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Adaptations to Environments

 Unit
3

TROPHIC LEVELS ON THE ENERGY PYRAMID

All energy in a food chain comes from the Sun except food chains at deep sea vents. The energy pyramid on the previous page illustrates that level one is composed of plants and occasionally fungi or algae. These are called primary producers. This is called **trophic** level one. *Trophic* is a Greek word for nourishment. The second energy level includes plant-eating animals and insects. Deer, rabbits, some butterflies, squirrels, and some small birds are at the second trophic level of the energy pyramid. The third trophic level of the energy pyramid includes insect eaters, like frogs and birds and animals that live on rodents like snakes. The fourth trophic level, the highest level, includes carnivores like foxes, wolves, tigers, and large birds of prey like owls.

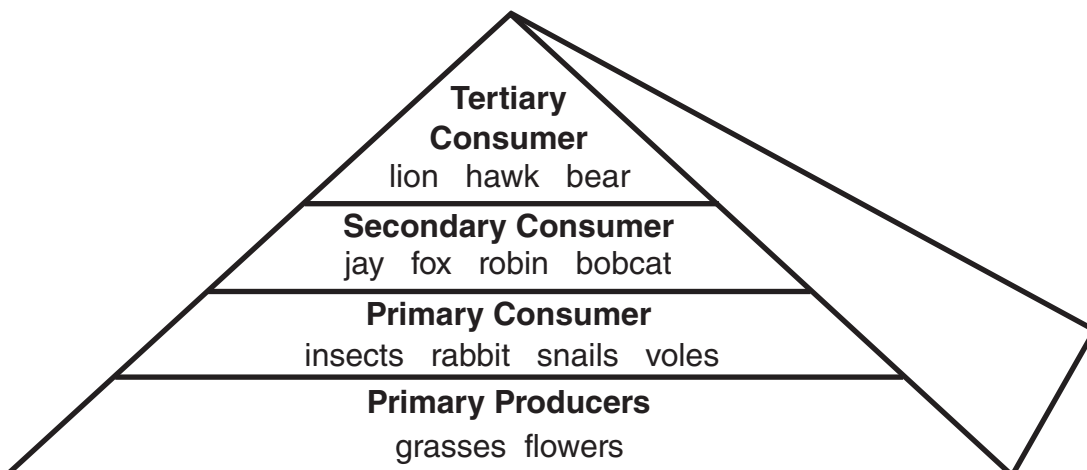
FOOD CHAINS

Food chains illustrate the relationship between organisms living in an ecosystem. They usually have only three or four links. For example, rabbits eat grass and bobcats eat rabbits. Food chains follow trophic levels.

grass → rabbit → bobcat
 plant plankton → insect larvae → salmon → brown bear
 flower → snail → thrush → hawk

FOOD WEBS

Food webs are interconnected food chains reflecting the diversity of animal eating habits. All the living creatures on Earth can be linked together in one giant food web. Plants are the basic producers of food. Primary animal consumers include plant-eating insects, mice, rabbits, beavers, and similar small animals. Secondary animal consumers usually eat these primary consumers. These consumers can include small hawks, snakes, bobcats, and foxes. Tertiary (third level) animal consumers can include sharks, bears, lions, and other large carnivores or birds of prey. Some animals, such as bears and bobcats, may be both second and third level consumers depending upon what they are eating. Below is a simple food web.



Unit
3

Adaptations to Environments

HERBIVORES, CARNIVORES, AND OMNIVORES

Deer, horses, and manatees have flat molars for chewing and eating plants. These animals and many smaller mammals that eat plants are **herbivores**. An animal's place in a food chain or web is often based on its eating adaptations. Cats, like mountain lions and tigers, have long, sharp teeth for chewing and tearing meat. So do wolves and many sharks. These animals are called **carnivores**. Some animals can eat both plants and animals. These animals are **omnivores**. Bears, coyotes, foxes, and crows are omnivores.

DECOMPOSERS

Decomposers are very important organisms in any food chain or food web. These organisms break down dead and decaying plant and animal matter and animal waste products. In eating and digesting these products, the organisms return minerals to the soil with their own waste products. They are essential in returning carbon and nitrogen to the soil that are necessary to plant and animal growth. These decomposers include many kinds of bacteria and fungi such as mushrooms, and many invertebrates. These animals include many kinds of insects, snails, earthworms, and similar creatures without backbones.

