

# Examining Biodiversity in Ecosystems: Examining Energy Flow.

**Background:** This activity is designed to have students understand and examine the energy movement in an ecosystem. They will examine the impact that humans can have on the energy cycle through various practices.

**Learning Event:** After reading the background information about the energy in ecosystems, students will engage in an interactive activity that will illustrate how human demands on the ecosystem influence the health and sustainability of that ecosystem.

**Set:**

Start a discussion with the students about how and where they get their energy from. Great starter questions can be:

- How do you feel when you skip a meal? (Probe past the obvious answer of hungry)
- Why do professional athletes eat so much when they are training?
- What are calories and why do you need to have a certain amount every day?

The goal of these questions is get students to think about how they get their energy and where that energy comes from.

**Development:**

- Explain to the students that all living things need energy to grow develop and perform all the functions required to maintain life. Just as humans need energy to run and be awake, all living things need energy to grow and move. Scientists can track and follow the flow of energy through an ecosystem. This is another way that we can tell if an ecosystem is sustainable.
- Have students read the passage about energy flow from the *Science 10: Concepts and Connections*
- Alternatively <http://www.bcgrasslands.org/grasslands/ecosystemprocesses.htm> for a different written explanation or <http://www.learner.org/workshops/energy/resources.html> for an online video presenting information on the energy cycle.
- Review the reading with the students. Assess understanding by assigning the text questions or through discussion with the students. Through discussion, students should identify the different levels of energy users (**Trophic, Primary, Secondary**). Students should also understand that at each level, energy is lost because the organism uses the energy to move, grow, and live.

## ***Learning Activity***

Students will engage in a simulation activity or game that will model how energy is transferred and used in an ecosystem. Through the activity and various manipulations, students will see the energy needs of different types of ecosystems.

### **Materials:**

Enough Copies of the *Energy Cards* [Appendix A] and *Role Cards* for each student.

### **Procedure:**

Each round, the class (the ecosystem) is given the energy for their survival. The teacher puts out the energy cards around the classroom face down and the 1st level players must gather them.

The aim of the activity is for every student to survive each round by gathering enough energy to make it to the next round. All the information is provided for the students on their cards illustrating where they are allowed to get their energy from, how much they must lose per contact and how much energy they must gather, and how many times they can be contacted before they are out of the round.

Every student is given a role or an animal. Students can be an organism at the First Trophic Level (a producer), the Second Trophic Level (a primary consumer), or the Third Trophic Level (a secondary consumer).

1st level gets their energy from the original energy cards.

2nd level gets their energy from the 1st level

3rd level Omnivores can gather their energy from the 1st level or the 2nd level

3rd level Carnivores can gather their energy from any 2nd or 3rd level players.

Students must walk around the room and ask for energy cards from their classmates. Every time that a student asks the correct type of person, that person must give their energy to the student. With every transaction, the asker must “spend” energy according to their card. At the end of the round, students must have enough energy to continue the next round. If a student gets contacted too many times, as indicated on their player card, they must also leave the game.

Each round should last about a minute but should be varied for the size of the class.

The card distribution for a class of 25 students should be 15 Level One, 6 Level Two, 2 Level Three Omnivore, 2 Level Three Carnivore.

### ***Alternating Rules:***

Throughout the course of the game, the teacher can change the rules for students to experience different types of ecosystems.

#### **Alternative One: Cattle Farm**

To simulate a cattle farm, remove the Third Level cards and make the ratio of producers and primary consumers nearly equal. Students will not be able to sustain this arrangement for long. Have a discussion about what has to be done for the ecosystem to survive. Is this a sustainable ecosystem?

#### **Alternative Two: Traditional Grain Farm 1**

To simulate a traditional grain farm, have more Producers and fewer of the Primary Consumers to represent the desire of farmers to limit the amount of animal life that consumes their crops. Keep the Secondary Consumers the same. Have a discussion about what stresses this puts on the different players. Is this a sustainable ecosystem?

