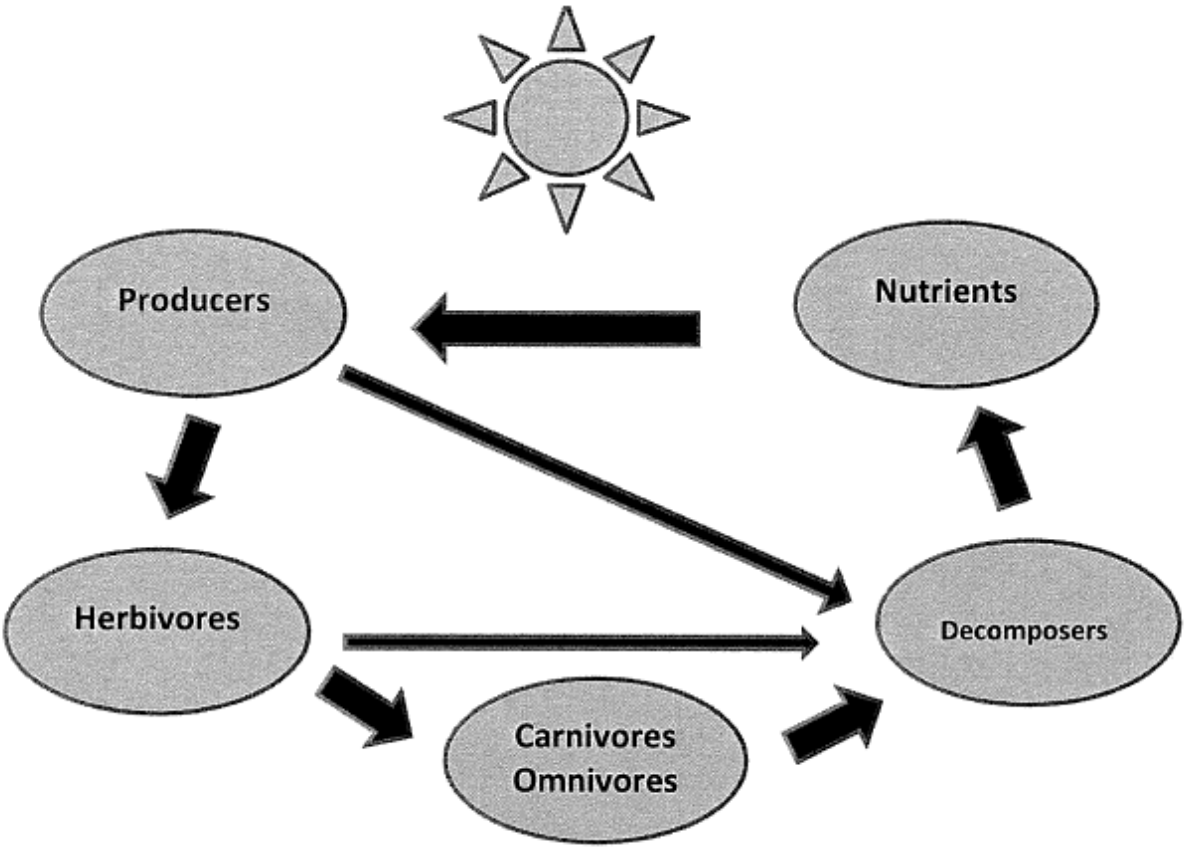
ENERGY FLOW AND BALANCE IN ECOSYSTEMS



Producers:_____

_____

Herbivores:_____

_____

Carnivores:_____

_____

Omnivores:_____

_____

Decomposers:_____

_____

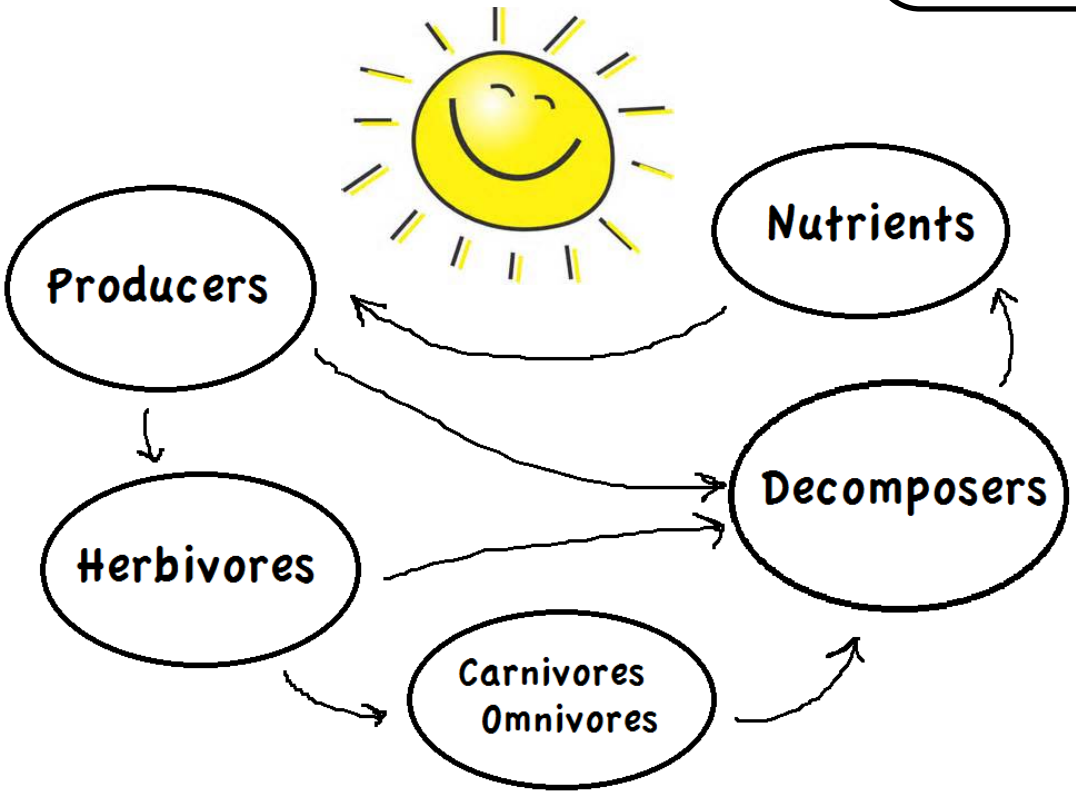
ENERGY FLOW

All living things need energy to carry out their life functions. Some of these life functions are moving, growing, and reproducing. Living things get their energy from the food they produce or eat. In an ecosystem, the energy flows from one living thing to another in several steps. These steps are based on what a living thing eats and where it gets its food. Each living thing fills a niche in this flow of energy. As you already know, a niche is a way of life that a living things has in a community.

Energy flow in an ecosystem can be shown in a diagram. Look at the diagram as each step in the flow of energy is described.

ENERGY FROM THE SUN

