

Name: \_\_\_\_\_ Hour: \_\_\_\_\_

## Food Chains and Webs --- "What's for dinner?"

Every organism needs to **obtain energy** in order to live. For example, plants get energy from the sun, some animals eat plants, and some animals eat other animals.

A food chain is the sequence of who eats whom in a biological community (an ecosystem) to obtain nutrition. A food chain starts with the **primary energy source**, usually the sun or boiling-hot deep sea vents. The next link in the chain is an **organism that makes its own food** from the primary energy source -- an example is **photosynthetic plants** that make their own food from sunlight (using a process called **photosynthesis**) and **chemosynthetic bacteria** that make their food energy from chemicals in hydrothermal vents. These are called **autotrophs** or **primary producers**.

**Sample Food Chains**

Trophic Level	Grassland Biome	Pond Biome	Ocean Biome
Primary Producer	grass ↓	algae ↓	phytoplankton
Primary Consumer	grasshopper ↓	mosquito larva ↓	zooplankton
Secondary Consumer	rat ↓	dragonfly larva ↓	fish
Tertiary Consumer	snake ↓	fish ↓	seal
Quaternary Consumer	hawk	raccoon	white shark

Next come organisms that eat the autotrophs; these organisms are called **herbivores** or **primary consumers** -- an example is a rabbit that eats grass. The next link in the chain is animals that eat herbivore - these are called **secondary consumers** -- an example is a snake that eats rabbits. In turn, these animals are eaten by larger **predators** -- an example is an owl that eats snakes. The **tertiary consumers** are eaten by **quaternary consumers** -- an example is a hawk that eats owls. Each food chain ends with a **top predator** and animal with **no natural enemies** (like an alligator, hawk, or polar bear).

### Food Chain Questions

1. What travels through a food chain or web? \_\_\_\_\_
2. What is the ultimate energy for all life on Earth? \_\_\_\_\_
3. Food chains start with what? \_\_\_\_\_
4. The 1<sup>st</sup> organism in a food chain must always be what type of organism? \_\_\_\_\_
5. Name 2 food making processes. \_\_\_\_\_
6. Where do chemosynthetic bacteria get their energy? \_\_\_\_\_
7. Define herbivore. \_\_\_\_\_
8. Herbivores are also called \_\_\_\_\_.
9. What are animals called that feed on herbivores? \_\_\_\_\_
10. Secondary consumers are eaten by larger \_\_\_\_\_.
11. \_\_\_\_\_ consumers eat secondary consumers.
12. Make a food chain with a producer and 3 consumers.

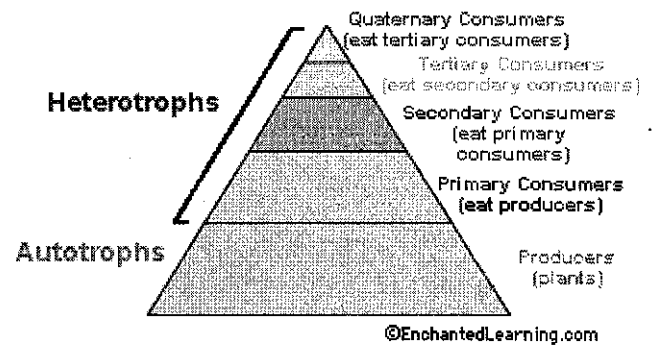
The arrows in a food chain show the flow of **energy**, from the sun or hydrothermal vent to a top predator. As the energy flows from organism to organism, energy is lost at each step. A network of many food chains is called a **food web**.

### Trophic Levels:

The trophic level of an organism is the position it holds in a food chain.

- Primary producers** (organisms that make their own food from sunlight and/or chemical energy from deep sea vents) are the base of every food chain - these organisms are called **autotrophs**.
- Primary consumers** are animals that eat primary producers; they are also called **herbivores** (plant-eaters).
- Secondary consumers** eat primary consumers. They are **carnivores** (meat-eaters) and **omnivores** (animals that eat both animals and plants).
- Tertiary consumers** eat secondary consumers.
- Quaternary consumers** eat tertiary consumers.
- Food chains "end" with top predators, animals that have little or no natural enemies.

## The Food Web



When any organism dies, it is eventually eaten by **detrivores** (like vultures, worms and crabs) and broken down by **decomposers** (mostly bacteria and fungi), and the exchange of energy continues.

