

Ecosystems

Biology and Geology

Ecosystems

- Ecosystems: levels of organisation
- Interaction in ecosystems
- Flow of matter and energy in an ecosystem
- Adaptation to biotic factors.
- Classification of ecosystems
- Soil as an ecosystem
- Ecosystem balance-sustainability

Ecosystems: levels of organisation

Ecosystems

Ecology is the science of studying ecosystems. There are two main parts of an ecosystem: the **biotope** or physical environment, and the **biocenosis** or living thing.



A **population** is a group of individuals of the same species that lives in the same place.



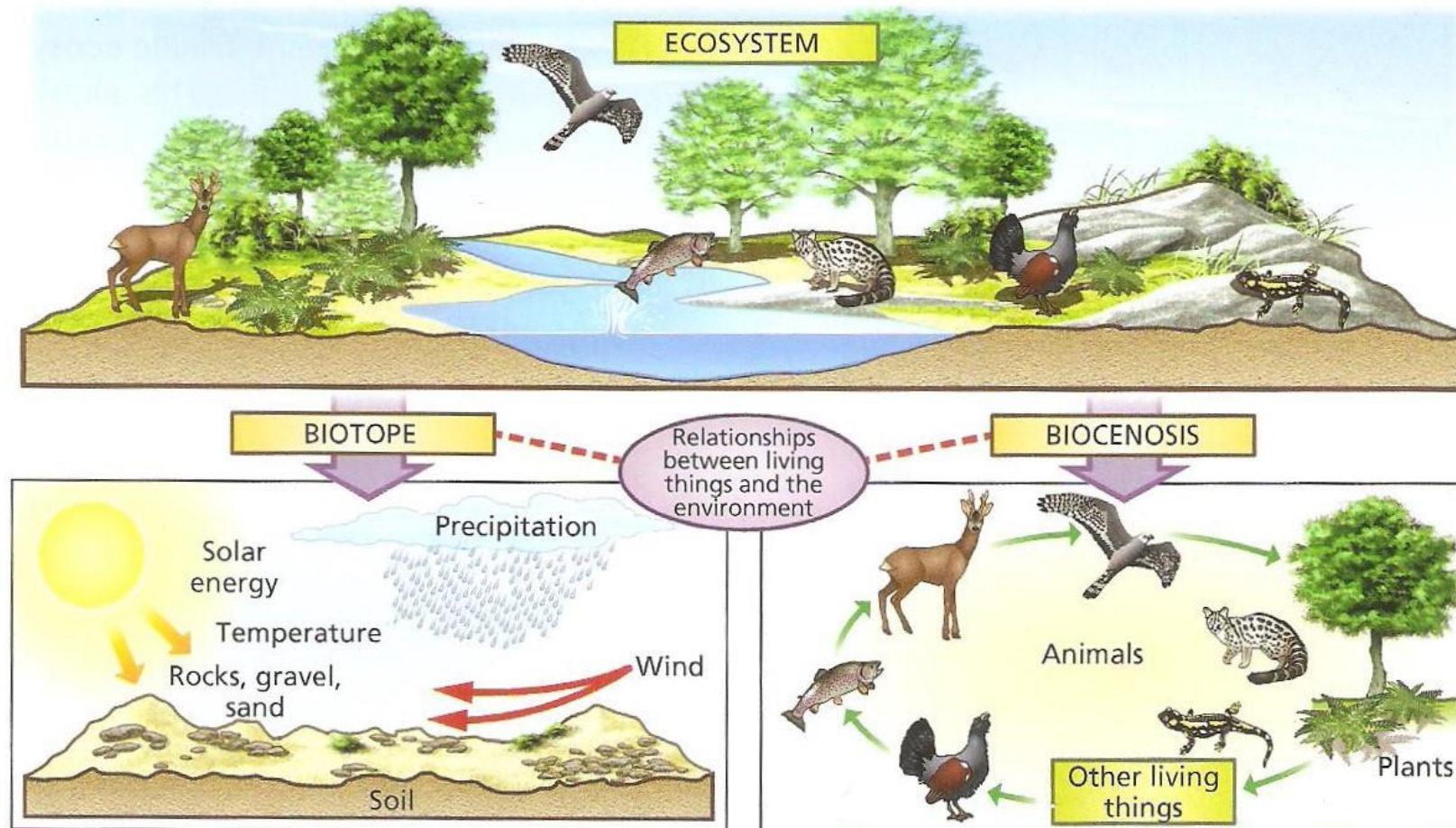
A **community** or **biocenosis** is a group of populations that lives in a particular area. They also interact with each other.