Energy flow begins with the sun. The sun and the physical environment provide living things with the materials that they need. These materials include energy from sunlight, along with nutrients from the air, water , and soil.



USING ENERGY

This step involves green plants such as trees, grasses, and algae in the ocean. Plants make food, using energy from the sun, carbon dioxide from the air, and water and minerals from the soil and the ocean. Some of this food energy is used by plants themselves, and some of it is stored. This process of making food is called photosynthesis.

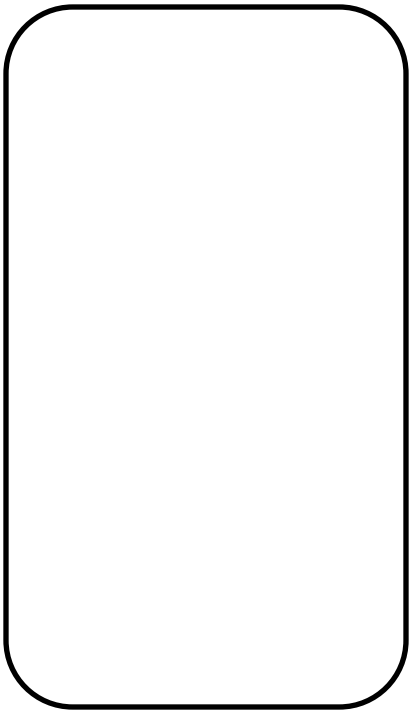
Because they make their own food from nonliving materials, green plants are called PRODUCERS. (a living things containing chlorophyll and capable of using sunlight to make its own food from materials taken from the soil and air.) The niche of producers in any community is an important one. All other living things depend on them as a source of food and energy. Without producers, all life in a biotic community would end.

