

1.0 Forest Ecology at the Ecosystem Level

Ecology is the study of living and non-living parts of the environment and how they affect each other.

The **environment** is everything around us. It includes the climate, and all the plants and animals. Non-living things that surround us, such as air, water, rocks, and minerals, are also part of our environment.

Man, through time understood these relationships, and so we know that Chinese farmers planted garlic and onions within rows of vegetables to prevent pests in their gardens

It is important to have knowledge of ecology to help us make better decisions regarding what happens in a special environment such as the forest

1.2 Organisms, populations, communities, niche, ecosystems, and biomes

Scientists interested in the environment have developed smaller units, or systems, called **ecosystems**.

Scientists know that our world can be divided into units, or parts, that have similar plants, animals, and climates, which is called a **biome**.

- a) **Organism** is animal or plant having different organs and parts that work together as a whole.
- b) **Population** is a group of organisms of the same species.
- c) **Communities** are populations of different species which live together in nature.

A rabbit is an **organism**.

Groups of rabbits could be a **population**.

A mixture of rabbits, balsam fir trees, and other plants and animals that live together is a **community**.

All the organisms, populations, and communities that live and interact with this environment is the **ecosystem**.

All these animals and plants could live in a land **biome**.

d) Niche is the geographical area and habitat a species lives in. The species have adapted to the niche and know what they have to do to survive. No two species have the exact niche.

e) Genetically adapted happens when one species is able to adapt to a different niche.

f) Scientists also like to study the life history of a single individual or species to see how it survives in its environment. An example could be the life of sandhill crane, or what a moose needs for food to survive.

1.3 Various relationships that commonly exist in the forest ecology

All members of the forest community affect other members by their presence, their health and when they leave the environment.

- a) Sometimes in nature when two species are interacting, there can be a situation when neither species is harmed and at least one species has benefitted.
---An example is a cowbird feeding on parasites on the back of a large elk which is good for both the elk and the cowbird.

- b) **Fungi** in the tree's roots help the tree gather nutrients and return with food from the tree. Some areas won't let trees grow because of the lack of fungi and some bogs won't support the trees there because there no fungus is present.

- c) In the interaction between two species it can happen that one species benefits while the other species is not harmed or does not have any benefit.

--An example is when a small fish attaches itself (via a sucker fish) to a larger fish for ease of travelling.

--Or, when a lichen plant attaches itself to a jack pine tree while receiving food from the atmosphere and using the tree as a dry place to hang.

- d) Parasites, predators, and competitors take part in the process to survive and often one species is badly affected or does not survive.

- e) **Consumptive (eating)** relationships happen when species eats part of another species which weakens or kills that species.

Organisms also interact chemically. If one plant has leaves partially eaten by a deer, the chemical given off by the deer can hurt others that eat off that plant.

f) There is a process in the forest where one plant affects another plant in a bad way

--An example is when some plants produce chemicals that don't let seeds or other plants grow on a site such as red pine needles or walnut leaves.

--Some chemicals in plants prevent other plants from flowering and therefore they do not produce.

1.4 Producers and use in the forest ecology

Energy is what life is about and everything living needs energy. Organisms are accumulations of energy and would die without it.

For an organism to reproduce it needs:

- growth
- for new growth it needs energy
- to get new energy it must do work
- to do work it needs to use energy

How many organisms survive, how good their survival skills are and where they live are determined by energy.

- a) Organisms that use **biotic energy** (non-living source such as the sun) are called **producers** (plants). They live and grow by using the sun, water, and carbon dioxide.

Some animals eat plants and they are called **primary consumers**.

An animal that eats a primary consumer is called a **secondary consumer**.

- b) The food produced by these plants is used by another group of living organisms called **consumers**. In some ways the consumers depend on producers for their food source.

- **herbivore** eats green plants only (vegetation only)
- **carnivore** eats herbivores and other carnivores (meat only)
- **omnivores** eat both plants and animals (meat and vegetation)
- When plants and animals die, they decay. Bacteria, molds, and fungi cause decay. These organisms are called **decomposers**. They use the energy in dead or decomposing plants and animals

--**parasite** gets energy from a living host usually without killing the host

- As the life of the consumer comes to an end, the process is then able to begin again as plants once again use the nutrients, along with water, carbon dioxide, and the sun to produce food by **photosynthesis**.

Here is an example:

- A cottontail rabbit is a **consumer**. It gets its food and energy from plant materials such as grasses. The plants produced their food using the sun as their source of energy.
- When the rabbit dies, microorganisms break down the rabbit's body and the ground becomes enriched with this animal decomposing. This makes the grass grow better.
- A rabbit had been eaten by a hawk. Hawks are known as a **predators** because it uses other living things as food. The rabbit becomes the hawk's **prey** because it is hunted for food. But the hawk also needs the producers (the grasses) to provide food for the rabbit so that the rabbit can in turn become the hawk's food source.
- If the hawk should die, it may be eaten by a coyote. The coyote would be known as a **scavenger** because it uses dead or rotting organisms as its food. The coyote is dependent on producers (grasses) to provide food for the rabbit, which then became food for the hawk, which died and became the coyote's food source.
- The transfer of energy from one organism to another is known as a **food chain**.

Example: Rabbit eats the grass, hawk eats the rabbit, coyote eats the hawk...

