NIZHNY NOVGOROD STATE
TECHNICAL UNIVERSITY
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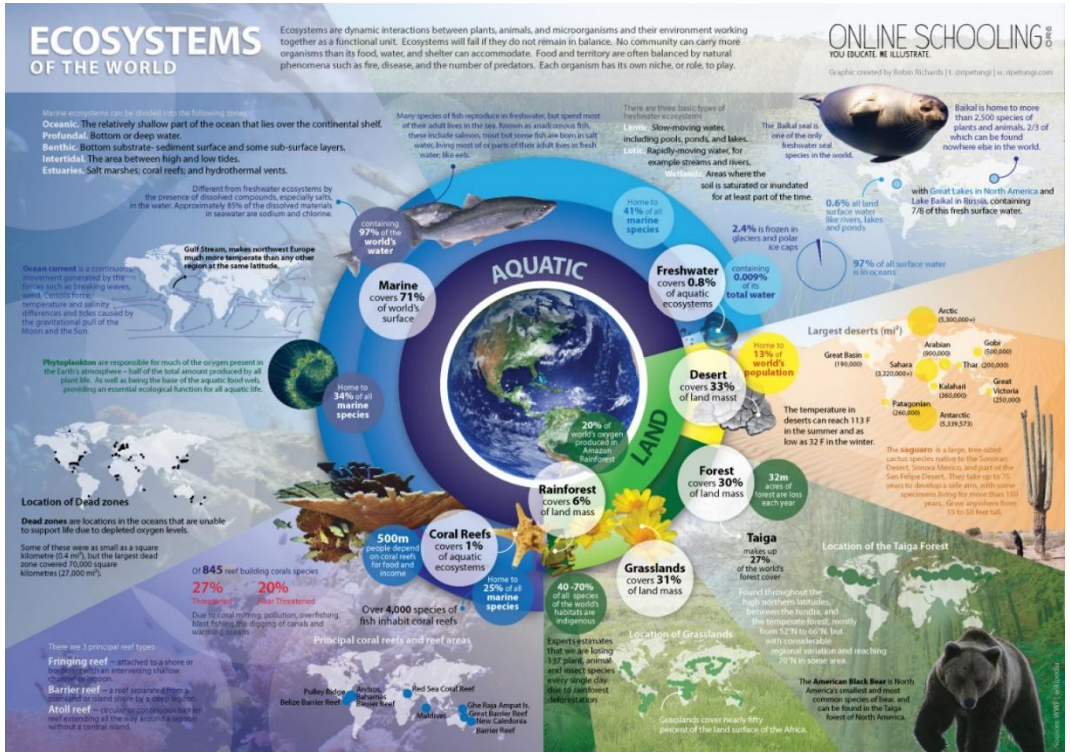
Ecology

2. Energy use and material cycling in ecosystems

Ecosystems function by **maintaining a flow of energy** and a **cycling of materials** through a series of steps of eating and being eaten, of utilization and conversion, called the food chain.

The **structure** of an ecosystem is essentially a description of an environment's organisms and physical features.



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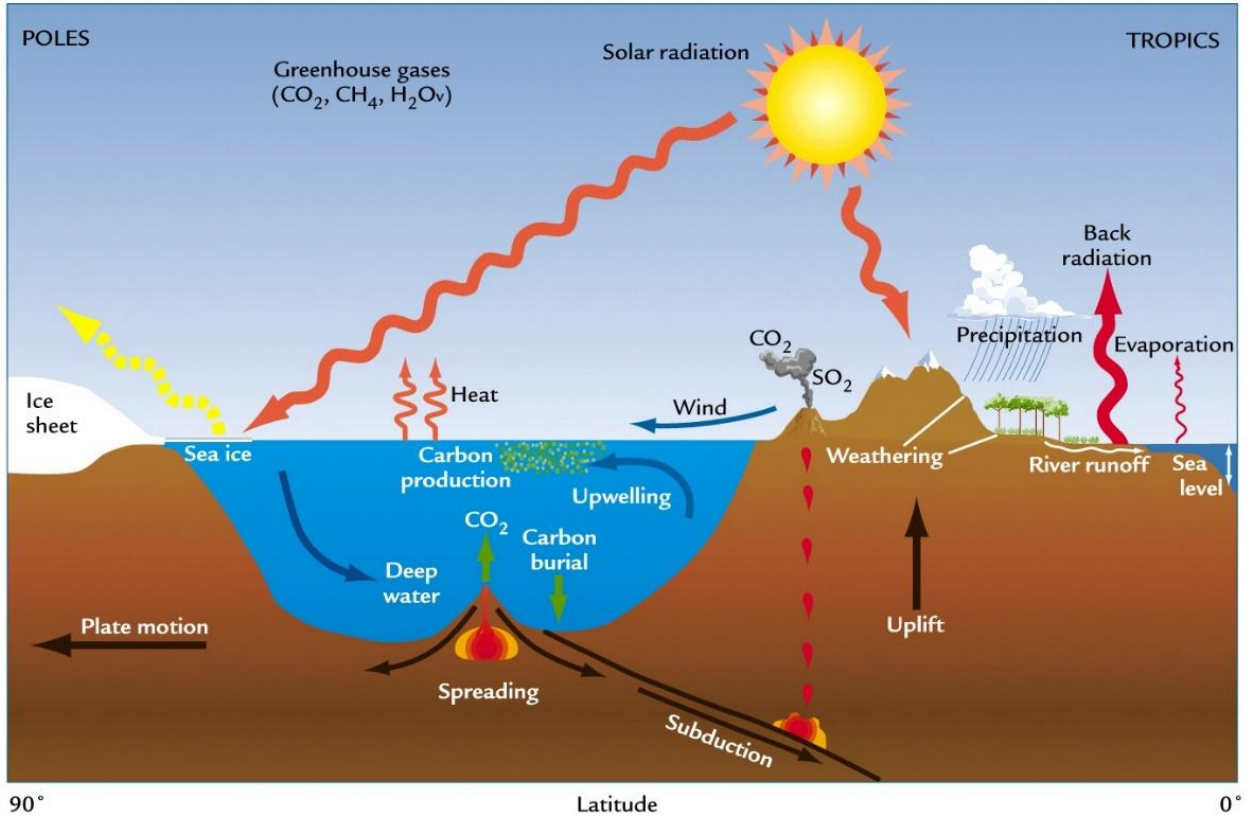
There are 6 major components in an ecosystem:

