

# Relationships and Interactions

Real World Ecosystems  
Backgrounder  
Grade Level: 5-8



In any ecosystem, many different species of plants, animals, and **micro-organisms** live together in all kinds of interesting ways. The relationships and **interactions** (actions or effects between plants, between animals, or between plant and animal species) between **organisms** are what make the ecosystem (a community of organisms together with the environment they inhabit and with which they interact work). Much of the energy and matter that flows and cycles through an ecosystem does so with the help of organisms.

There are a few basic ways organisms interact when they live together in ecosystems. Most interactions or relationships take the form of some kind of predation, competition, or **symbiosis**. Let's look at each of these in more detail.

**Predation:** Predation is when an organism captures and kills another organism and uses it for food. Most predators are animals, but there are a few plants, such as the Venus flytrap, that kill insects.

Predators are specially equipped for capturing, killing, and consuming their prey. They have specialized teeth, talons, claws, and other adaptations. They also have special digestive systems designed to process the food they eat. For example, wolves have stomach and intestines that can process large amounts of bone, hair, and other indigestible material.

## Competition

**Competition** occurs between organisms of the same or different species that have similar needs for light, space, food or other resources. If organisms live in the same place, they become competitors for those resources. For example, trees often compete with each other for the water and nutrients that are available in the soil. Among animals, competition may be over food, water, nesting or den sites, or even mates.

**Intraspecific competition:** Competition between members of the same species is called intraspecific competition. The intense competition between some male herd animals for the privilege of mating with the females is an example. This type of competition favours the animals that are biggest, strongest, and most aggressive. Three individuals tend to pass their traits on to offspring, which helps the species keep its place in the ecosystem over time.

Intraspecific competition among plants is less dramatic, but no less interesting. Canadian forests are often composed of large populations of trees from just a few species. In a lodgepole pine forest, for example, the main form of competition is intraspecific. In this case, trees battle not only for moisture and nutrients from the soil, but also for sunlight. Their trunks grow tall and most of their leaf-bearing branches are concentrated near the top of the tree.

**Interspecific competition:** Competition between different species for the same resource is called interspecific competition.

A good example is the competition between great horned owls and lynx for snowshoe hares, which are the principal food for both predators. Other species also eat snowshoe hares, which makes the hares an extremely valuable food source in the boreal forest!

Competition is one of the factors that helps keep populations of plants and animals in balance in ecosystems. Essentially, species that compete for a resource such as food or water may make that resource scarcer, which in turn means lower survival for the competing species. Without balancing factors such as competition, species can sometimes increase their numbers to epidemic proportions.

## Symbiotic Relationships

**Symbiosis:** This term simply means “living together”. Biologists think of symbiosis as any kind of relationship between two organisms (most often different species) that takes place over a long period of time and which is important to the survival of one or both of the species.

**Parasitism:** Parasitism is a form of symbiosis in which one organism lives on or in another, called a host. The parasite gets its food, shelter, or some other important resource from its host, usually damaging the host in the process. Parasites are a diverse group. They live on or in millions of species of different organisms in every ecosystem on the planet. Their complex life cycles often require two or more stages, each with different hosts. There are several hundred species of parasites specific to humans alone.

An example of a host-parasite relationship is that of moose and ticks. The winter tick, *Dermacentor andersoni*, can infect the skin of moose in large numbers. It feeds on moose’s blood and causes serious irritation to the moose’s skin. If the number of ticks on the moose is large enough, the health of the moose can suffer.

The lives of some parasites are bizarre. For example, the horsehair worm lives as an adult in ponds and lakes in Alberta and other places. After its eggs hatch, the microscopic larvae go to the surface where insects such as grasshoppers come to drink. Inside the grasshopper, the larva burrows into the tissues of the insect’s abdomen to complete its development. Infected grasshoppers are known to crawl out onto grass, leaning over ponds where they slowly die. The mature horsehair worm then cuts its way out and escapes to the water, where it looks for a mate.

**Commensalism:** In commensalism, two species live closely together, with one benefiting while the other remains unaffected. An example is the human follicular mite found in the eyebrows and eyelashes of almost all humans. These tiny mites live harmlessly inside the pores around our eyes. They consume dead cells and skin oils, and usually go unnoticed.

Another example of commensalism is found in the boreal forest. Many lichens and mosses grow on the bark of aspens, spruce, and other trees. The moss and lichens benefit from better access to moisture, sunlight, and other resources, but the trees they grow on see, unaffected.