RECEIVING ENERGY

Animals cannot make their own food. They receive their energy by eating the stored food in plants or by eating other animals. They are called CONSUMERS (a living thing that eats other living things.)

Secondary consumers are neat-eating animals, or CARNIVORES (an animal that eats ONLY other animals) Some of these animals are wolves, spiders, and owls. These animals do not eat plants. Their niche is to eat herbivores or other carnivores. Some consumers, such as bears, raccoons, and people eat both plants and animals. They are called OMNIVORES (an animal that eats both plants and animals.)

The energy flow changes again when living things die and decay. Living things such as fungi, certain insects, earthworms, and bacteria eat the remains of animals or plants or their wasters, These living things are called DECOMPOSERS (a living thing that feeds on dead materials, breaking them down and returning the materials to the environment) The niche of decomposers is to break down dead matter into simpler materials. These materials, such as nutrients and other matter, can be returned to the soil, water, or air. In this way, nutrients and other matter can be used again by plants as resources to make food.



QUESTIONS:

1. What materials from the environment are used by producers?

_____

_____

2. What are 2 living things that are producers? _____, _____

2 living things that are consumers? _____, _____

2 living things that are decomposers? _____, _____

3. What is the difference between an herbivore and a carnivore?

_____

_____

4. Why is more energy involved when an herbivore eats a plant than when a carnivore eats an animal?

_____

_____

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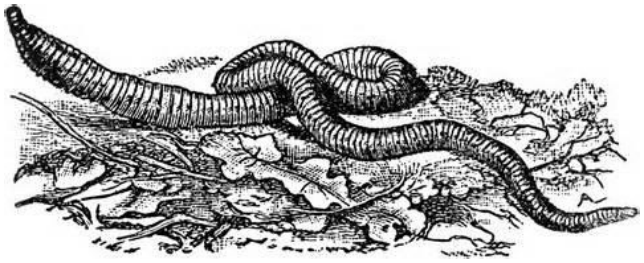
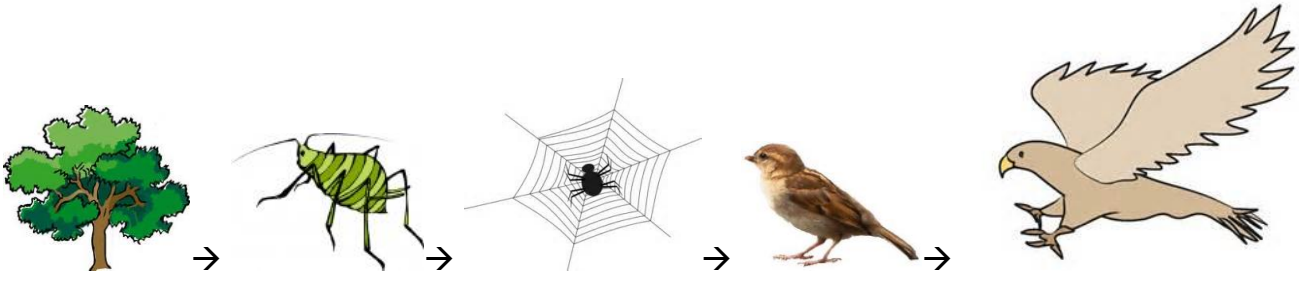
FOOD CHAINS AND FOOD WEBS

Pretend that you are exploring a forest ecosystem. Since you have just finished learning that energy flows in steps from producers to consumers to decomposers, you decide to look for some examples of energy flow. Under a large oak tree there are some fallen leaves. You lift the leaves and observe some decomposers (earthworms and beetles) eating the dead leaves.



You look up at the oak tree. You might notice that there are many tiny insects on the leaves. They are aphids. They are being eaten by flying insects. You see a spider in a web. Some flying insects are caught in the web. While you are watching the spider, a small bird flies into the web and eats the spider. Suddenly, a hawk swoops down and catches the small bird.



A while later, you see a wood mouse run down the oak tree with an acorn in its mouth. It has barely reached the ground when a snake catches and eats it. As the snake moves away from the oak tree, it is spotted by a hawk. The hawk dives down, grasps the snake with its claws, and flies off to its nest with a meal for its young. At some time in the future, of course the hawk will die and be acted on by decomposers.