1. **inorganic substances**
2. **organic compounds**
3. **climate, temperature, wind, light and rain which affect all the processes in an ecosystem**



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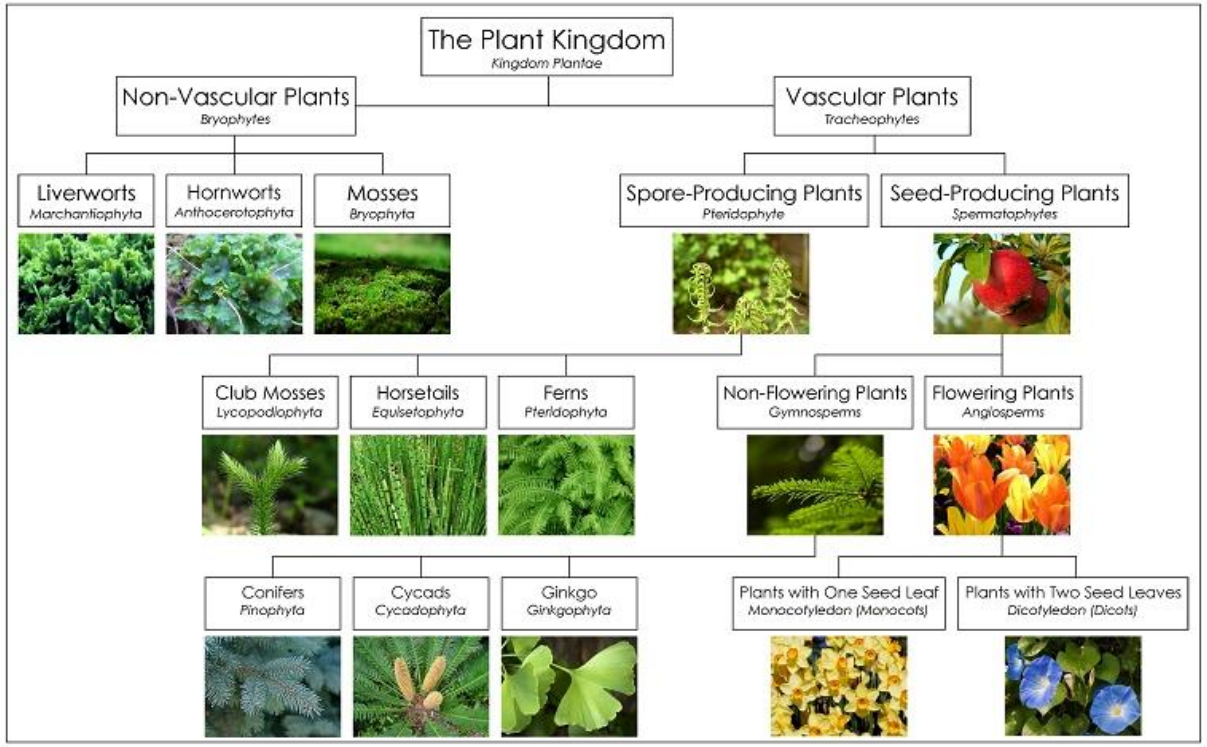
4. **producers**;

green plants which are able to manufacture food from simple inorganic substance in the process known *photosynthesis.*



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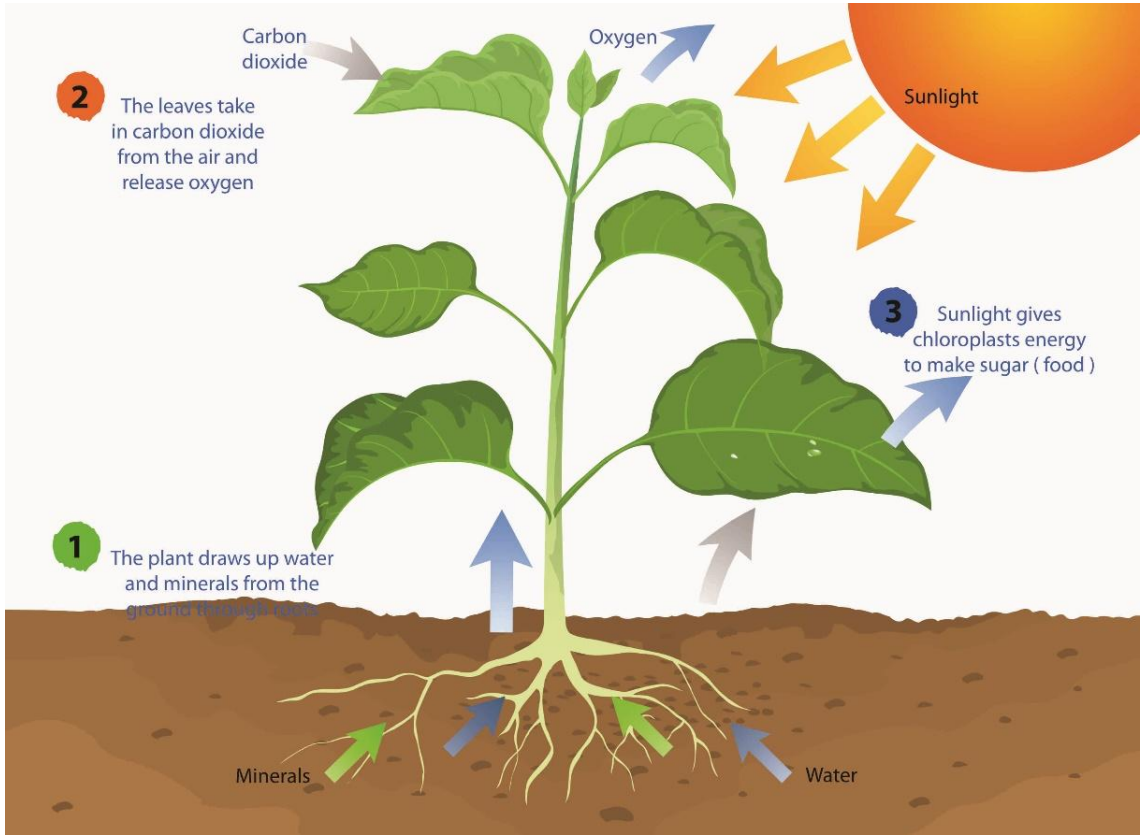
Photosynthesis is a process used by plants and other organisms to convert light energy into chemical energy that can later be released to fuel the organisms' activities.



