

# Lab 12: Ecology

## Overview

This lab will give the student brief explanations of the basic principles of ecology and our ecosystem. The student will be able to explore the components of ecosystems through these laboratory activities.

## Learning objectives

- Be able to define ecology, population, community, and ecosystem
- Be able to differentiate between producer, consumer, herbivore, carnivore, omnivore, parasite, decomposer, and detritivore
- Be able to assign organisms to their trophic level and construct a food web

## Materials and equipment

- Scissors
- Glue
- Paper
- Jenga game
- Colored markers

## Background

### Vocabulary

- **Consumer** a living organism that eats plants or other animals
- **Decomposer** an organism that breaks down dead plants and animals, returning nutrients to the soil
- **Energy** allows an organism to move and do work from food that is eaten
- **Food chain** the order of eating, or energy transfer, in an ecosystem
- **Food web** the interaction of all related food chains
- **Plankton** microscopic organisms floating in water
- **Producer** a plant or plankton that changes the sun's energy into food

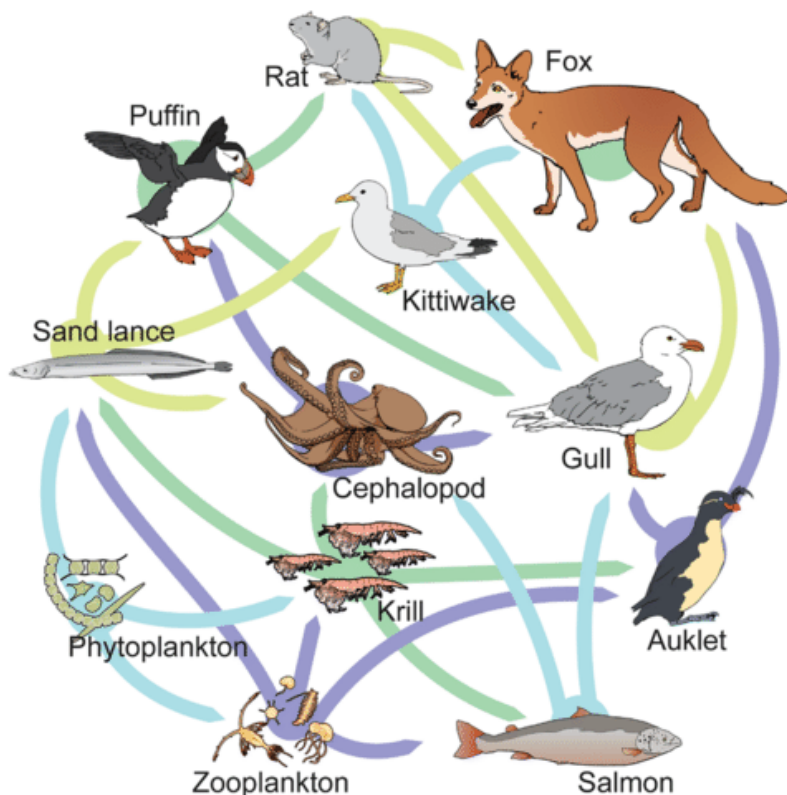
Ecology is the study of the relationships between living organisms, including humans, and their physical environment; it seeks to understand the vital connections between plants and animals and the world around them. Ecology also provides information about the benefits of ecosystems and how we can use earth's resources in ways that leave the environment healthy for future generations. An ecologist studies the relationship between living things and their habitats. In order to learn about the natural world, ecologists must study multiple aspects of life ranging from the moss that grows on rocks to the wolf population in Yellowstone National Park.

A food chain is web of organisms that eat one another so that energy and nutrients flow from one to the next. For example, if you had a cheeseburger for lunch, you might be part of a food chain that looks like: Alfalfa (hay) → cow → human. If you had a slice of tomato on your cheeseburger then your food chain looks like tomato → human. However, food chains *Figure 1* are not as simple as such because we cannot always fully describe what each organism eats in one straight path. Therefore we use food webs *Figure 2* which represents many intersecting food webs indicating what each organism consumes.

**Figure 1. Food chain with producer and consumers**



**Figure 2. Food web showing multiple feeding relationships but not clear trophic levels**



[Examples of food webs](#), by Mariana Ruiz Villarreal (LadyofHats) for CK-12 Foundation, is licensed under [CC BY-NC 3.0](#).