GIVE AN EXAMPLE OF YOUR OWN

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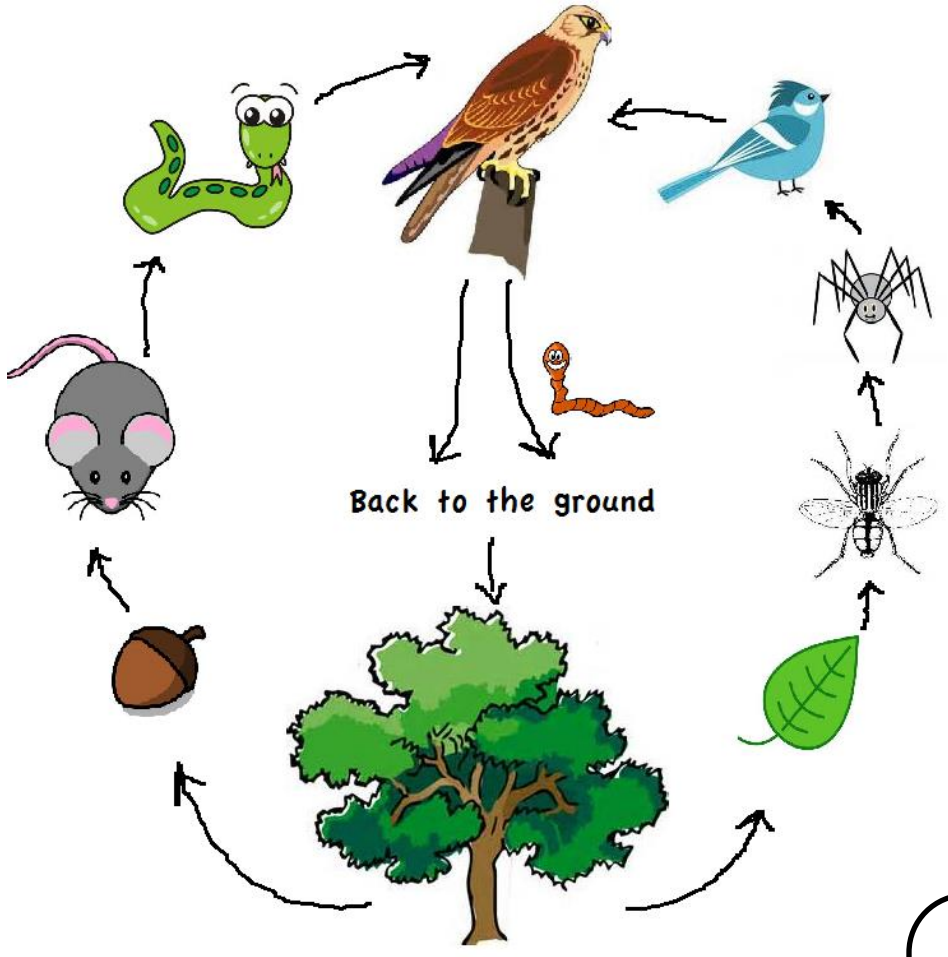
FOOD CHAINS- the events that you just read as you explored the forest could be shown in the following way:



These diagrams show the feeding order of some living things in this forest community. They are called FOOD CHAINS (the arrangement of living things in order in which each uses the next as a source of food.) A food chain is used to show who eats what in a community.

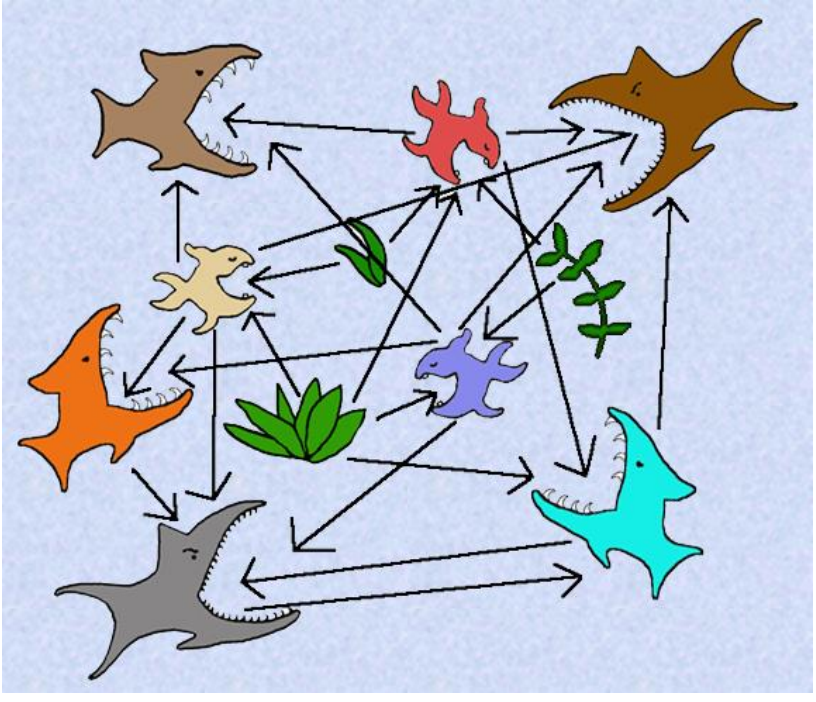
There are many food chains in a community. They vary in the number of steps. Producers, or plants, are always the starting point of the food chain. Consumers follow in the food chain. The first consumers are herbivores that eat only plants. They are followed by carnivores that eat herbivores. These carnivores may be eaten by larger carnivores. When all living things die, they become food for the decomposers.