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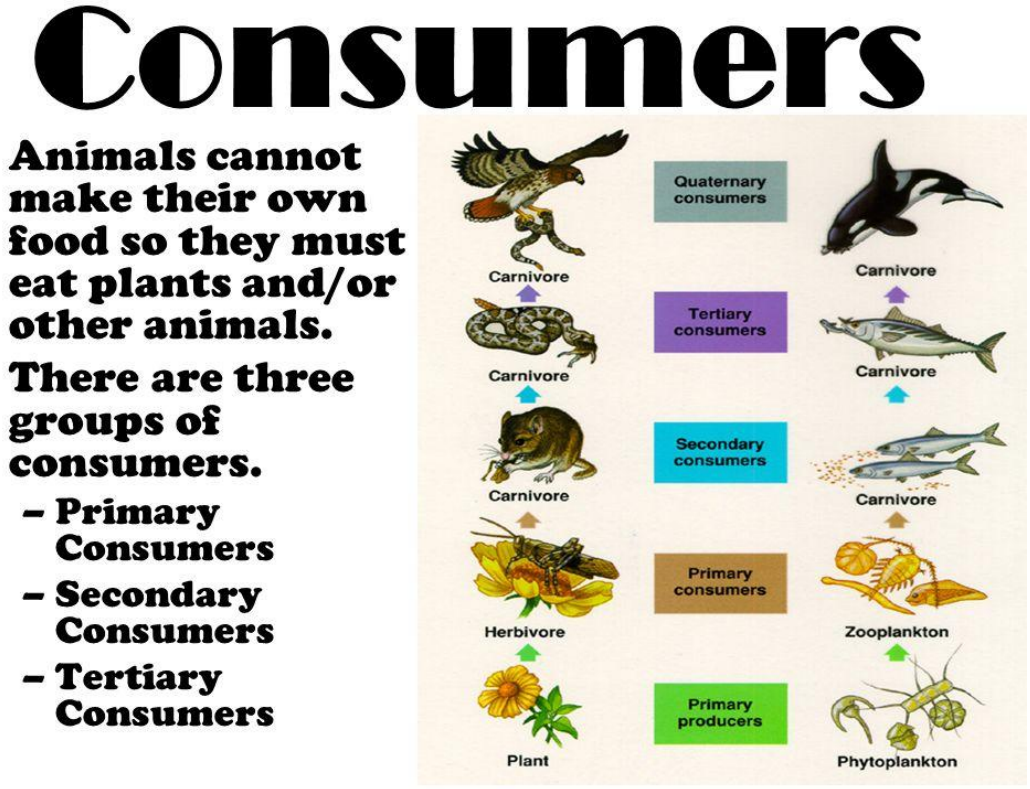
5. **consumers**;

Primary consumers: they obtain their energy, from green plants. But secondary consumers such as dogs and cats feed on other animals.

There are three groups of consumers: **primary consumers, secondary consumers and tertiary consumers.**



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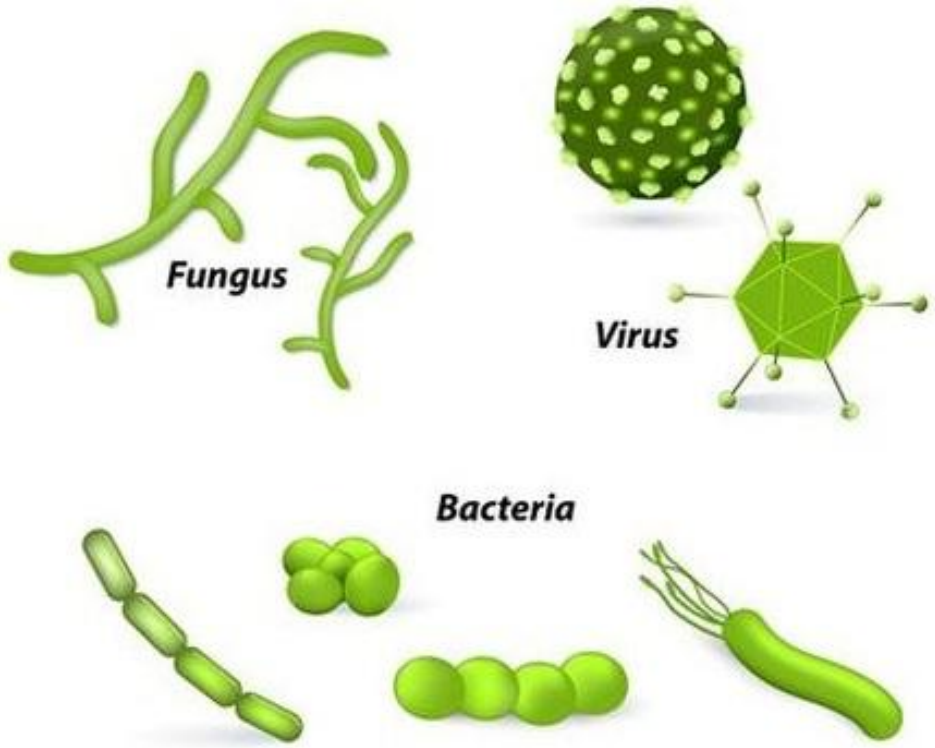
6. **decomposers**, such as bacteria and fungi.

Bacteria break down the flesh of dead animals. Fungi break down plant material. They enable chemical substances to return to the physical environment.