Some organisms' position in the food chain can vary as their diet differs. For example, when a bear eats berries, the bear is functioning as a **primary consumer**. When a bear eats a plant-eating rodent, the bear is functioning as a **secondary consumer**. When the bear eats salmon, the bear is functioning as a **tertiary consumer** (this is because salmon is a secondary consumer, since salmon eat herring that eat zooplankton that eat phytoplankton, that make their own energy from sunlight). Think about how **people's place in the food chain varies - often within a single meal!**

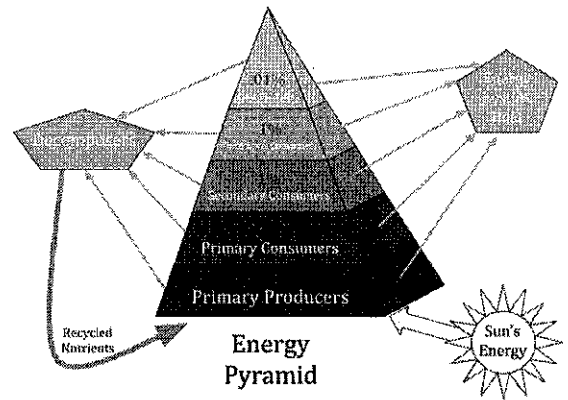
### Food Web Questions

- What is used to indicate the flow of energy in a food chain or web? \_\_\_\_\_
- What happens to energy as we move from step to step in a chain or web? \_\_\_\_\_
- Define food web. \_\_\_\_\_
- What is meant by trophic levels? \_\_\_\_\_
- Define autotroph. \_\_\_\_\_
- The 1<sup>st</sup> trophic level consists of \_\_\_\_\_ producers called \_\_\_\_\_.
- Name the 2<sup>nd</sup> trophic level (both names). \_\_\_\_\_
- Secondary consumers may be \_\_\_\_\_ (meat eaters) or \_\_\_\_\_ (eat both plants and animals).
- What is the 3<sup>rd</sup> trophic level called? \_\_\_\_\_
- What is the 4<sup>th</sup> trophic level called? \_\_\_\_\_
- At the 5<sup>th</sup> trophic level would be \_\_\_\_\_ consumers that eat \_\_\_\_\_ consumers.
- Give an example of 3 detrivores. On what do they feed? \_\_\_\_\_
- What organism feeds on dead plants and animals and helps recycle them? \_\_\_\_\_
- Both \_\_\_\_\_ and \_\_\_\_\_ act as decomposers.

27. Can an organism fill more than one trophic level --- yes or no? Give an example. \_\_\_\_\_

**Numbers of Organisms:**

In any food web, energy is lost each time one organism eats another. Because of this, there have to be many more plants than there are plant-eaters. There are more autotrophs than heterotrophs, and more plant-eaters than meat-eaters. Each level has about 90% less energy available to it because some of the energy is lost as heat at each level. Only 10 % of the energy gets passed on to the next trophic level. Although there is intense competition between animals, there is also interdependence. When one species goes extinct, it can affect an entire chain of other species and have unpredictable consequences.



28. In food chains and webs, what trophic level must you have more of than others? \_\_\_\_\_

29. Each trophic level has how much LESS energy? \_\_\_\_\_

30. What may happen if a species goes extinct? \_\_\_\_\_

**Equilibrium**

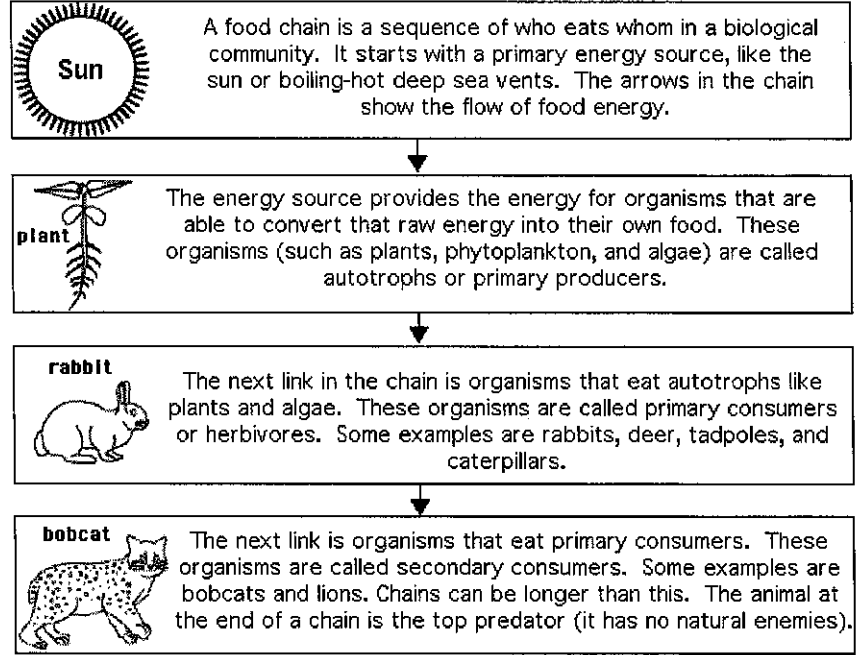
As the number of carnivores in a community increases, they eat more and more of the herbivores, decreasing the herbivore population. It then becomes harder and harder for the carnivores to find herbivores to eat, and the population of carnivores decreases. In this way, the carnivores and herbivores stay in a relatively stable equilibrium, each limiting the other's population. A similar equilibrium exists between plants and plant-eaters.

Circle the organisms that complete the food chains below.