FOOD WEBS

Look at the diagram of the two food chains described earlier. You will notice that they have some of the same things. What living things are parts of both food chains? Living things in a community are most often part of more than one food chain. Most herbivores in a forest community, for instance, feed on more than one plant. Carnivores such as a hawk may feed on snakes, birds, and mice. This means food chains are connected.

All the food chains that are found in a community would look more like a web than a chain. Together they make a FOOD WEB (a combination of all the food chains in an ecosystem). A food web is another way of showing the feeding relationships in a community. It shows how food chains are linked together.

Ecosystems with many kinds of plans have many kinds of animals. They will have food chains and complex food webs. On the other hand, ecosystems with few plants will have few kinds of animals. They will have fewer food chains and simpler food webs.



QUESTIONS:

1. What is a food chain?

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_____

2. Why does a food chain begin with plants?

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_____

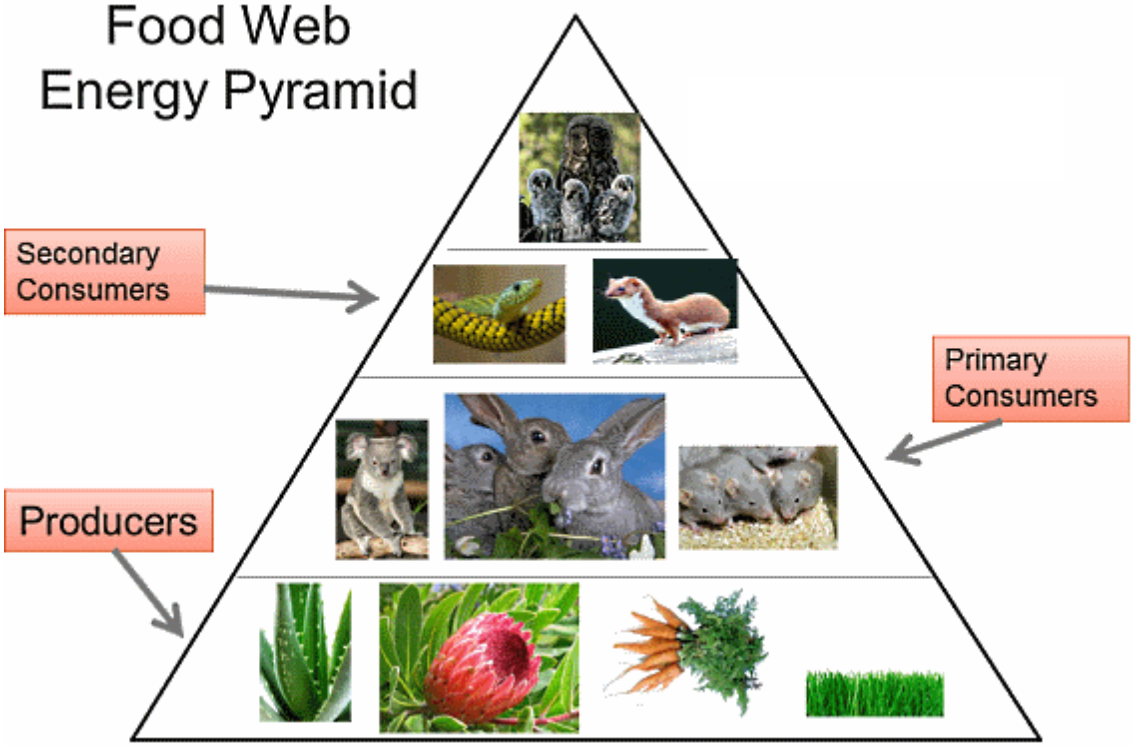
3. Give an example of somewhere with a simple food web. Explain.