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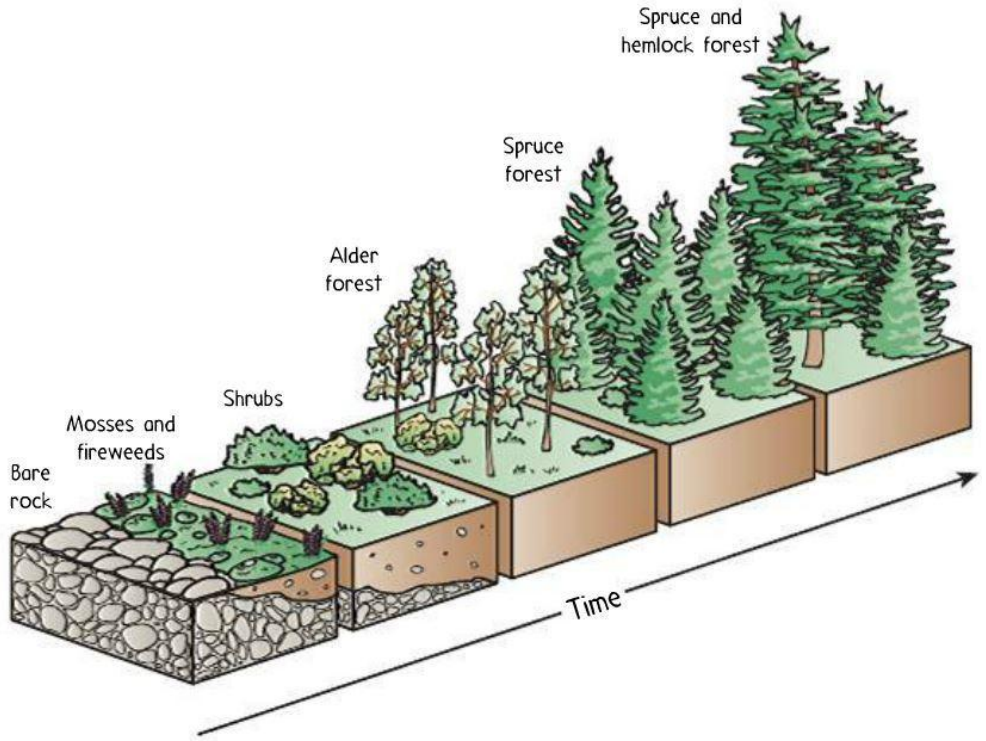
Ecosystems tend toward maturity, or stability, and in doing so they pass from a less complex to a more complex state. This directional change is called succession.

Ecological succession is a series of progressive changes in the species that make up a community over time.



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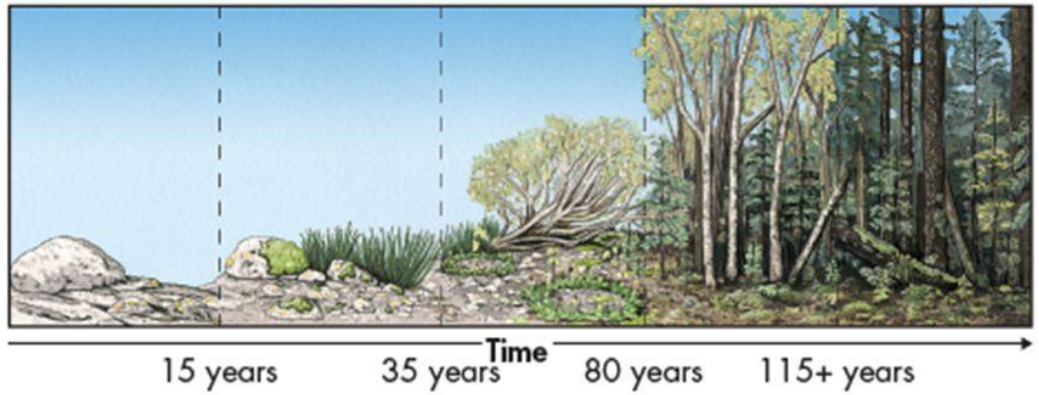
Succession that begins with bare rock.



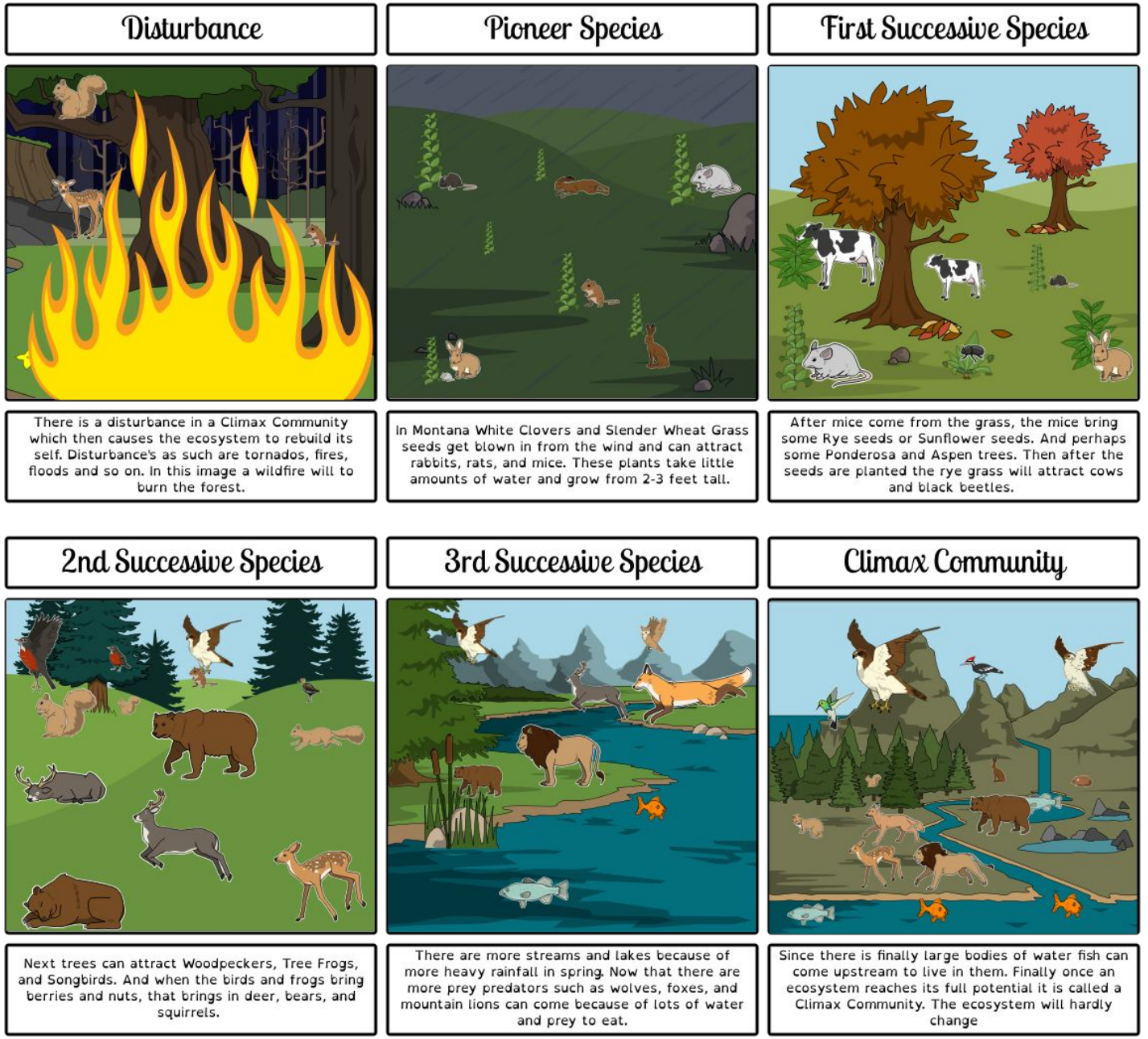
Ecologists usually identify two types of succession, which differ in their starting points:

In **primary succession**, newly exposed or newly formed rock is colonized by living things for the first time.

Primary succession occurs when new land is formed or bare rock is exposed, providing a habitat that can be colonized for the first time.

In **secondary succession**, an area previously occupied by living things is disturbed—disrupted, then recolonized following the disturbance.

The **community** begins with relatively few pioneering plants and animals and develops through increasing complexity until it becomes stable or self-perpetuating as a climax community.



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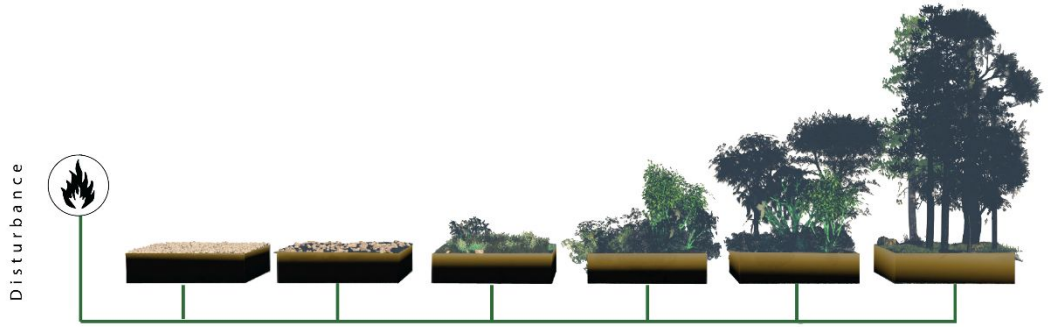

The **path and endpoint** of succession:

The early ecologists, who first studied succession thought of it as a predictable process in which a community always went through the same series of stages. They also thought that the end result of succession was a stable, unchanging final state called a **climax community**, largely determined by an **area's climate**.

15 minute break

(please, come back on time)

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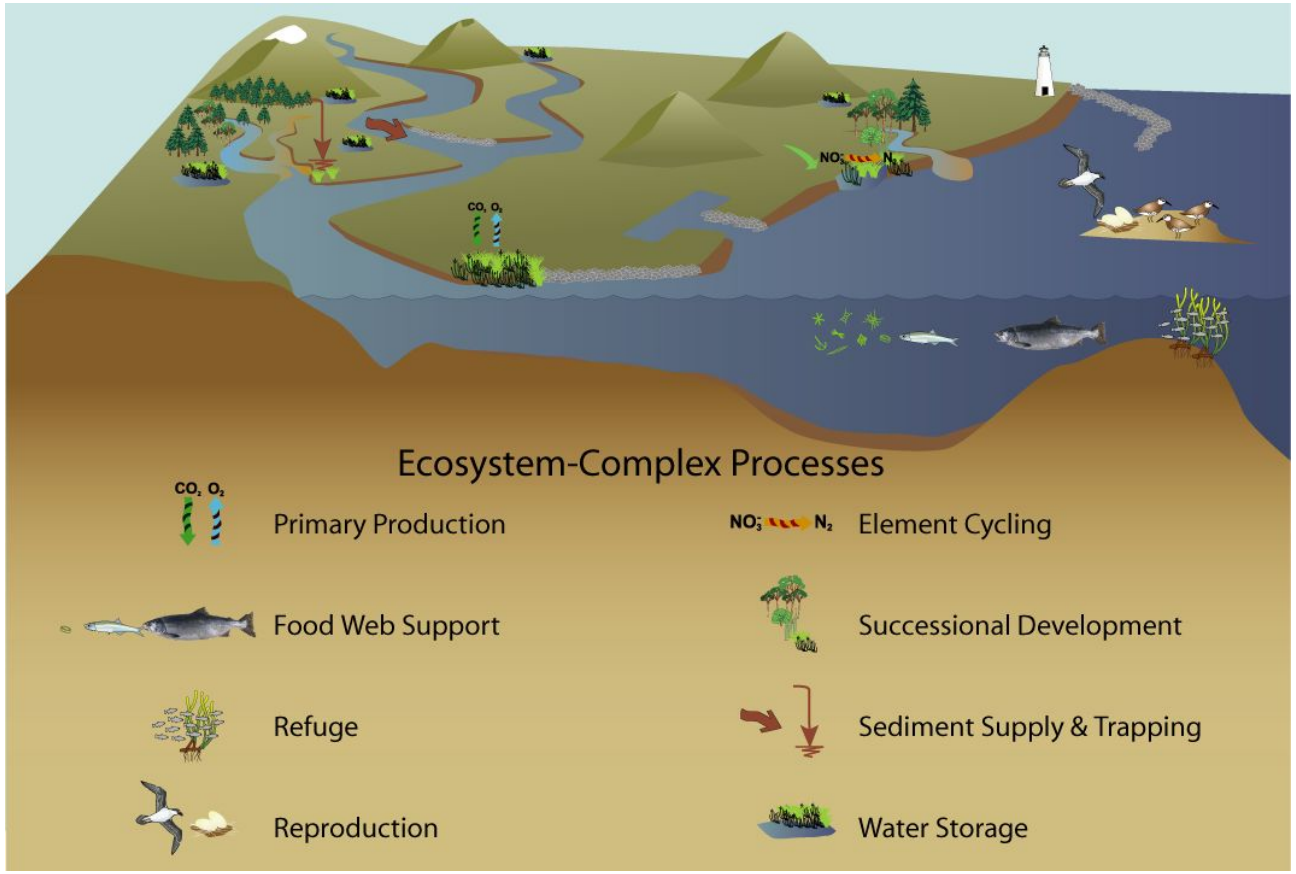
The main processes in ecosystems include:

1) **food chains**
2) **materials cycles**
3) **development**
4) **evolution**



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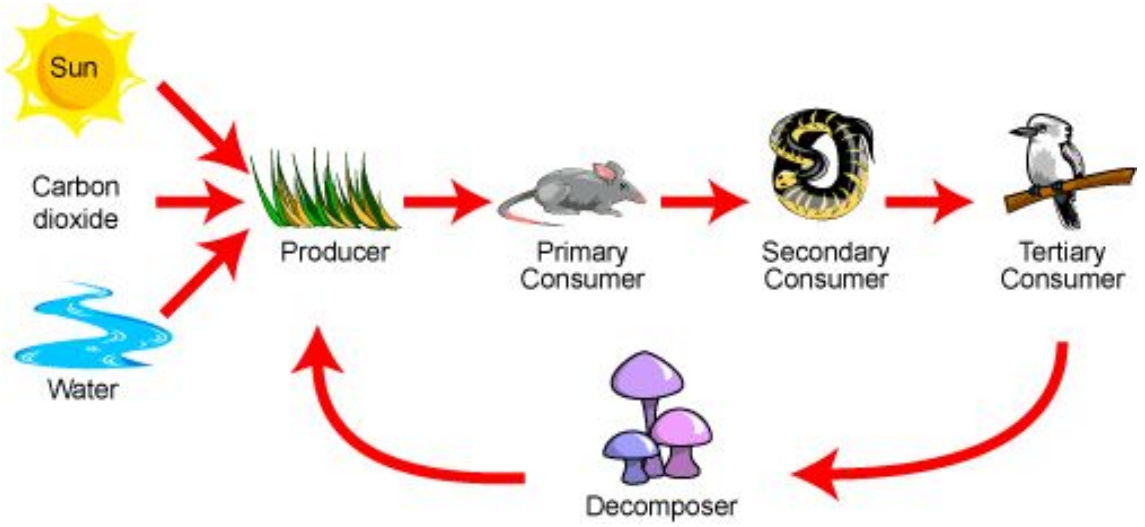
Food chains. The Sun's energy travels through an ecosystem.

The proper transfer of energy through an ecosystem by the producers, the consumers and the decomposers is called **a food chain**.



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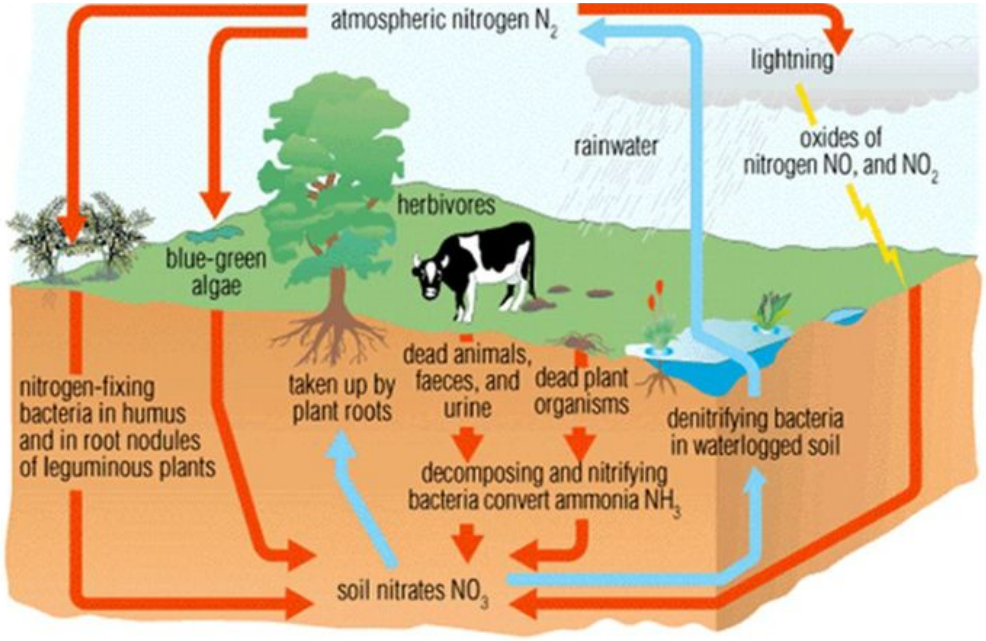

Materials Cycles. Materials cycles include cycles of nitrogen, carbon, oxygen, water and mineral salts. Chemical substances move from the non-living environment to living things. They are then returned to the environment.