An **ecosystem** is the group formed by a community, the physical environment it inhabits and the interactions that occur.

Ecosystems

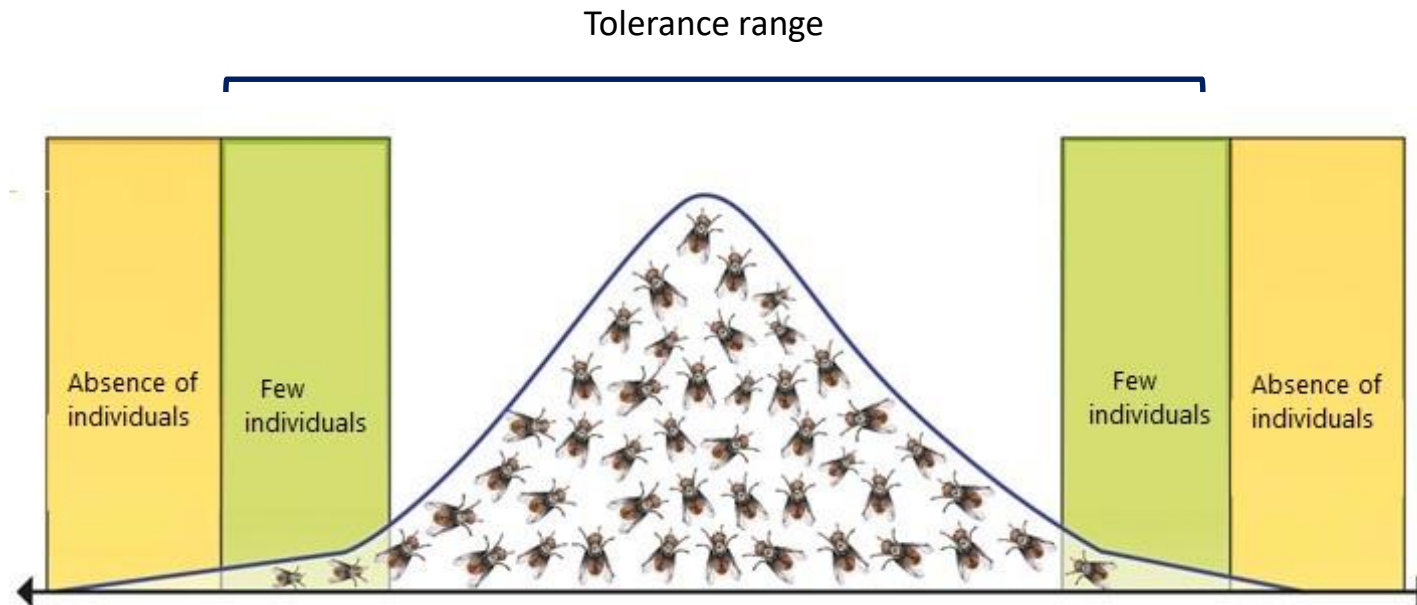
An **ecosystem** is a group of living things, the physical environment surrounding them and the relationships between them all.



Ecosystems

The components of a biotope and its biocenosis affect what living things inhabit the ecosystem.

- **Abiotic factors:**
 - **climatic** (temperature, precipitation or humidity...).
 - **physical** (light, pressure).
 - **chemical** (soil composition, salinity...).
- **Biotic factors.** which originate in the biocenosis and involve all living things and the interaction between them and with the environment.







Interaction in ecosystems

Ecosystems

- **Intraspecific relationships.** Involve individuals from the same species.

When living things can interact with individuals of the same species is called **intraspecific interaction**. They can be **positive** (cooperation), when it benefits the individual and the population, or **negative** (competition) when individuals compete for the same resource, reproduction opportunities, social dominance or food.

Families	Colonies	Groups	Societies
			
<p>Individuals of the same family interact. Related individuals live together to protect the young and reproduce.</p>	<p>Individuals can live very close together in large groups called colonies.</p>	<p>Individuals of the same species stay together for protection or to find food.</p> <p>Flocks of birds, herds of mammals, societies of insects, schools of fish.</p>	<p>Some species interact in highly organised hierarchies that rank individuals.</p> <p>(Queen, worker and drone)</p>

Ecosystems

- **Interspecific relationships.** Involve individuals from different species.