**Table 1. Different trophic levels of the energy pyramid**

Trophic Level	Types of Organisms	Where It Gets Food	Example
1st Trophic Level: Primary Producer	Photosynthetic Autotrophs	Makes its own food	Plants make their own food
2nd Trophic Level: Primary Consumer	Herbivores	Consumes primary producers	Mice eat plant seeds
3rd Trophic Level: Secondary Consumer	Primary carnivores	Consumes primary consumers	Snakes eat mice
4th Trophic Level: Tertiary Consumer	Secondary carnivores	Consumes secondary consumers	Hawks eat snakes

*Figure 3* is an ecological pyramid illustrating the large amount of phytoplankton needed to support the carnivores of the oceans. This energy pyramid has four trophic levels, which signify the organisms place in the food chain from the original source of energy.

**Figure 3. Ecological pyramid with four trophic levels**

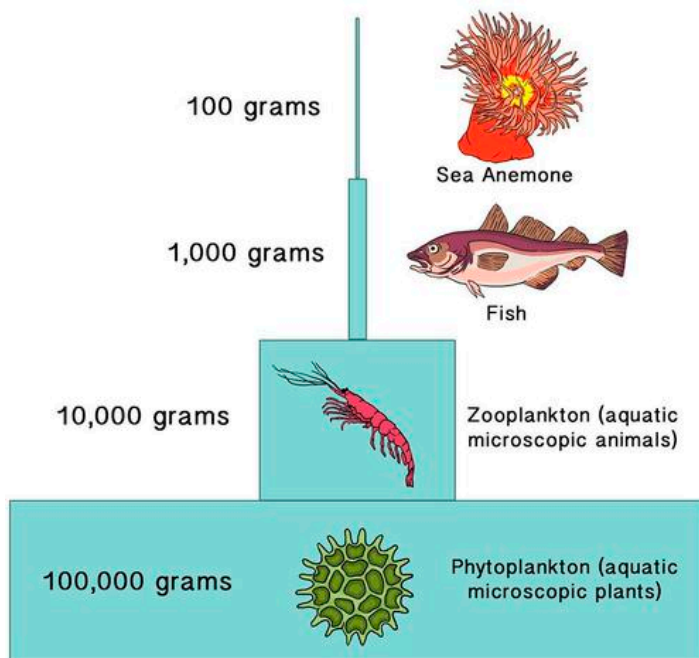
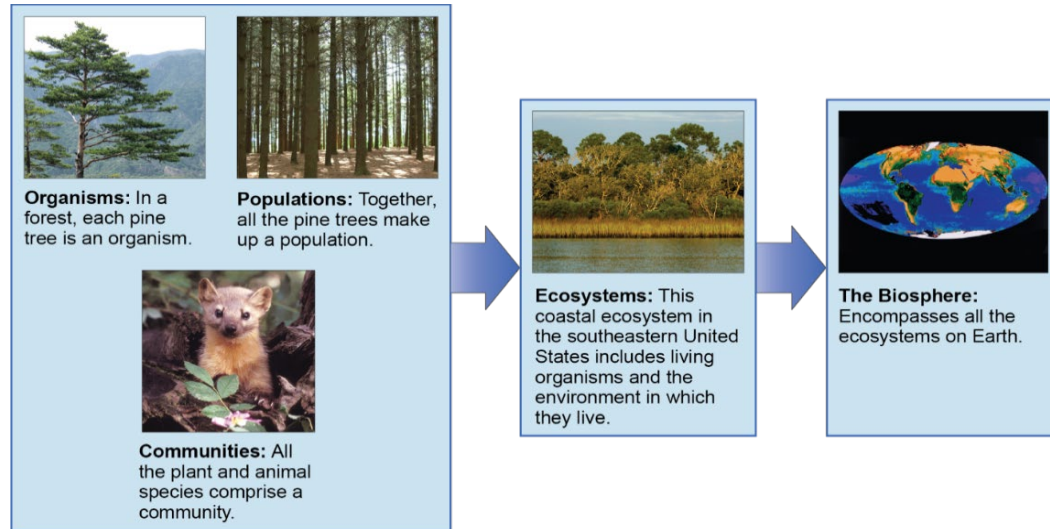