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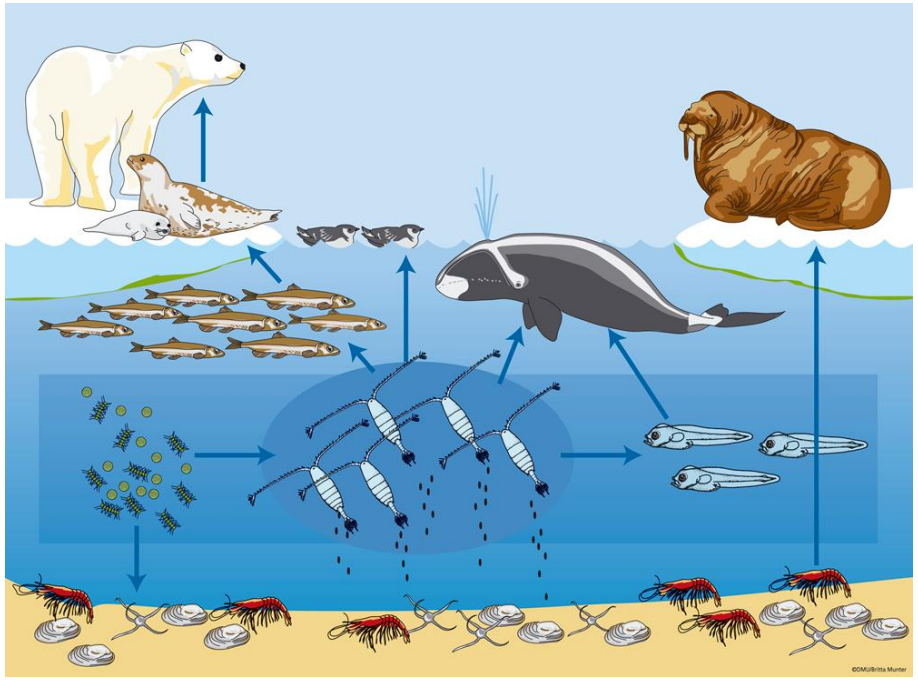

Development. An ecosystem exists in a state of equilibrium.

It can support a certain number of plants and animals of different species. If the population of one animal increased, there would not be enough food and water for all the animals. Consequently, some would die. In this way the ecosystem regulates itself and returns to its state of equilibrium.

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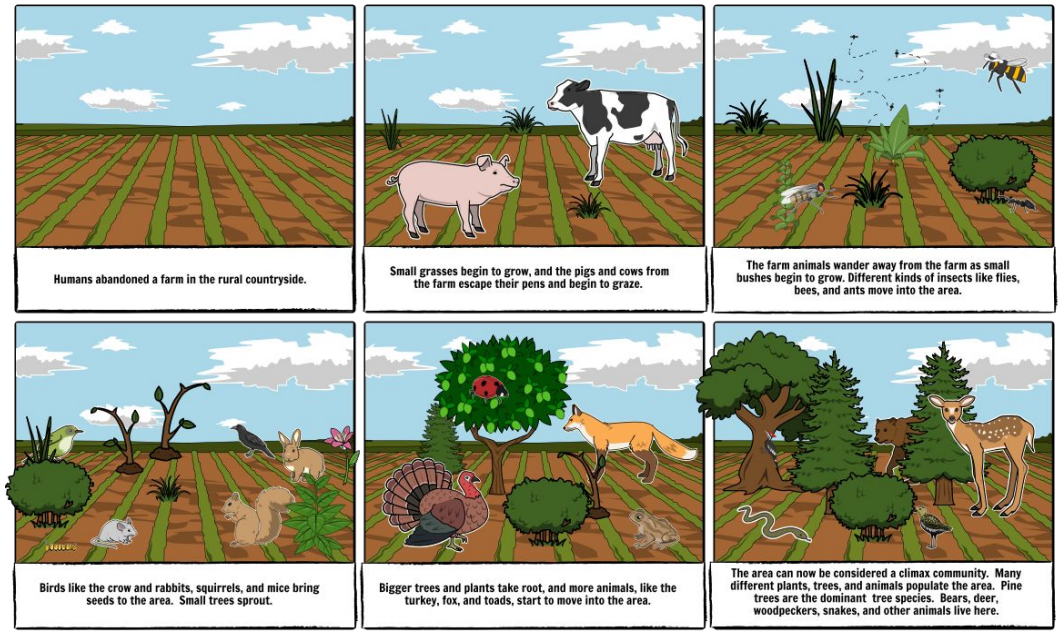

Ecosystems are not static - **they change all the time**. Plants and animals are able to adapt to changes in the physical environment. For instance, if a human destroyed the vegetation in a region, there would be certain changes. First grass and some flowers would grow. Then insects would appear. The wind would blow the seeds of small trees. These trees would grow and birds and animals would appear.

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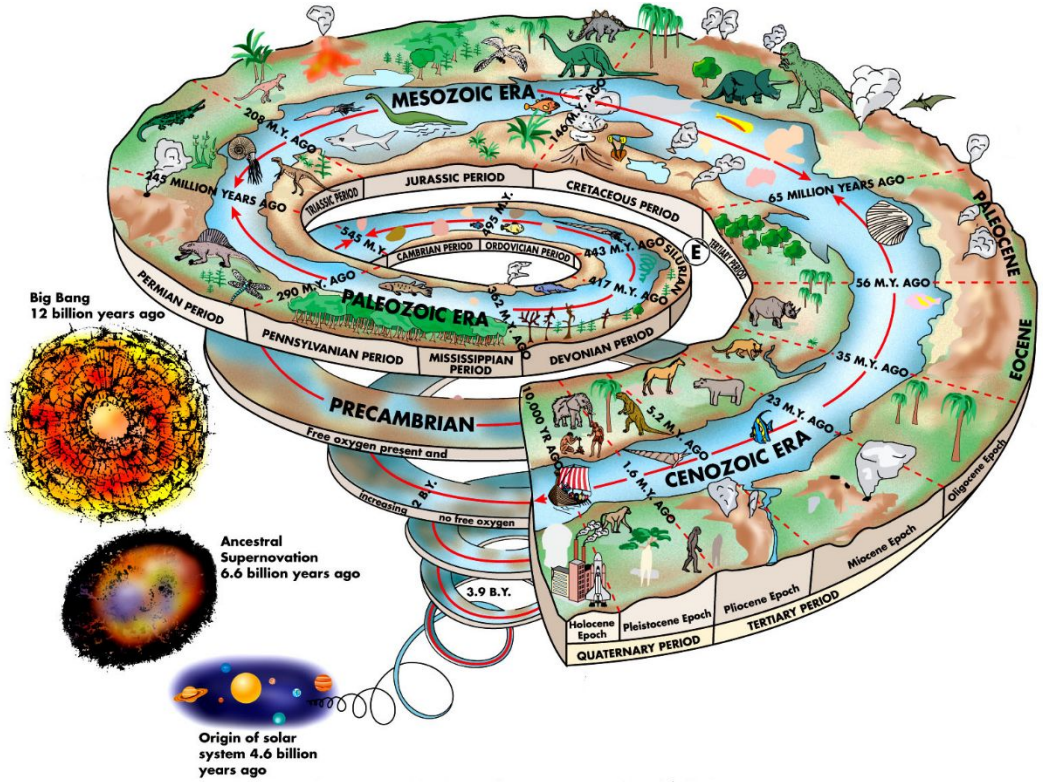
Evolution. During long periods of time ecosystems evolve.

