

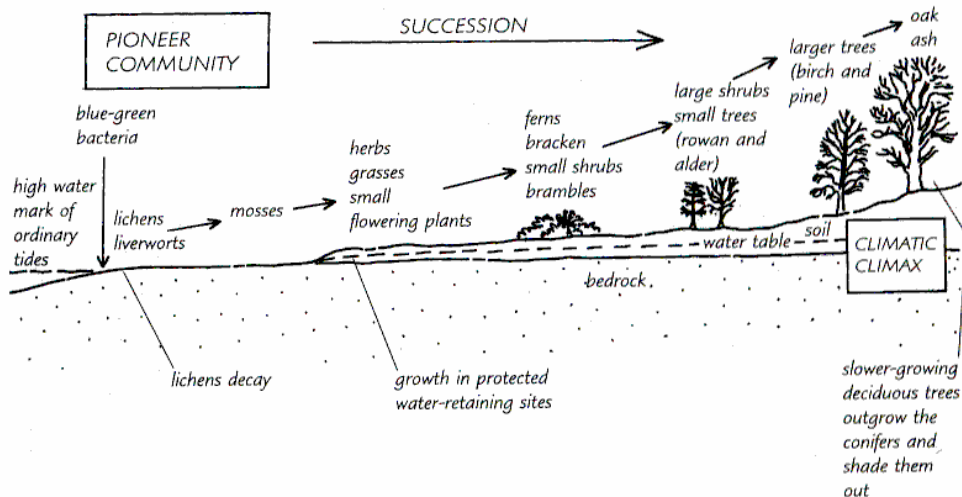
Succession in Ecosystems

From your studies of the **psammosere** and **hydrosere** succession in year 12, you should be familiar with the concept of succession. Other successions include the **lithosere** (succession from a bare rock surface) and the **hydrosere** (succession in a pond, a lake or on a river bank).

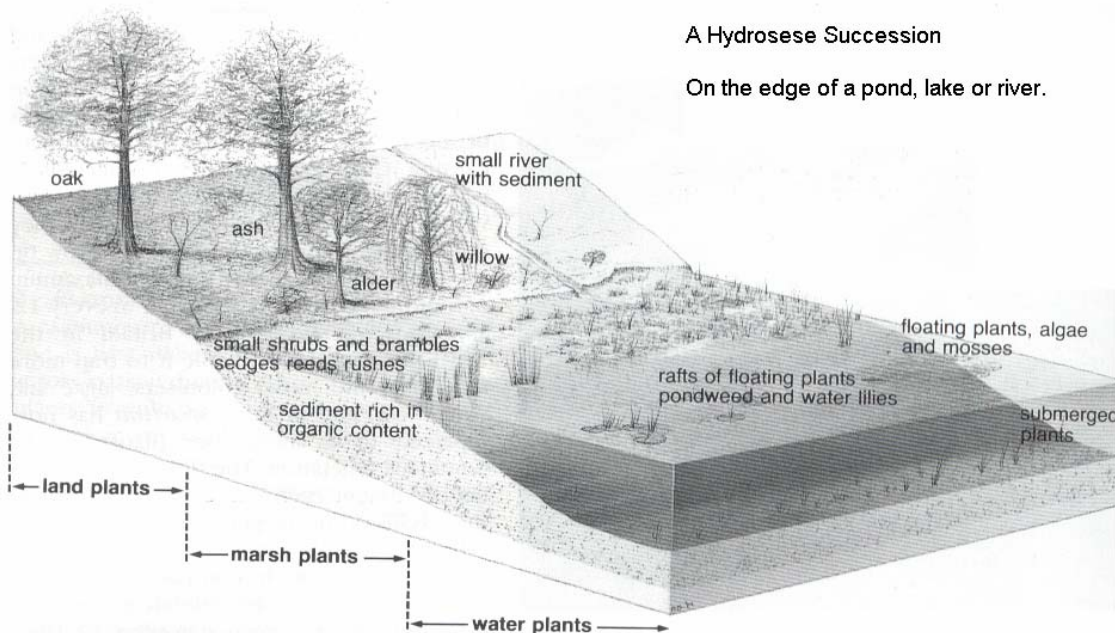
Human and physical factors influence the spatial and temporal variations in ecosystems. This includes their amount of **biomass** and their **net primary productivity (NPP)**.

Biomass is the total mass of all the living organisms in a given area or of a particular biological population or trophic level.

