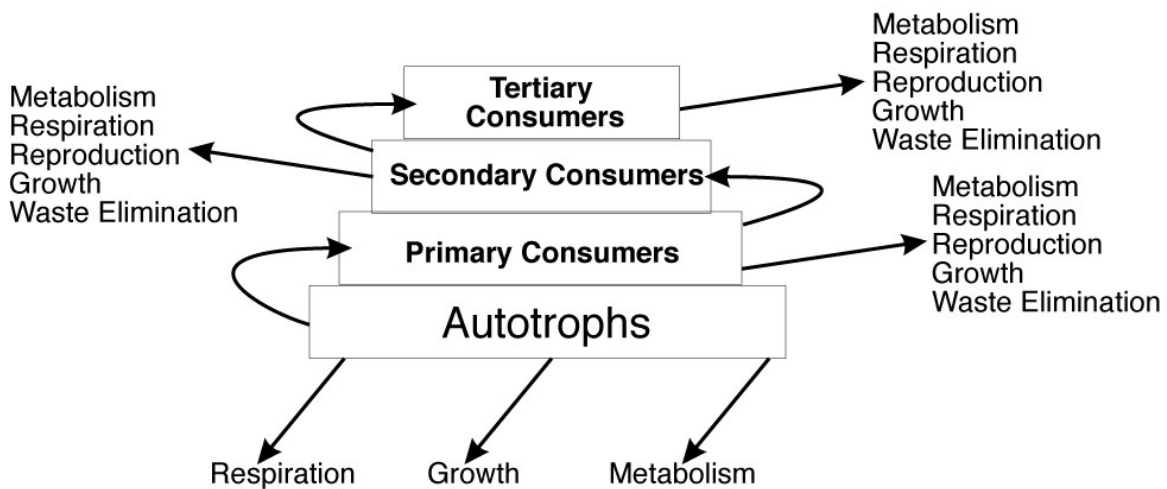
How can it eat so much and not gain any weight?

Have students develop answers to the above questions and then have them explain what might be happening here.

Introduce the concept of energy flow in a community. Ask students what animals might use energy for. What does this mean when another animal eats them? You can illustrate this nicely as:



From this we can revisit the idea of the biomass pyramid and show that this occurs at every trophic level of the pyramid. There is much more energy and biomass at lower levels of the pyramid than at higher levels due to losses which occur at each successive level. Therefore we can see that there is **an inversely proportional relationship between trophic level and biomass**.



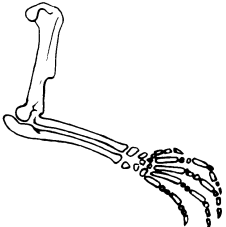
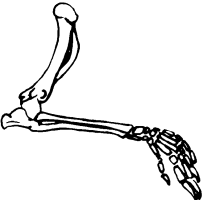
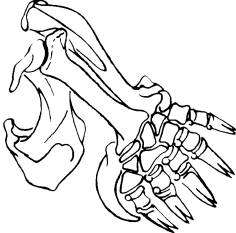
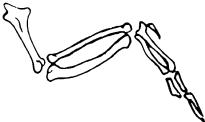
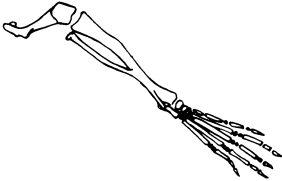
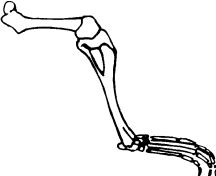
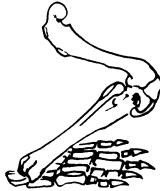
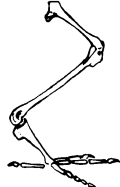
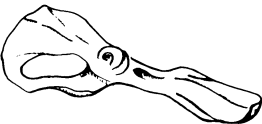
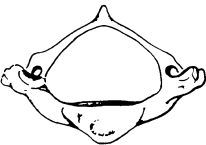
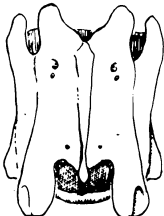
ENDING

Unfortunately, we had to release *Mr. Barn owl* on the basis of immunity granted through the CITIES endangered species treaty.

Elaboration/Evaluation

Have students look at an ecosystem and develop one food chain. Now have them determine how many individuals make up the population for each level of the food chain. They should identify each level as producer, consumer, decomposer. Does their food pyramid match what was discussed in class? Why or why not?

Owl Pellet Bone Chart

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

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