Relationships which harm one of the species

Competition



Predation



Parasitism



Relationships which benefit both species

Mutualism



Symbiosis



Relationships which benefit one species but don't affect the other

Commensalism



Inquilinism



Ecosystems

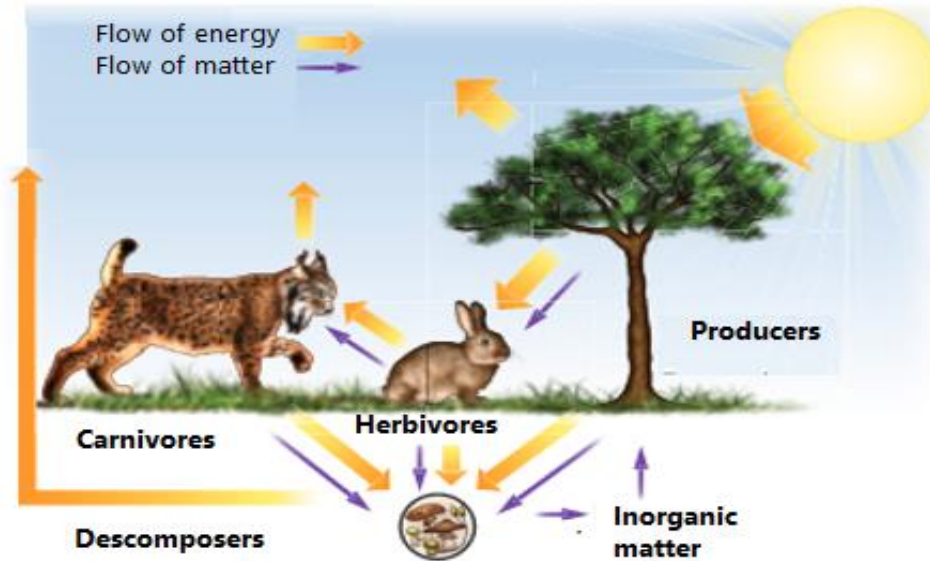
When living things can interact with individuals from other species, it's called **interspecific interaction**.

	Name	When	Example
<u>Harmful</u>	Competition	Two different species use the same limited source.	Plants in a forest competing for sunlight.
	Predation	One species (predator) feeds on another (prey)	Birds that eat fishes.
	Parasitism	One species (parasite) benefits from the other (host)	Lice and humans
<u>Beneficial</u>	Mutualism	Both species benefit from each other but can survive without one another	Flowers and insects
	Symbiosis	Two species live in a long-term association	Fungi living with particular algae to form lichen
	Commensalism	One species eats food left over by the other species	Vulture eating antelope hunted by lion.
	Inquilinism	One species uses part of the body of another species as a home	Hermit crab using the shell of other molluscs.

Flow of matter and energy in an ecosystem

Ecosystems

This diagram shows how **matter** and **energy** flow in an ecosystem.



- The Sun is the main source of energy for all ecosystems.
- The flow of energy in an ecosystem is an open path translation.
- Matter follows a closed cycle.

A **trophic level** is a group of organisms that obtain matter and energy in the same way.

There are three trophic levels: **producers**, **consumers** and **descomposers**.

Ecosystems



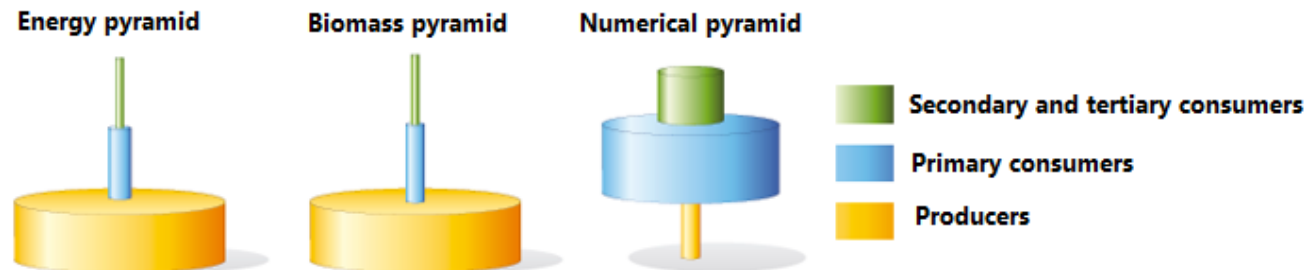
Food chain



Food webs

Food webs are more complex than **food chains**. A food web shows all the possible feeding relationships between living things.

Trophic pyramids are another way of representing trophic levels.



Adaptation to biotic factors

Ecosystems

Adaptations are the adjustments made by species over million of years of evolution to help them survive in their environment.

Adaptation to temperature



Plants in very cold areas grow close to the ground.



Some plants lose their leaves in winter (beech trees)



Plants in warmer climates, have small hard leaves (holm oaks)



Fat and fur that protect them from the cold (bears)



Certain animals are nocturnal (barn owls)



Body temperature regulation (lizards)

Adaptation to humidity



Exoskeleton, terrestrial arthropods



Plants in arid climates usually have small thick leaves and extensive roots to store water.



Dromedary camels can produce water from fat accumulated in their humps.



Flowering and leaf drop depending on the number of hours of daylight.



Big eyes in nocturnal animals (owls).



In dense forests, many plants have big leaves or climb up other plants to get closer to the sunlight

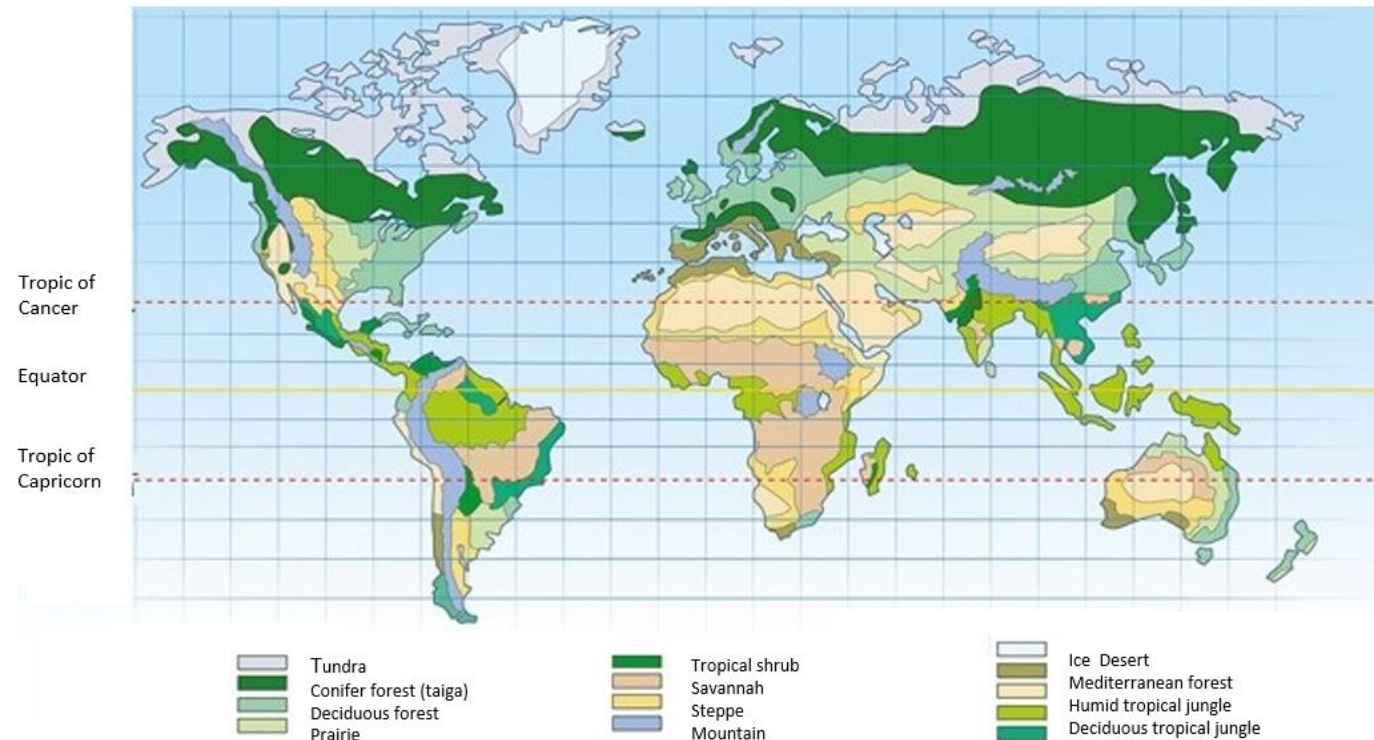
Classification of ecosystems

Ecosystems

Organisms that inhabit the land or air live in **terrestrial ecosystems**. Organisms that live underwater live in **aquatic ecosystems**.