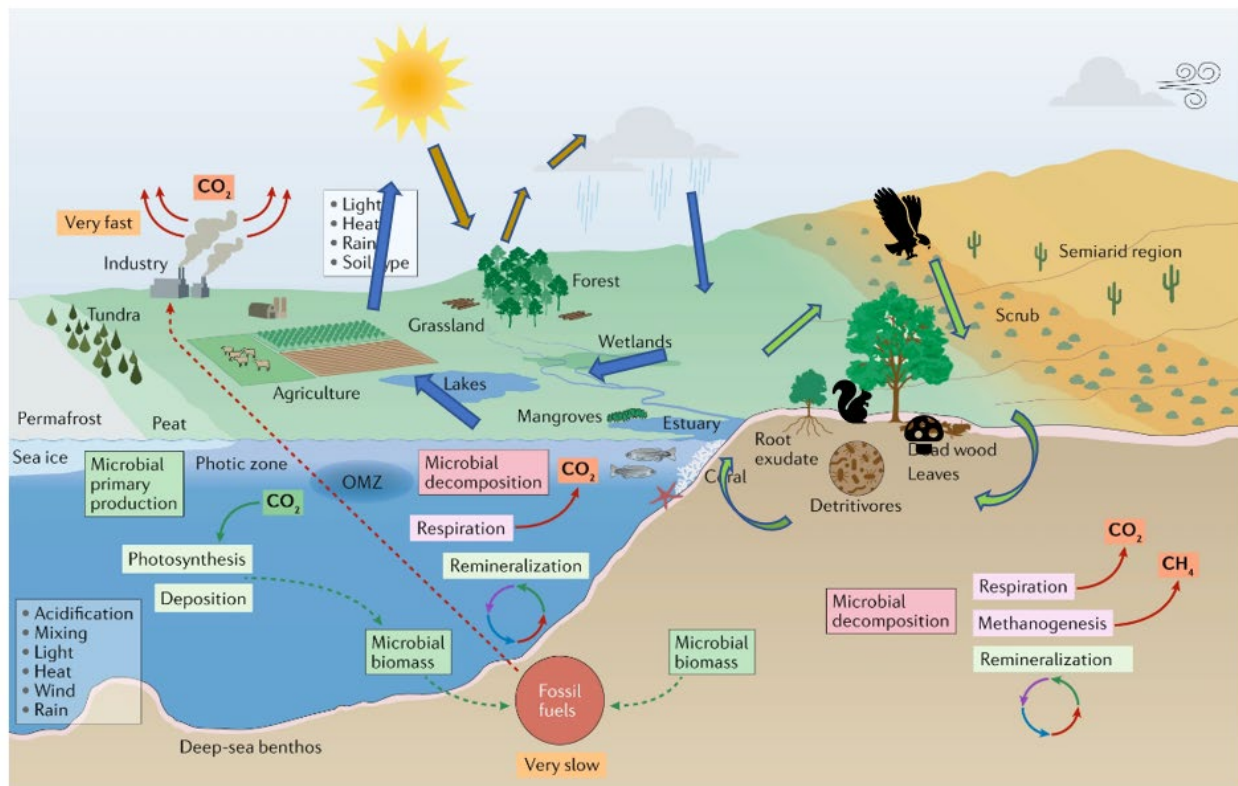
Figure 4 shows different populations together make up a community. Communities together with the non-living things in their surroundings make up an ecosystem. All the ecosystems on Earth make up the biosphere

**Figure 4. Flow chart of different communities within an ecosystem**



## Procedures Part I Biome Ecosystem

**Figure 5. Microorganisms and climate change in marine and terrestrial biomes**



[Microorganisms and climate change](#), used under [CC-BY-4.0](#). Black icons and additional arrows added.

## Questions

Before going on to the next section, answer the following questions.

1. List some of the abiotic things in the ecosystem shown in Figure 5.

2. For each of the organisms, discuss how you think the organisms below are interacting with the abiotic environment.

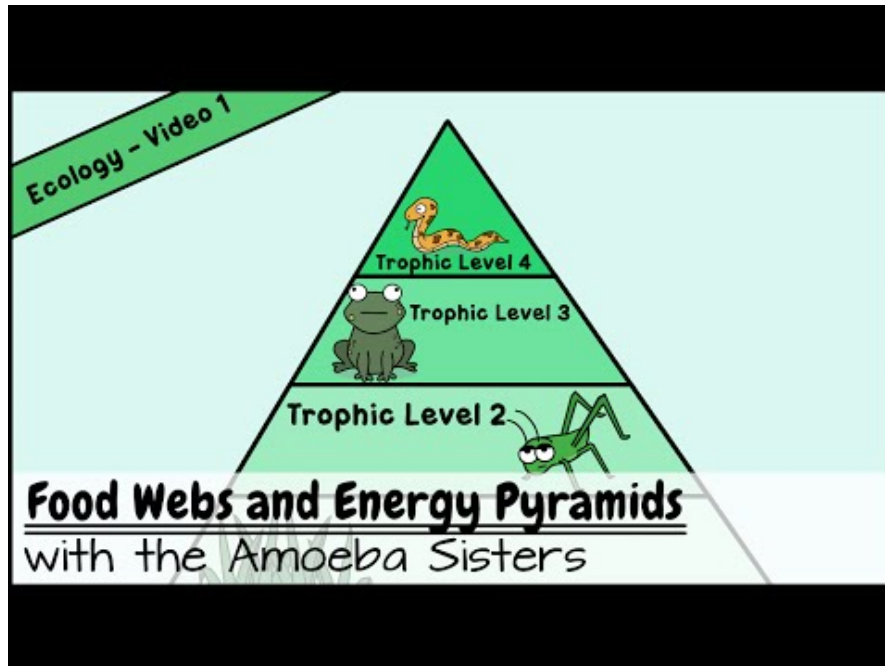
a.The eagle    b.The trees and grass    c.The mouse    d.The worm and insect