_____

_____

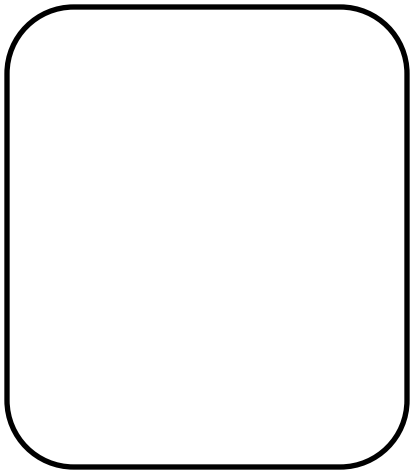
FOOD PYRAMIDS

As you have already learned, living things need energy to carry out their life functions. They get this energy from the food they eat. Food chains and food webs are ways of showing who eats what in a community. This is, they show how food energy flows in a community. However, food chains and webs do not show how much food is needed by living things to meet their energy needs.



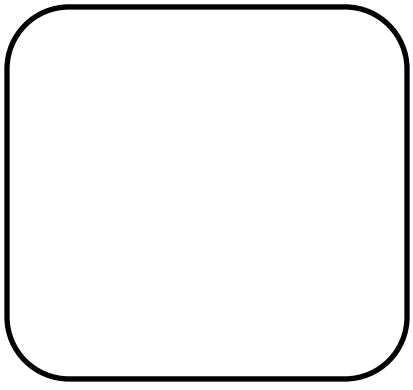
AMOUNT OF FOOD

The differences in the sizes of populations shown in the diagram are due to the amount of food energy available to each population. The populations with the largest amount of food energy available to the are the biggest. The amount of food energy that is available at each feeding step can be shown by a FOOD PYRAMID (a diagram to show how the amount of food energy available changes at each step of the food chain.)

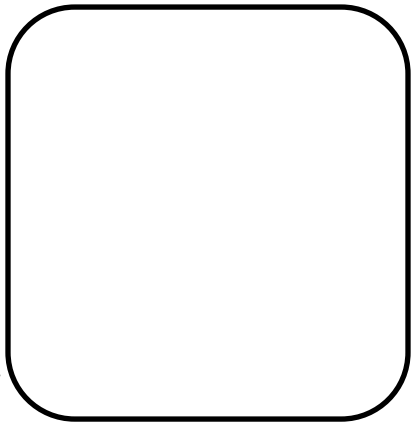


NUMBER OR ORGANISMS

Plants form the base of the food pyramid. They make their own food by using energy from sunlight, water, air, and minerals. Food energy that is not used by the plants is stored in the plants. Herbivores, such as the squirrel, rabbit, or mouse get their energy by eating the plants. Much of this energy is used by the squirrel, rabbit, or mouse to carry out their life functions. The rest is stored in their bodies.

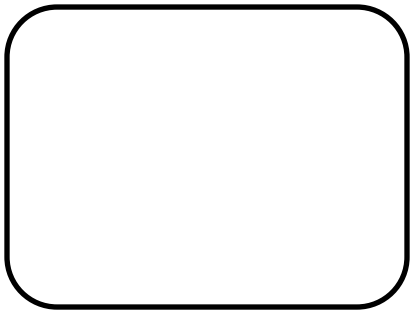


Carnivores such as the owl or fox, get their energy by eating other animals such as mice, birds, or squirrels. The energy that is not used by the carnivores is stored in their bodies.



At each step, living things use much of the energy for their own needs. Thus, there is less food energy available at each higher level of the food pyramid. Because there is less food energy available, the number of living things will be fewer at each step.

In other words, the largest populations and the most food energy in a community are in the producer (plant) step. This is because plants get their energy directly from the sun. Further up the steps of a food pyramid, the amount of food energy available and the populations of those living things decrease.



QUESTIONS:

1. What is a food pyramid?

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2. Why does each step in a food pyramid have less food energy available than the one below it?

_____

_____

_____

3. Draw or create your own food pyramid below: