

Energy Flow Through An Ecosystem

Name _____

Food chains and food webs are representations of the predator-prey relationships between species within an ecosystem or habitat. Many chain and web models can be applicable depending on habitat or environmental factors. Every known food chain has a base made of autotrophs, organisms able to manufacture their own food (e.g. plants).

Food chains are overly simplistic as representatives of the relationships of living organisms in nature. Most consumers feed on multiple species and in turn, are fed upon by multiple other species. For a snake, the prey might be a mouse, a lizard, or a frog, and the predator might be a bird of prey or a badger.

A food web is a series of related food chains displaying the movement of energy and matter through an ecosystem. The food web is divided into two broad categories: the grazing web, beginning with autotrophs, and the detrital web, beginning with organic debris. There are many food chains contained in these food webs.

In a grazing web, energy and nutrients move from plants to the herbivores consuming them to the carnivores or omnivores preying upon the herbivores. In a detrital web, plant and animal matter is broken down by decomposers, e.g., bacteria and fungi, and moves to detritivores and then carnivores.

There are often relationships between the detrital web and the grazing web. Mushrooms produced by decomposers in the detrital web become a food source for deer, squirrels, and mice in the grazing web. Earthworms eaten by robins are detritivores consuming decaying leaves

Food energy flows from one organism to the next and to the next and so on, with some energy being lost at each level. Organisms in a food chain are grouped into trophic levels, based on how many links they are removed from the primary producers. In trophic levels there may be one species or a group of species with the same predators and prey.

Autotrophs such as plants or phytoplankton are in the first trophic level; they are at the base of the food chain. Herbivores (primary consumers) are in the second trophic level. Carnivores (secondary consumers) are in the third. Omnivores are found in the second and third levels. Predators preying upon other predators are tertiary consumers or secondary carnivores, and they are found in the fourth trophic level. There is usually a maximum of four or five links in a food chain, although food chains in aquatic ecosystems are frequently longer than those on land. Eventually, all the energy in a food chain is lost as heat

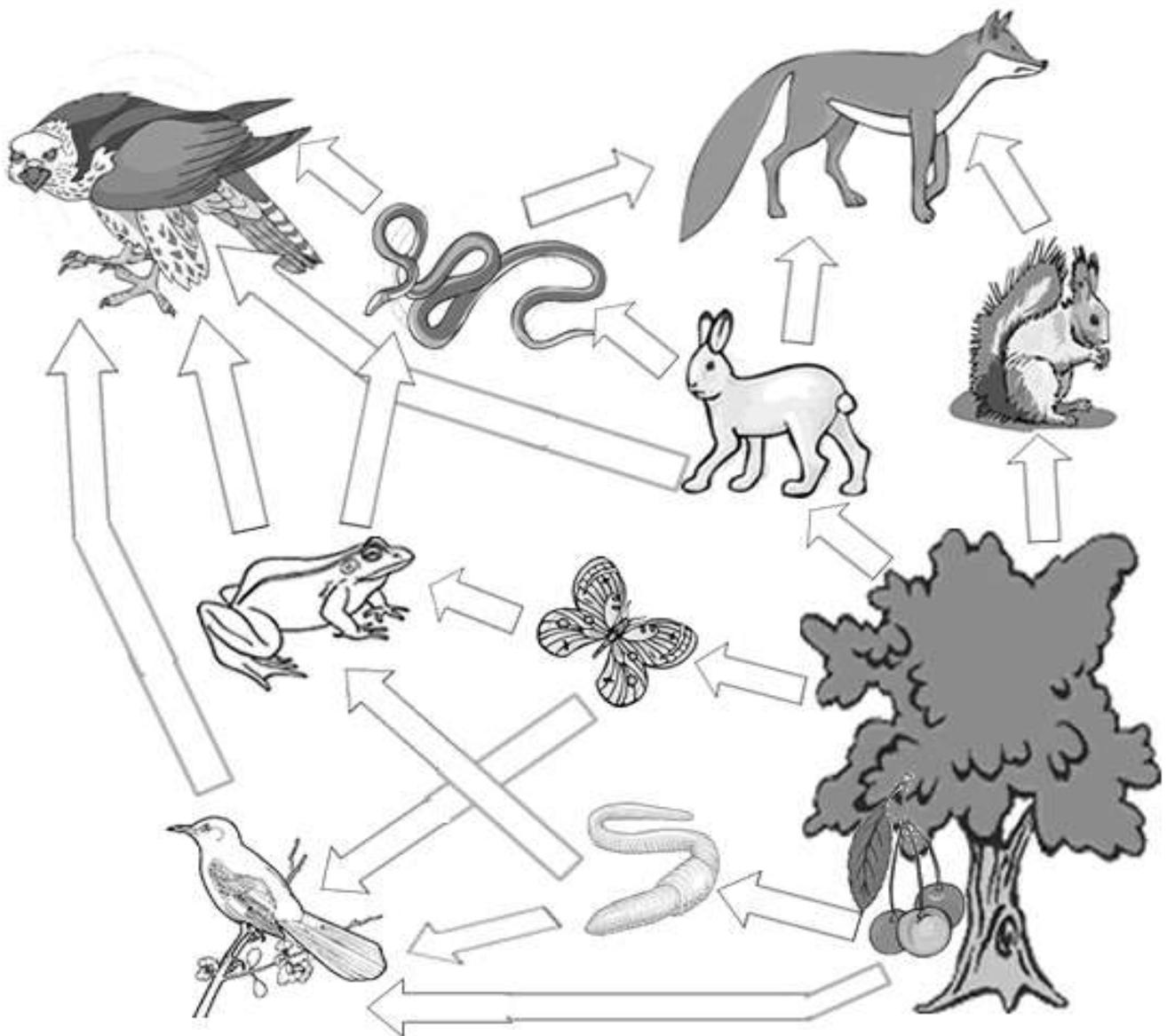
It is often the case that the biomass of each trophic level decreases from the base of the chain to the top. This is because energy is lost to the environment with each transfer as entropy increases. About eighty to ninety percent of the energy is expended for the organism's life processes or is lost as heat or waste. Only about ten to twenty percent of the organism's energy is generally passed to the next organism. The amount can be less than one percent in animals consuming less digestible plants, and it can be as high as forty percent in zooplankton consuming phytoplankton. Graphic representations of the biomass or productivity at each trophic level are called ecological pyramids or trophic pyramids. The transfer of energy from primary producers to top consumers can also be characterized by energy flow diagrams.

An **ecological pyramid** (or **trophic pyramid**) is a graphical representation designed to show the biomass or productivity at each trophic level in a given ecosystem. *Biomass pyramids* show the abundance or biomass of organisms at each trophic level, while *productivity pyramids* show the production or turnover in biomass. Ecological pyramids begin with producers on the bottom (such as plants) and proceed through the various trophic levels (such as herbivores that eat plants, then carnivores that eat herbivores, then carnivores that eat those carnivores, and so on). The highest level is the top of the food chain

1. For the food web, label each organism: (Some may have more than one label)

P = producer 1 = Primary Consumer 2= Secondary Consumer 3 = Tertiary Consumer

2. Now label each animal as either a : H = herbivore C = carnivore O = omnivore



3. Draw a pyramid of biomass and a pyramid of numbers for this diagram. You are free to make up your own numbers.

4. Create your own food web. You do not need to draw pictures, you could just write the words. Animals to put on your web: MOUSE, CORN, BLUEBIRD, KING SNAKE, HAWK, CAT, CRICKET. Draw a pyramid of biomass and numbers for your food web.