3. In **Figure 5**, the blue arrows show the movement of water through the ecosystem. What do we call this movement of water?

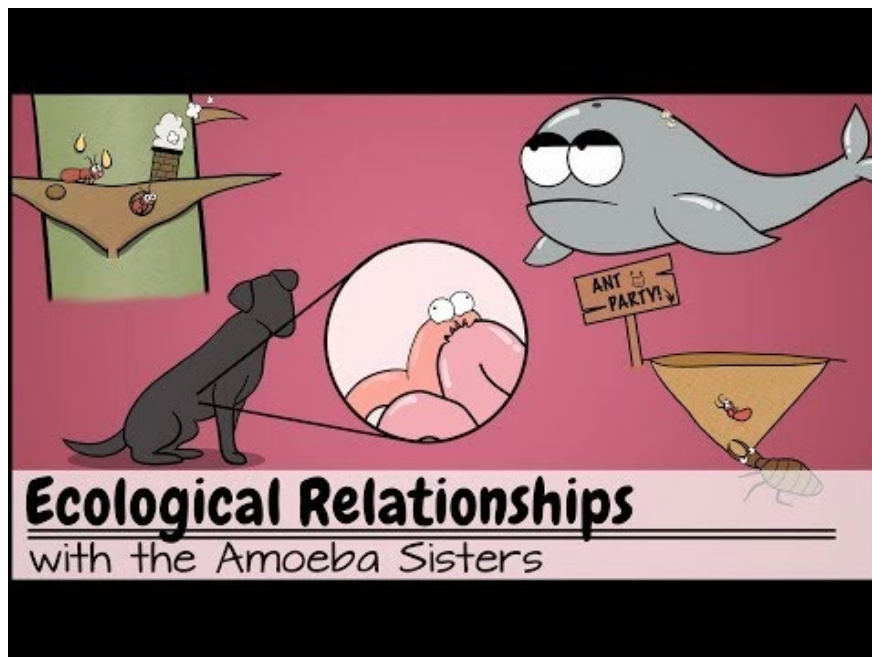
4. Temperature is an abiotic factor in an ecosystem. What can affect the temperature in the ecosystem?

5. Another abiotic factor which affects ecosystems is the slope of the land. For example, is it flat or are there hills or mountains. How would you describe the land in the grassland ecosystem? How do you think this contour affects the ecosystem?

Watch the following YouTube Videos



Amoeba Sisters. (2015, July 24). *Food Webs and Energy Pyramids: Bedrocks of Biodiversity* [Video]. YouTube. <https://youtu.be/-oVavgmveyY>



Amoeba Sisters. (2017, November 27). *Ecological Relationships* [Video]. YouTube. <https://youtu.be/rNjPI84sApQ>

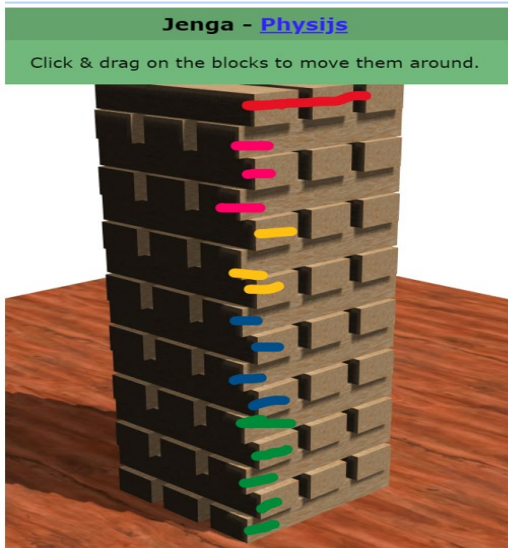


## Procedures Part II Ecosystem Jenga

[Instructions](#) (PDF file)