Terrestrial ecosystems

A **biome** is a set of terrestrial ecosystems that have similar climatic conditions and a similar biocenosis.



Cold climates: polar desert, tundra and taiga.

Temperate climates: deciduous forests, Mediterranean forests and steppes.

Warm climates: hot desert, Savannah and rainforests.

Mountainous regions



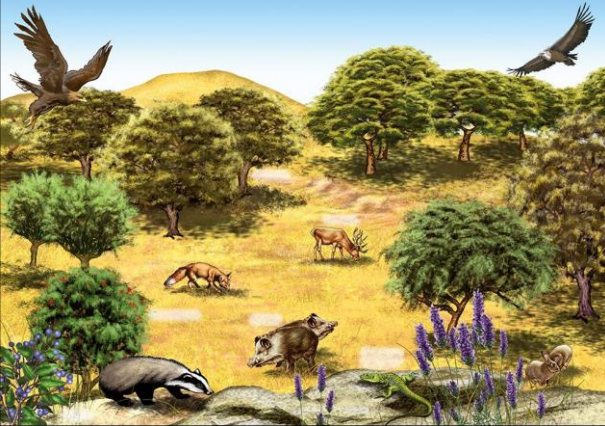
Ecosystems

A **biome** is a set of terrestrial ecosystems that share similar climatic conditions and have similar biocenosis.

Cold climate zone	Polar desert	Tundra	Taiga	Mountainous regions
	Low precipitation and temperatures below 0 °C.	Low precipitation. Only during the summer temperatures are higher than 10 °C.	Snowy winters and mild, humid summer.	
Temperate climate zone	Deciduous forest	Mediterranean forest	Steppe	
	Long warm summers and winters with a lot of precipitation.	Dry warm summers and mild winters; rainfall is considerable during autumn and spring.	Very cold winters and hot summers with low precipitation.	
Warm climate zone	Hot deserts	Savannah	Rainforest	
	There is a great variation in temperature depending on whether it is daytime or night-time. Very little precipitation.	A long, dry hot summer that alternates with a brief rainy mild season.	These are the wettest areas of the planet. They have constantly high temperatures throughout the year.	
Areas with abundant snow during winter and rain during the summer. Temperatures low all year round.				

Ecosystems

The main terrestrial ecosystems in Spain

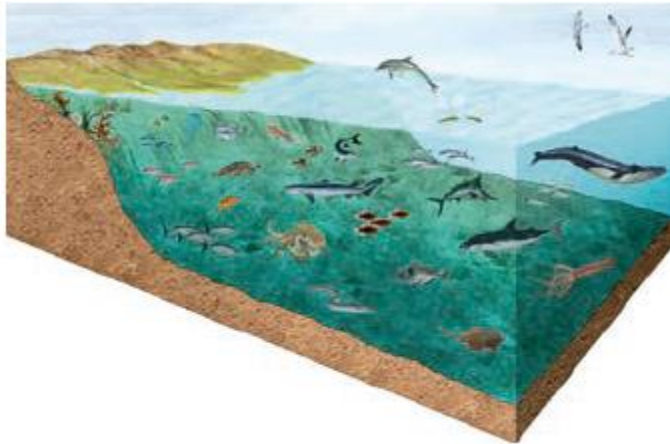
Atlantic forests	Dehesa	Mediterranean forests
		
<p>They are in the north. Temperatures are mild and precipitation is abundant. They're also called deciduous forests. The soils are rich in nutrients.</p>	<p>They are in the east and southwest of the Iberian Peninsula. They are the resulting ecosystems when Mediterranean forests are modified by human activity.</p>	<p>They are all over the peninsula. Plants here are adapted to high temperatures and little precipitation. Therefore, plants are evergreen with hard leaves that prevent water loss.</p>

Ecosystems

Aquatic ecosystems

Abiotic factor: salinity

Salt water



- **Photic zone.** near the surface, has the most light.
- **Bathyal zone.** receives very little light and pressure is high.
- **Abyssal zone.** Total absence of light.