Facts to Remember

- *Adaptations help organisms survive in harsh climates, find food, and protect their young.*
- *Structural adaptations are physical changes in an organism.*
- *Functional adaptations affect an animal's digestive system, breathing, pulse, or other body functions.*
- *Behavioral adaptations are changes in an animal's actions that improve its chances for survival. These include changing homes, migration, and hibernation.*
- *Organisms use about 90% of their food to function.*
- *An energy pyramid illustrates four trophic levels including producers and three levels of consumers.*
- *Food chains illustrate what animals eat and which animals were eaten.*
- *Food webs are combined food chains reflecting the interactions of animals in a habitat.*

VOCABULARY

adaptation—*a change in an organism*

carnivore—*animal which eats meat*

decomposers—*organisms which eat dead, organic material dormant (inactive, resting)*

estivation—*climate-controlled period of dormancy*

herbivore—*animal which eats plants*

hibernation—*period of inactivity in severe winter weather*

migration—*to move to different habitats during some seasons*

omnivore—*animal which eats both plants and animals*

organism—*a living thing*

trophic—*nourishment; a level of energy*

Understanding Food Chains

Reminders

- A food chain illustrates who eats what within a natural food web.
- Plants are the basic producers in all food chains.
- Large carnivores and birds of prey are at the top of most food chains.
- Carrion eaters (animals which eat dead animals) eat large carnivores when they die.

Directions

Rearrange each list of organisms in a food chain in the correct order on the chart below. The first two have been done for you. Create two food chains of your own for numbers 9 and 10.

Chain #1 fox shrubs rabbit	Chain #2 plant plankton bear salmon water snail	Chain #3 lizard berries grasshopper	Chain #4 lion grass antelope
Chain #5 snail water plants duck great-horned owl	Chain #6 wolf small plants vulture moose	Chain #7 mink bark hare great-horned owl	Chain #8 great white shark clams sea lions plankton

Food Chains

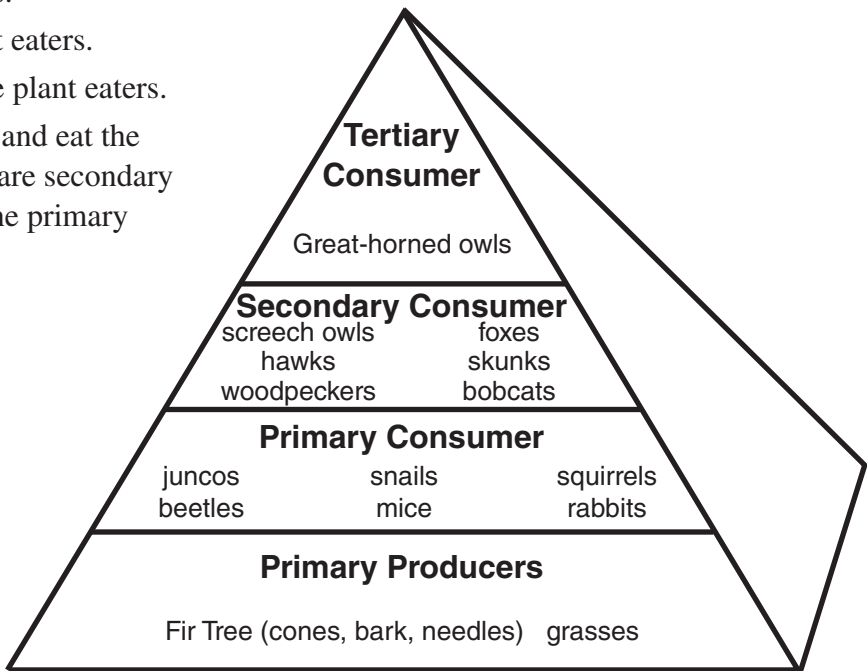
	Primary Producer	Primary Consumer	Secondary Consumer	Tertiary Consumer
1.	shrubs	rabbit	fox	— — —
2.	plant plankton	water snail	salmon	bear
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____

Understanding Food Webs

Food Web

Study the food web illustrated here. Note the following facts:

- The primary producers are plants.
- The primary consumers are plant eaters.
- The secondary consumers eat the plant eaters.
- The tertiary consumers are large and eat the smaller mammals and birds that are secondary consumers (and sometimes eat the primary consumers, too).



Directions

Use the food web you studied above and the facts you learned to arrange the plants and animals named here into a food web. Some blank lines will not be used. Draw the lines to show the pattern of predation (who eats what).

- | | | | | |
|----------|-------------|---------|----------|----------|
| bobcat | porcupine | grasses | nuts | wolf |
| rabbit | insects | leaves | hawk | blue jay |
| hare | berries | twigs | sparrow | acorns |
| squirrel | bark | clover | barn owl | |
| mice | small brush | seeds | deer | |

Primary Producer	Primary Consumer	Secondary Consumer	Tertiary Consumer
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____