#### **Alternative Three: Traditional Grain Farm 2**

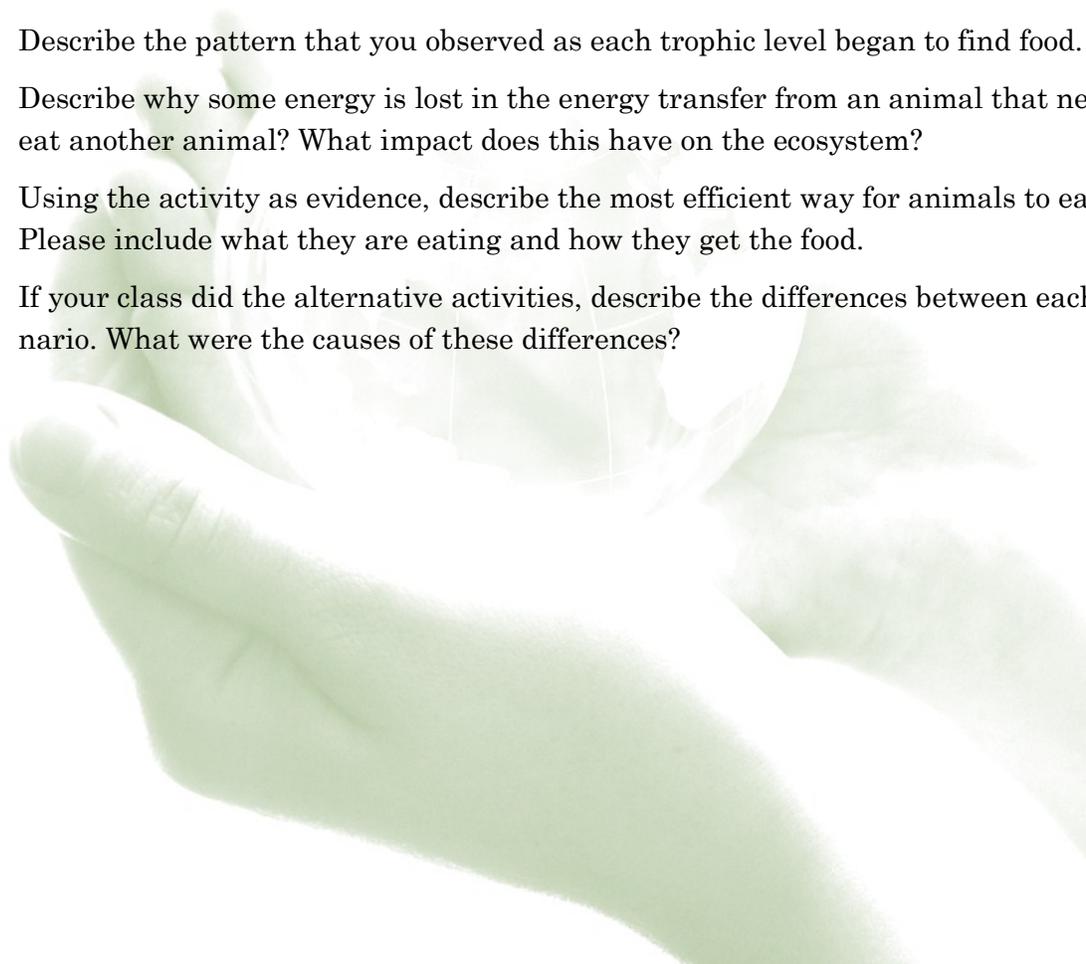
This alternative demonstrates what harvesting and removing the grain does to the ecosystem. Half way through the round, take out all but a few of the Producers. Discuss with the students what this does to the energy available for the other players. Is this a sustainable ecosystem?

#### **Assessment and Evaluation:**

At the end of the activity, have the students reflect on their experiences. Have them examine the difference when the different Trophic Levels are manipulated by man or the environment.

### ***Student Assessment Questions: Journal Questions***

1. Which animal had the easiest time getting food? Explain what factors influenced this.
2. Describe the pattern that you observed as each trophic level began to find food.
3. Describe why some energy is lost in the energy transfer from an animal that needs to eat another animal? What impact does this have on the ecosystem?
4. Using the activity as evidence, describe the most efficient way for animals to eat. Please include what they are eating and how they get the food.
5. If your class did the alternative activities, describe the differences between each scenario. What were the causes of these differences?



You are at the **Third Trophic Level:**

### **Carnivore**

You must gather 75 energy points per round.

You lose 5 points for every contact.

You must only get your energy from the first trophic level.

You can be contacted 2 times per round.

You are at the **Third Trophic Level:**

### **Omnivore**

You must gather 75 energy points per round.

You lose 5 points for every contact.

You must only get your energy from the first trophic level.

You can be contacted 2 times per round.

You are at the **Second Trophic Level**

You must gather 50 energy points per round.

You lose one point for every contact.

You must only get your energy from the first trophic level.

You can be contacted 3 times per round.

You are at the **First Trophic Level**

You must gather 25 energy points per round.

You don't lose any points for contact.

You must only get your energy from the original energy cards.

You only can be contacted 5 times per round.

You are at the **Third Trophic Level:**

### **Carnivore**

You must gather 75 energy points per round.

You lose 5 points for every contact.

You must only get your energy from the first trophic level.

You can be contacted 2 times per round.

You are at the **Third Trophic Level:**

### **Omnivore**

You must gather 75 energy points per round.

You lose 5 points for every contact.

You must only get your energy from the first trophic level.

You can be contacted 2 times per round.

You are at the **Second Trophic Level**

You must gather 50 energy points per round.

You lose one point for every contact.

You must only get your energy from the first trophic level.

You can be contacted 3 times per round.

You are at the **First Trophic Level**

You must gather 25 energy points per round.

You don't lose any points for contact.

You must only get your energy from the original energy cards.

You only can be contacted 5 times per round.

1

Energy

2

Energy

3

Energy

1

Energy

2

Energy

3

Energy