

Energy In and Along the River

In a food web, all energy comes from the sun. Light energy from the sun is absorbed by primary producers, such as plants, and converted to chemical energy that they can use to produce more cells and grow. Primary producers are the first trophic level. Consumers are organisms that get their energy by consuming, or eating, producers or other consumers. Consumers can be herbivores (the second trophic level) and only eat plant material, or they can be omnivores (the third trophic level) and eat plants or animals, or they can be carnivores (the fourth trophic level) and eat only animals. Some organisms are decomposers, which breakdown or eat non-living organic matter. Decomposers breakdown waste products like feces, dropped leaves, and dead animals. In this way decomposers are like the recyclers of an ecosystem. They are connected to everything because all living things eventually die and they can use the energy left in the waste or dead organism.

The energy transferred from one organism to another can vary. However, generally only 10% of the energy from an organism can be used by its consumer. Energy transfer is not very efficient - 90% of the energy is lost in the process, usually in the form of heat. Because so much energy is lost as you move from one trophic level to the next (as you move from one organism of a food web to the next), there needs to be many more producers and herbivores than big carnivorous predators. That's why you always see many more plants than herbivores, and herbivores are much more numerous than carnivores.

Activity - Build Your Own Prairie River Food Web

Materials

Large sheet of unlined white paper and markers

Notebook paper and pencil/pen

Tape or glue

not required, but helpful - field guides or access to other information about species listed on the next page

Procedure

Examine the list of organisms on the next page.

If you don't already know, do a little research to find out what each species produces or eats.

Think about the relationships between the species. Who produces usable energy from the sun? Who eats whom? Can more than one animal eat individuals of the same species? Can an animal be eaten by more than one predator? Can different parts of a plant be eaten by different herbivores?

When you have decided on the relationships, write the name of each species on a piece of paper and cut out the names. Arrange the species names on the large piece of paper and glue or tape down. Draw lines between the organisms, representing the transfer of energy from producer to consumer. The lines will connect herbivores to primary producers, predators to prey, and decomposers to everything. Draw an arrow to indicate the direction in which energy is flowing.

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Some of the Organisms found in a Large Prairie River Ecosystem

Plant Species - cottonwood, willow, cattail, tamarisk, giant rush, sunflower, grasses, box elder, evening primrose, persimmon tree

Alga - diatoms, blue-green algae, filamentous algae

Invertebrates - dragonfly, mosquito, box elder beetle, toad bug, tiger beetle, grasshopper, carrion beetle, tick, gnat, chigger, crayfish

Birds - heron, egret, indigo bunting, greycrested gnatcatcher, mallard, turkey vulture, least tern, bald eagle, Mississippi kite, gold finch

Fish - mosquito fish, catfish, Arkansas River shiner, paddlefish, bass

Reptiles - rattlesnake, red-eared slider, box turtle, soft shell turtle, ratsnake, gartersnake, snapping turtle

Amphibians - bullfrog, Woodhouse's toad, cricket frog, leopard frog

Mammals - white tailed deer, raccoon, beaver, river otter, mouse, coyote, kangaroo rat

Bacteria and Fungi

Questions for Discussion

1. Name 2 of the primary producers in your food web.
2. Name 2 of the herbivores in your food web.
3. Name 2 of the consumers in your food web.
4. Which species are top predators?
5. What would happen to the food web if the mosquito fish or catfish disappeared?
6. What would happen to the food web if the sunflower or persimmon tree disappeared?
7. Which trophic level has the most energy?
8. How much energy is lost at each trophic level?
9. Why might it be advantageous for a large animal such as a deer to feed on tree leaves?
10. What is the difference between a cycle and a flow.
11. Does energy cycle or flow through the ecosystem? Explain.

Tip - to be realistic, some species will eat, and be eaten by, several different organisms