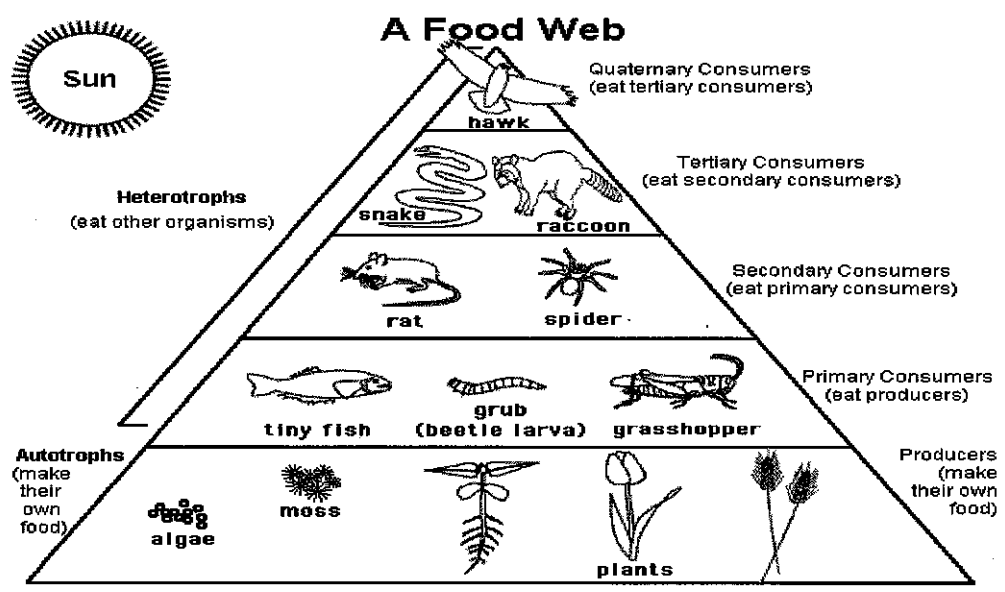
Sun →	a. Plankton b. Alligator c. Fish → d. Grass e. chicken	ZEBRA →	a. spider b. guppy c. lion d. wheat e. human
Sun →	Algae →	a. moth b. snail c. whale → d. caterpillar	a. lion b. starfish c. fish → d. grass e. crow
Sun →	Phytoplankton →	a. zooplankton b. algae c. seal → d. walrus e. moss	a. jellyfish b. spider c. krill → d. starfish e. clam
			RACCOON
			HUMPBACK WHALE

Read the information in the diagram then answer the questions.

31. What do the arrows in a food chain represent?  
\_\_\_\_\_
32. A food chain starts with an \_\_\_\_\_ source.
33. Organisms that make their own food are called \_\_\_\_\_ or \_\_\_\_\_.
34. Organisms that eat plants are called \_\_\_\_\_ or \_\_\_\_\_.
35. An animal with no natural enemies is a \_\_\_\_\_.



Read the passage then answer the questions below.



36. There are many more \_\_\_\_\_ than there are primary consumers.
37. Organisms that eat other organisms are called \_\_\_\_\_.
38. Organisms that make their own food are called \_\_\_\_\_ or \_\_\_\_\_.
39. Grass is an example of a/an \_\_\_\_\_.
40. Zebras (grass-eaters) are \_\_\_\_\_.
41. Lions (zebra-eaters) are \_\_\_\_\_.

Circle the correct answer.

42. A plant is
- An autotroph
  - A heterotroph
  - A primary producer
  - A and C
43. A cow is
- A primary consumer
  - A heterotroph
  - An herbivore
  - All of the above
44. Autotrophs
- Make their own food
  - Are the base of the food chain
  - Are primary producers
  - All of the above
45. A lion that eats a zebra that ate grass is
- Primary producer
  - Primary consumer
  - Secondary consumer
  - Quaternary consumer
46. A bear that eats a fish that ate bugs that ate algae is a
- Primary producer
  - Primary consumer
  - Secondary consumer
  - Tertiary consumer
47. A person who eats chicken that ate grain is
- Primary producer
  - Primary consumer
  - Secondary consumer
  - Quaternary consumer
48. Primary consumers eat
- Primary producers
  - Primary consumers
  - Secondary consumers
  - Quaternary consumers
49. Secondary consumers eat
- Primary producers
  - Primary consumers
  - Tertiary consumers
  - Quaternary consumers
50. Tertiary consumers eat
- Primary producers
  - Primary consumers
  - Secondary consumers
  - Quaternary consumers
51. Quaternary consumers eat
- Primary producers
  - Primary consumers
  - Secondary consumers tertiary consumers
52. A heterotroph
- Is an autotroph
  - Eats other organisms
  - Is a primary consumer
  - A and C
  - None of the above
53. A cow (that eats plants) is
- A primary consumer
  - A heterotroph
  - An herbivore
  - All of the above
  - None of the above
54. If a person eats a vegetable, the person is acting as
- A primary producer
  - A primary consumer
  - A tertiary consumer
  - A quaternary consumer
55. A top predator
- Has no natural enemies
  - Is a meat eater
  - Is a heterotroph
  - All of the above
  - None of the above