The evolution of an ecosystem is caused by factors inside and outside it. Consider the evolution of the atmosphere: when life began there was no oxygen in the atmosphere.



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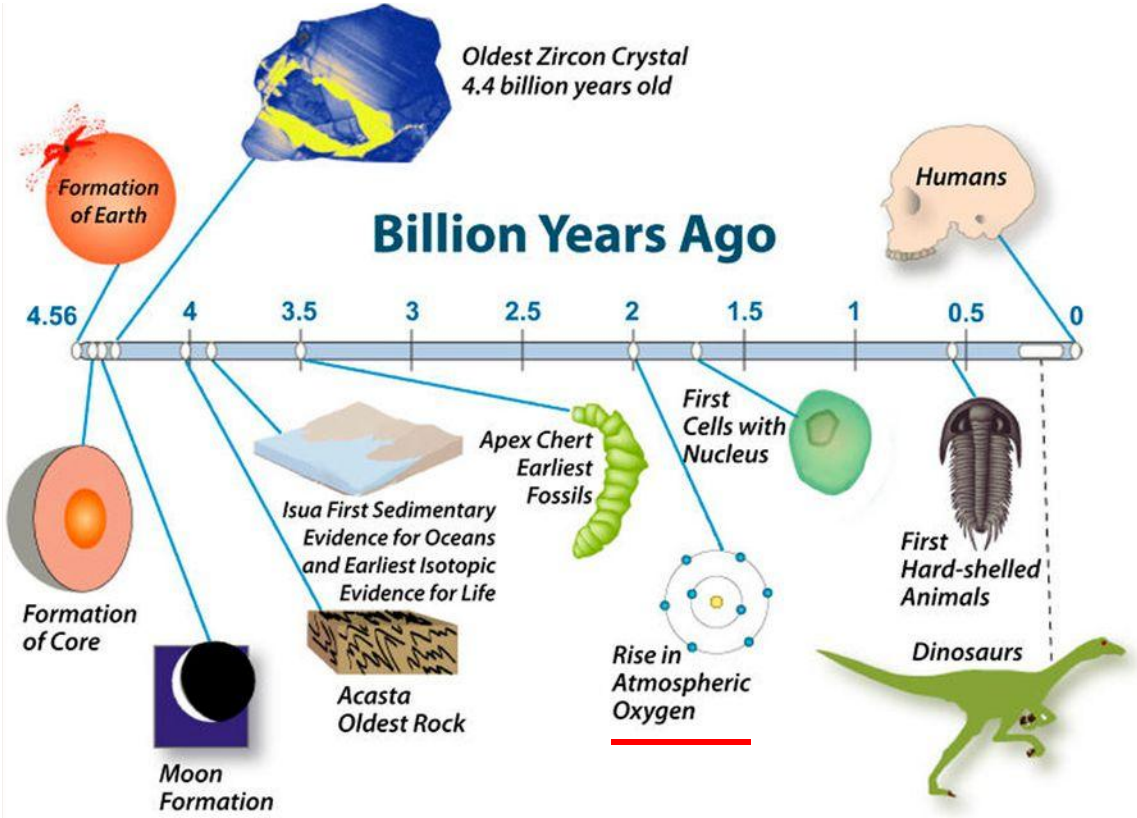
Consequently, the **Sun's rays** prevented life from developing on land. The first living organisms developed under the sea. After the evolution of photosynthesis, the **oxygen** in the atmosphere increased and life expanded.



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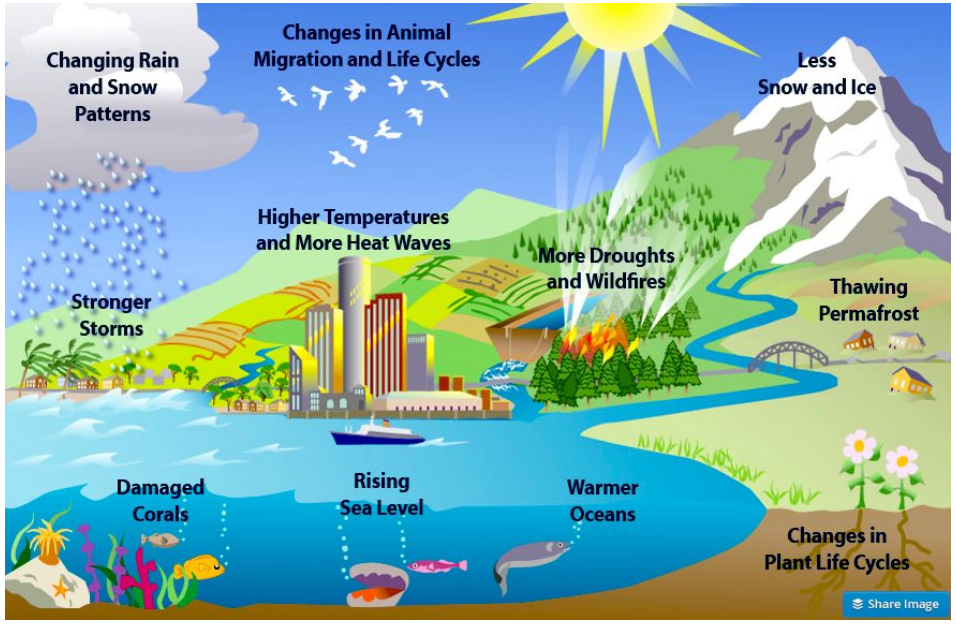

As the oxygen in the atmosphere increased, a layer of ozone was formed; life would be impossible without it on the surface of the Earth. Today **life on the Earth** is in danger: man himself might destroy the equilibrium of ecosystem by pollution, extinction of wildlife and unreasonable utilization of the globe's material resource.

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Thank you for your attention!

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