[Virtual Jenga](#)

**Figure 6. Stack of Jenga blocks**



(<https://chandlerprall.github.io/Physijs/examples/jenga.html>)



CrashCourse. (2013, Jan 10). *5 Human Impacts on the Environment: Crash Course Ecology #10* [Video]. YouTube. <https://youtu.be/5eTCZ9L834s>

## Procedures Part III Food Web and Energy pyramid

Let us test our knowledge of the food web and the energy pyramids.

**Table 2. Instructions for making a food web and energy pyramid**

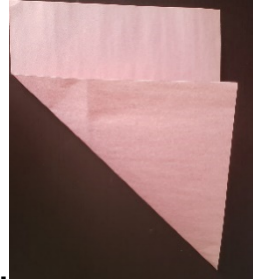
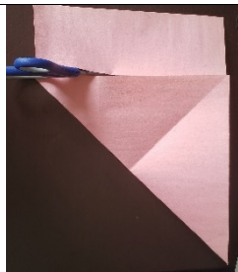
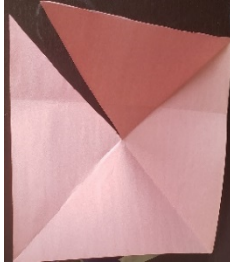
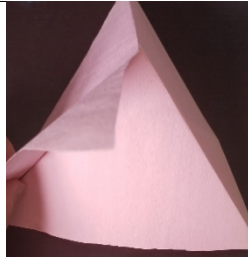
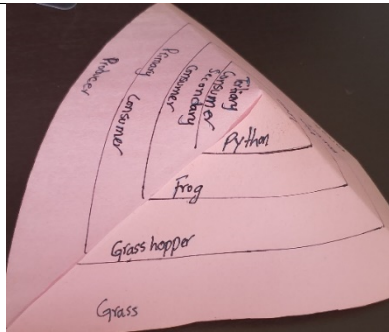
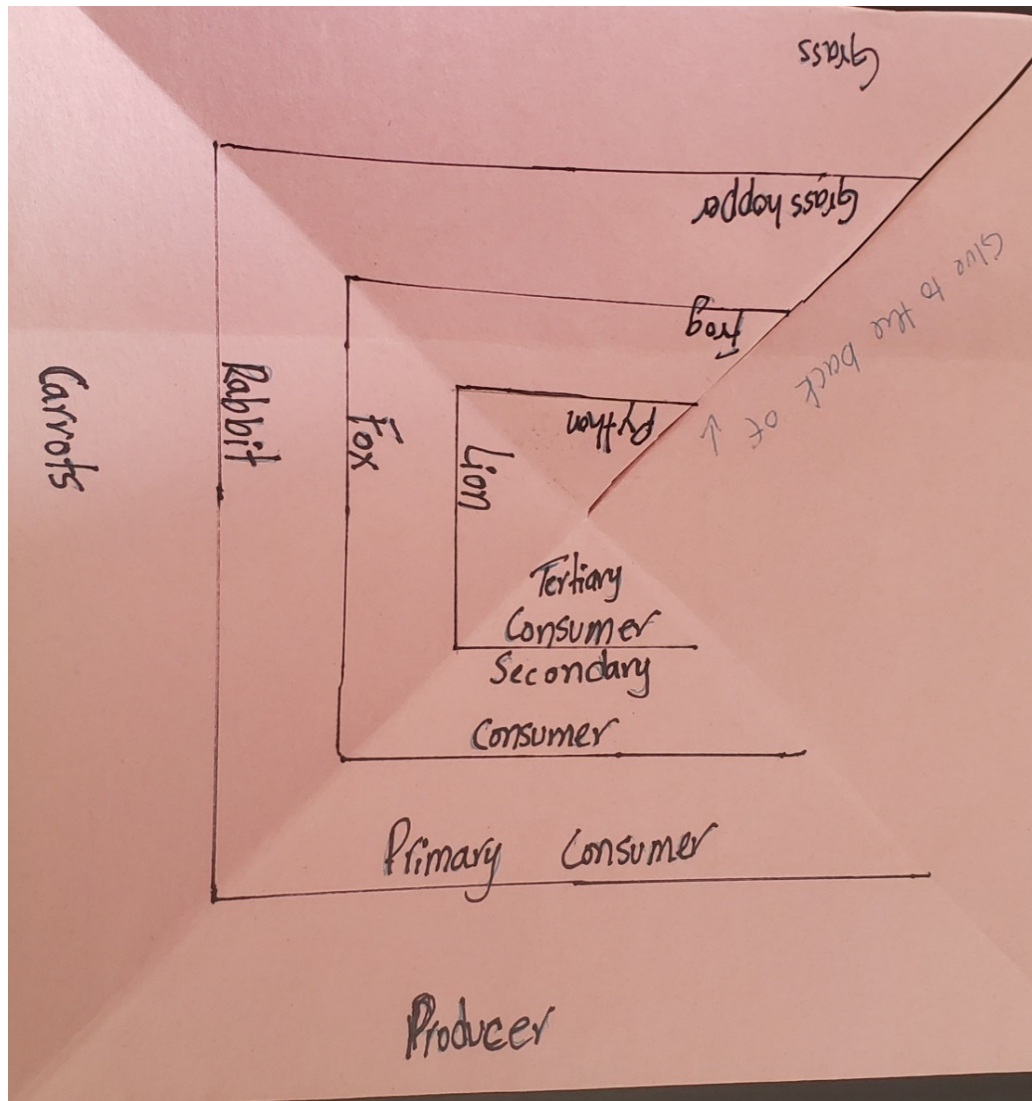
Steps	Figures
Use any square piece of paper. If it does not have equal sides, bring the short side over the long side and fold.	7a. 
When the triangle is formed, cut out the piece that is extra.	7b. 
Fold the square again in the opposite direction. You will have shape of X on the square. Cut one of the corners and stop at the middle.	7c. 
You will have a pyramid that looks like Figure 7d. Before you glue or tape, draw three lines for each trophic level	7d. 
You need to design your own energy pyramid. Decide on the organisms that will go into each level. You will need producers, primary consumers, secondary consumers and a tertiary consumers. Figure 8 is an example. You have to come up with a different one.	7e. 



