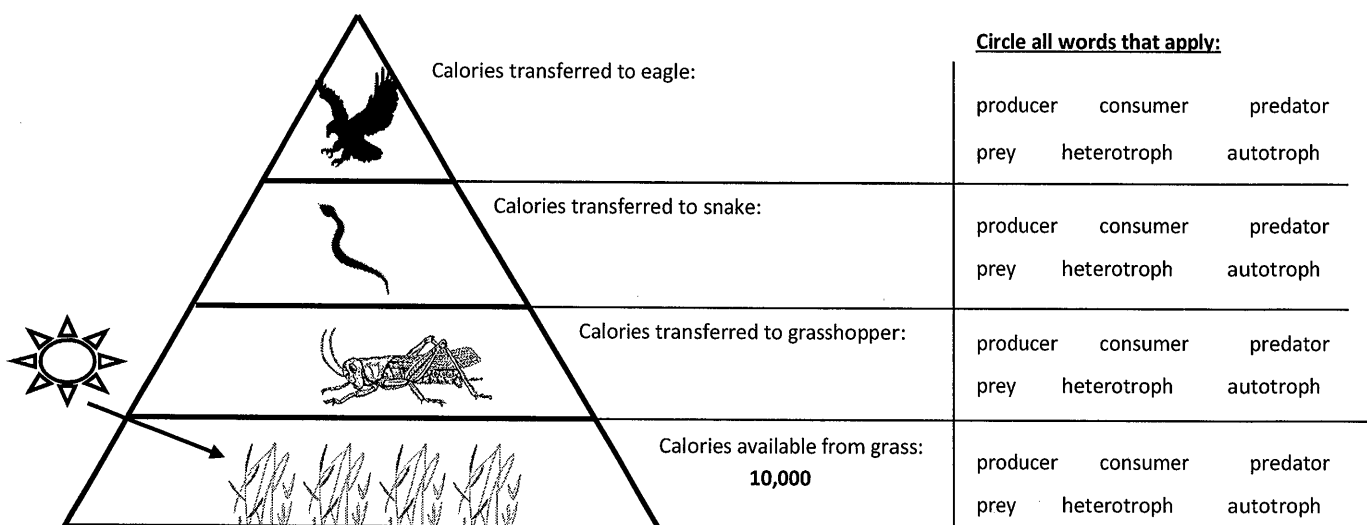


Energy through Ecosystems Worksheet

The amount of available energy at each trophic (feeding) level decreases as it moves through an ecosystem. As little as 10 percent of the energy at any level is transferred up to the next level.

In the energy pyramid below, calculate the amount of energy that is passed up from one trophic level to the next, assuming only 10% of the energy from the previous level is available for the next level. For each trophic level, circle all the words that apply to identify each organism as either a producer or consumer and as either an autotroph or a heterotroph. If the organism could be considered a predator and/or prey, circle those words also.



Questions

- Assume that the grasshopper in the food pyramid above must eat half its body weight in grass each day. If an average-size grasshopper weighs 2 grams, and 1 blade of grass weighs 0.1 grams (one tenth of a gram), how many blades of grass does the grasshopper need to eat each day?
- Assume a snake must eat 5 grasshoppers per day, while an eagle must eat 2 snakes per day. Use this information along with your answer from Question #1 to calculate how many blades of grass are needed to keep an eagle alive for a day?
- How many blades of grass are needed to support a family of four eagles for a week?

Eating at a Lower Trophic Level

For the purposes of this exercise, you make the following assumptions:

- One farmer consumes one chicken per day for a year
- One chicken consumes 25 grasshoppers per day
- One thousand grasshoppers have a mass of one kilogram
- One grasshopper requires about 30 grams of soybeans per year
- One human requires about 600 grasshoppers per day
- Soybeans have 3.3 calories per gram

Procedure

1. Calculate the following scenarios, based on the background information provided. Calculations must show work and include units of measurement.
2. Based on the background information provided, respond to reflection questions below.

Reflection Questions:

1. Identify the food chain in this scenario, beginning with the soybeans. Use arrows to show the direction of energy transfer between each organism.
2. Identify the producer(s) and consumer(s) in this scenario. Also identify any herbivores, carnivores, or omnivores that are present. More than one term might apply to an organism.
3. What are some **abiotic** factors that would impact this food chain.
4. Calculate the number of grasshoppers a chicken eats per year.
 - a. How many grasshoppers are needed for a year's supply of chickens for the farmer?
 - b. What is the total mass, in kilograms, of the grasshoppers needed to feed all the chickens for one year?
 - c. How many kilograms of soybeans are needed to feed all the grasshoppers for one year?
5. Suppose the farmer chose to eat grasshoppers instead of chickens. How many people could the grasshoppers feed, compared to the one person that the chicken fed?
6. The farmer needs to consume 3,000 calories per day. If he ate only soybeans instead of the chickens or grasshoppers, how many people would his soybean crop feed?
7. Create a Biomass Pyramid, using the data you have developed up to this point. At each trophic level, record the biomass of the organisms over a period of one year needed to support one farmer. Assume that a farmer weighs 60 kg and a chicken weighs 1.5 kg.