INTRODUCTION TO ECOLOGY

WHAT IS ECOLOGY?

Ecology is the study of living things in their natural environment.

A *habitat* is the place where an animal or plant lives. All the living things in one habitat are called a community. An *ecosystem* is a complicated balance of plants, animals and non-living factors. Non-living factors include soil, climate, landscape and water.

A woodland ecosystem includes the trees, the soil, rocks and climate, as well as birds, insects and mammals. A rocky seashore ecosystem includes the rocks, sand, water, seaweed, limpets, mussels and fish. All the organisms within a community depend on each other for their existence.

Marram sand dune habitat

Oak forest habitat

Shingle shore habitat

Each habitat has its own particular set of environmental conditions. In order to be successful, to survive and breed, an organism must be suitable for its habitat. We call this adaptation to the environment.

PRODUCERS, CONSUMERS AND DECOMPOSERS

Green plants that photosynthesise are called producers. The chlorophyll in their leaves allows them to capture sunlight energy and convert it into food. Plants are important providers of food for animals. They can also provide other plants with shelter, support, food or protection.

Green plants contain chlorophyll

Animals provide food, pollinate flowers, disperse seeds and fertilise the soil. Animals are consumers because they can't make their own food. They are classified according to what they eat. Many insects, birds, reptiles, fish and mammals are called carnivores because they eat meat. Those that hunt for their food are called predators, e.g., foxes, owls, badgers, spiders and centipedes.

The sun provides the energy that producers (green plants) need to make food. Herbivores, such as mice, rabbits, voles and grasshoppers, only eat plants, i.e., producers. These in turn are eaten by carnivores, e.g., foxes, badgers, woodpeckers and barn owls. Animals that eat both plants and animal matter are called omnivores.

Cows are herbivores

Spiders are carnivores

Humans are omnivores

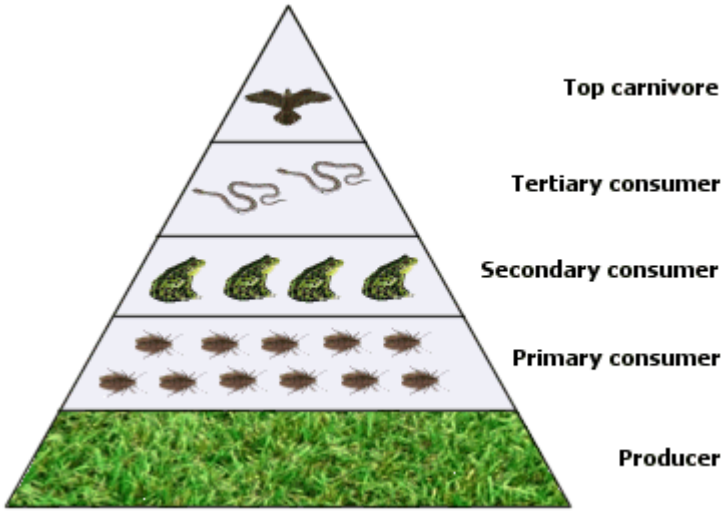
Bacteria and fungi feed off dead, decaying, organic material and break it down into simple nutrients that are returned to the soil or water. These substances are then re-used by the producers. Bacteria and fungi are called decomposers.

FEEDING RELATIONSHIPS

A food chain shows how living things feed on each other. A food chain is a group of organisms arranged diagrammatically showing the direction in which energy passes from one level to the next. For example, a butterfly feeds off a flower, a bird feeds off a butterfly and a cat eats a bird.

Only a small amount of the sun's energy is converted into food; most of the sun's energy that falls on a plant is reflected away.

The feeding relationships can be represented as pyramids of numbers, where the area of each rectangle in the pyramid is proportional to the number of organisms at that level.



Many animals eat more than one type of food so organisms can be part of several food chains. The result is a network of linked food chains called a food web.

RECYCLING MATERIAL

When animals and plants die their bodies decay. This is because bacteria and other micro-organisms feed upon them and break them down. The organisms that bring about decay are called decomposers. As a result of the activities of decomposers, simple substances are released from dead organisms. These substances are absorbed by plants and can go through the food chain all over again. Decomposers enable chemicals to be recycled and used again. They play a very important part in the cycling of elements such as carbon and nitrogen.

Fungi break down the remains of dead plants and animals

Earthworms in a compost bin help decompose organic waste

HABITAT STUDIES

Ecologists use habitat studies to investigate the numbers and relationships of organisms within a habitat.

One of the commonest ways of sampling habitat is to use a *quadrat*. A quadrat is a square frame usually $0.25m^2$ made of wood or metal. It is used to estimate the numbers of plants in a habitat. To sample an area using a quadrat, the quadrat is thrown randomly around the mapped area, and the numbers and types of species occurring within the quadrat are counted at each throw.

Sometimes the types of organisms gradually change as you go across a habitat. In cases like this, it is useful to record where each type of organism occurs. You can do this by placing the quadrats along a line crossing the area. This line is called a *transect*.

To investigate the animals in a habitat they need to be trapped first, and then counted. There are various different traps that ecologists use. Pitfall traps catch organisms that walk along the ground. Mammal traps catch mammals. A piece of wood placed on the ground will act as a trap as slugs and woodlice will hide under it. Pooters are used to collect insects and small animals from trees and bushes. Beating trays are used to dislodge insects and small animals from trees or bushes.

APPLIED ECOLOGY

The world's human population is growing and as it does so it needs more crops, meat, wood, fuels and minerals. This is causing problems for other populations.

To help crops grow, chemical fertilisers are often sprayed onto soil. These fertilisers are washed into lakes and rivers where they can encourage the growth of algae. Microbes feeding on dead algae use up all the oxygen in the water so that there is not enough left for other organisms, so fish and other aquatic organisms die.

Pesticides are sprayed onto crops to kill insects and other pests, but they can build up in the bodies of birds which feed on the pests and they can also be washed into lakes and rivers.

Huge areas of forest are being cut down for timber or to make space for agriculture or industry. However, trees supply the world with some of its oxygen and they also provide shelter for many forms of wildlife. When trees are removed the soil is easily eroded and large areas of ground can be turned into desert or bog.

Fish are an important food source for millions of people, but if too many fish are taken from the sea there are not enough left to breed. Soon the fish die out altogether.

When coal,oil and petrol are burnt the waste gases include sulphur dioxide and nitrogen oxides. Unless these are removed they dissolve in rainwater to form acid rain. Acid rain corrodes steel, eats into stonework and damages plants. Fuels also give off CO_2. This traps the sun's heat and causes global warming. This is referred to as the greenhouse effect.

Whenever humans interfere with the natural environment they will change the ecological balance. Conservation involves doing things to limit the damage caused by humans and to maintain ecological balance.