Commensalism is also common in marine ecosystems. For example, brightly-colored clownfish spend much of their time among the deadly tentacles of sea anemones. Their bodies are covered with a thick mucus that does not trigger the poison cells in the anemone’s tentacles. The clownfish is well protected from its predators, but does not seem to be affected by the anemone in any way.

**Mutualism:** In mutualism, both species receive some benefit from their close, living relationship. Nature is full of examples of mutualism between organisms. For example, the production of fruit in many flowering plants is totally dependent on a mutualistic relationship between plants and pollinating insects. Insects such as honeybees, carry pollen from flower to flower, a process essential to the fertilization of seeds and the development of fruit. The bees obtain both pollen and nectar (a sugar-rich fluid inside the flower), which they use as food for their larvae.

At least 70 percent of the plants in an area rely on a mutualistic relationship with soil fungi. These fungi form a fuzzy sheath around the roots of the plant, bringing moisture and minerals to the plant from the soil. In return, the plant supplies sugar, without which the fungus could not grow or reproduce.

Another important example is that of the relationships between clover and bacteria that live in their roots. The bacteria, living in fleshy nodules on the clover's roots, are provided with a moist, nutrient-rich environment. In return, the bacteria process nitrogen from the air to make nitrates, a nutrient the plant cannot make for itself.

In yet another example, some species of ants found in Alberta care for "herds" of aphids- tiny insects that suck sap from plant stems. From their abdomen, the aphids produce droplets of nectar that the ants collect and use as food. In return, the ants protect the aphids from predators, clean them, and move them to the choicest feeding sites on the planet.

Plants have a surprising array of adaptation for improving their survival. One is the use of "chemical weapons" to eliminate competitors. This is called allelopathy. Allelopathic plants produce chemicals that seep into the soil around them, chemical that act like natural herbicides, able to kill or suppress other plants. Many species of plants have this ability, particularly the members of the sunflower family. This group includes asters, daisies, sage, goldenrod, and many others. Allelopathic chemicals produced by these plants are being investigated as possible natural herbicides for use in agriculture.

## Did You Know?

### Predatory Plants in Alberta

Did you know that insect-eating plants are common in Alberta? The two most common are called sundew and butterwort. Both are found in mossy, nutrient poor bogs and both are able to catch small insects on their sticky leaves. Less common are pitcher plants, which can be found in wet peat bogs in northern Alberta. The leaves of pitcher plants form tube-like cups that fill with water. Insects fall into them and drown, and the plant absorbs the nutrients released as the insects decompose.

### Moths on Maneuvers

Everyone is familiar with bats' ability to "see" in the dark, by means of echolocation. The favourite prey of many of Canada's bats is nocturnal moths, which they catch on the wing. Some moths have special adaptations- the equivalent of ears- which help them detect incoming bats. When they hear the bats' chirps, the moths dive. Hoping to elude their pursuers. Amazingly, some moths have taken this step further, and make a sound that confuses or startles the bat, a case of insect "radar jamming."

### Swimmers Itch- a Case of Mistaken Identity

Ever had swimmers itch? People get this after swimming in ponds or lakes. It is caused by the larvae of a parasitic worm called a *schistosoma*. These worms normally live in the blood of ducks and geese. Their larvae hatch from eggs and spend the first stage of their life cycle in snails. A tiny larvae form called a *cercaria* leaves the snail and swims near the surface looking for a duck/ Cercariae are attracted to body heat, and will burrow into the skin of any warm-blooded animal it finds, including humans. The red bump and itching are simply the body's immune system, at work destroying the invader. The parasite cannot survive in a mammal, and it is harmless to humans. But some species of schistosomes found in tropical regions, such as parts of Africa, can attack humans and cause very serious health problems and, sometimes death.

## Key Points

- In every ecosystem, plants and animals compete for food resources. Plants will sometimes have to compete for sunlight. All organisms need to find ways to survive and not become someone else's food.
- A predator is an organism, which hunts and kills another for food.
- Two species can become dependent on each other for survival. This relationship is called symbiosis. In a symbiotic relationship one of the species benefits directly.
- There are different types of symbiotic relationships: mutualism, commensalism, and parasitism.

## Think About...

- What is the difference between mutualism, commensalism, and parasitism?
- What are some examples of mutualism, commensalism, and parasitism?
- What are some characteristics of herbivores, carnivores and omnivores?
- What role(s) do humans play in the food chain?
- What are the differences between producers and consumers?