NPP is the amount of energy which primary producers (autotrophs) can pass on to the second trophic level (herbivores). This represents the amount of carbon dioxide taken in by a plant minus the carbon dioxide it emits during respiration. The **respiration rate** carbon be measured by measuring the plants CO₂ output in the dark. (**Gross Primary Production is the net primary production + respiration.**)



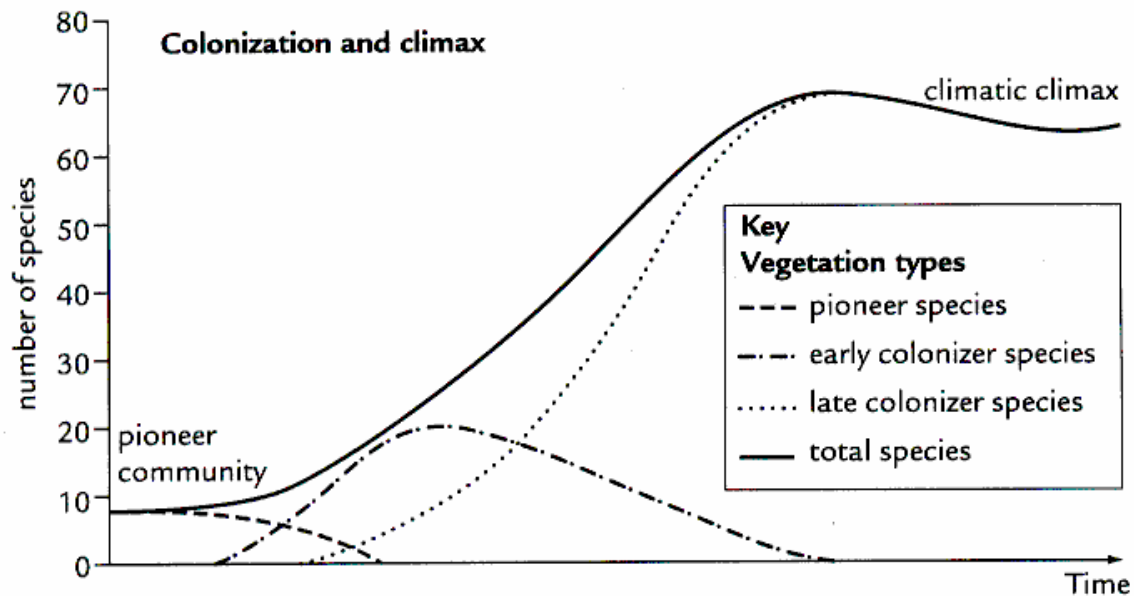
The Lithosere Succession on Bare rock.



A Hydrosere Succession

On the edge of a pond, lake or river.

Changes in species numbers through a succession from the pioneer community to the climax community.



Human and physical factors affect the **spatial** variations (at different scales) and **temporal** variations (either long term or seasonal) in ecosystem or **biome productivity**. A variety of factors are responsible for these variations.

Physical factors include: climate (precipitation, humidity, temperature etc.), seasonality, vegetation type, soil characteristics, fire and drainage.

Human factors include: agriculture (arable and pastoral), forest management (or mismanagement), conservation, soil management, climate change, burning and other land use changes.

Productivity in Different Ecosystems or Biomes

Productivity refers to the rate of energy production, normally on an annual basis.

Primary productivity refers to plant productivity.

Secondary productivity refers to that produced by animals.

Gross productivity is the total amount of energy fixed.

Net productivity is the amount of energy left after losses to respiration, growth, and so on, are taken into account.

Net primary productivity (NPP) is the amount of energy made available by plants to animals at the herbivore level. It is normally expressed as $g/m^2/yr$. NPP depends upon the amount of **heat, moisture, nutrient availability**, and **competition**, the number of **sunlight hours**, the **age of plants**, and the **health of plants**. In geographic terms NPP increases towards the equator, water permitting, and declines towards the poles.

Ecosystem	Mean NPP ($kg/m^2/yr$)	Mean biomass (kg/m^2)
Tropical rainforest	2.2	45
Tropical deciduous forest	1.6	35
Tropical scrub	0.37	3
Savanna	0.9	4
Mediterranean sclerophyll	0.5	6
Desert	0.003	0.002
Temperate grassland	0.6	1.6
Temperate forest	1.2	32.5
Boreal forest	1.2	32.5
Tundra and mountain	0.14	0.6
Open ocean	0.12	0.003
Continental shelf	0.36	0.001
Estuaries	1.5	1