Figure 8. Square paper with producer and consumers labeled by trophic levels



**Table 3. Food webs**

<b>Organism</b>	<b>Food Source(s)</b>	<b>Trophic Level</b>
Bacillus	Dead vertebrates	
Blackberry bush	Sun	
Bumblebee	Plant juices	
California gopher snake	Small rodents	
California tiger salamander	Insects	
California tree frog	Insects	
Desert tortoise	Leaves, flowers, fruit	
Duckweed	Sun	
Fairy shrimp	Algae, bacteria, protozoa, detritus	
Fly	Nectar	
Fresno kangaroo rat	Seeds, grasses, some insects	
Golden trout	Insect larvae, aquatic nematodes	
Grasshopper	Grasses	
Mosquito	Blood of mammals	
Mountain lion	Deer	
Mushroom	Decaying plants	
Opalinida (a protozoan)	Lives in the intestines of fish, amphibians, and reptiles	
Saprolegnia (pond mold)	Dead fish	
Screech owl	Rodents, fish, amphibians	
Sierra Nevada bighorn sheep	Grasses, woody plants	
Tule elk	Acorns, twigs, shrubs, berries, grasses, herbs	
Valley oak tree	Sun	
Water strider	Insect larvae, especially mosquito larvae	

## Questions

1. What is an herbivore? Write a definition below and then give four examples of animals from that are herbivores.

2. What is a carnivore? Write a definition below and then give four examples of animals that are carnivores.

3. There are different types of carnivores. Some carnivores hunt other animals. They are called predators. The animals that they hunt are called prey. A lion is an example of a predator. Give three examples of animals which are prey of a lion.

4. Other types of carnivores are called scavengers as they eat dead meat, for example a hyena. There are other scavengers. Identify them!

5. What do we call animals that eat both plants and other animals? Give one example.

6. What would you classify humans as?

7. The last group of organisms are the decomposers. Decomposers break down the remains of dead plants and animals. Give an example.

Refer to the study of an ecosystem in or near your school that you are busy with.

9. List the producers in your ecosystem. Explain how you know they are producers.

10. List the herbivores that you found in your ecosystem. Explain how you know they are herbivores.

11. Did you find evidence of or find examples of carnivores in your ecosystem? List them below.

**First and last name:** \_\_\_\_\_(required)

Follow your instructor's directions in renaming and submitting your lab.

### Copyright and attribution

This work is licensed under a [Creative Commons Attribution 4 International](https://creativecommons.org/licenses/by/4.0/).