Freshwater

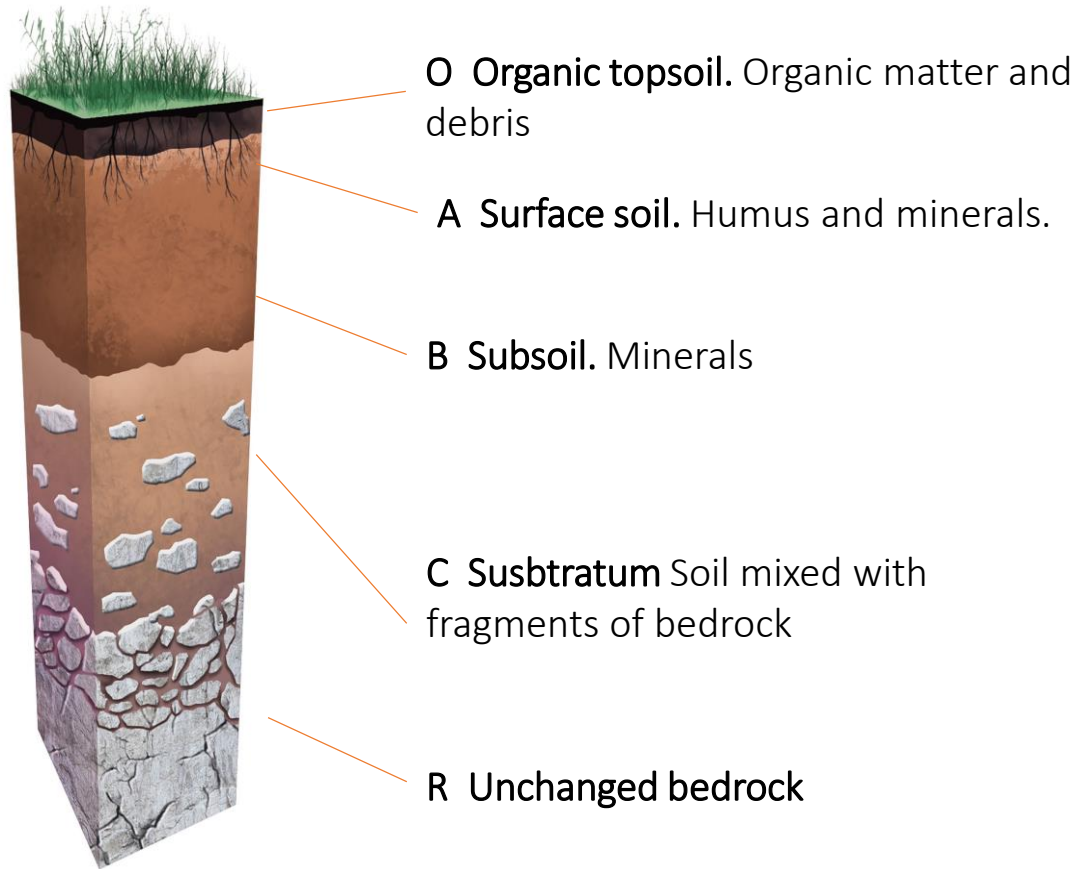


- **Calm water:** depending on how deep it is, we classify it as:
 - **wetlands**, which are shallow waters that shelter many migratory birds.
 - **lakes and lagoons.** Deeper than wetlands.
- **Flowing water**, rivers, streams. Cold water and rich in oxygen.

Soil as an ecosystem

Soil as an ecosystem

Earth's surface horizons



The external layer of the Earth's Surface is formed of loose materials. It has lots of air and water. Plants roots themselves in the soil and animals mix the soil as they move, adding moisture and gases.

The importance of protecting the soil

The formation of layers of rock and soil takes a long time. The process can take thousands of years. That's why any change can have severe consequences for the living things that it supports. For example, if the ground loses its vegetation cover, it's more exposed to the effects of wind and water and so erosion increases.

There are two main causes of damage to, or the deterioration of, soil:

- **Deforestation.**
- **Overexploitation of the soil:** intensive farming or livestock grazing.

Ecosystem balance- sustainability

Ecosystems

We say that an ecosystem is in **equilibrium** when its environmental conditions are stable, its components interact and its populations remain stable.

An ecosystem can be affected by the following factors:

- **Factores naturales** (earthquakes, floods, volcanic eruptions or droughts).
- **Humans**, who have the biggest effect on ecosystems. Technological and industrial developments lead to increased consumption of resources and the overexploitation of ecosystems.

Recovering balance in ecosystems:

- **Educational measures**
- **Political measures**

Sustainable development uses natural resources from ecosystems without depleting them, ensuring their existence for future generations.