A2 Geography 4.3 Ecosystems Student Notes

An Introduction to Ecosystems

A wide variety of factors can influence the ability of people to overcome challenges in different ecosystems in order to exploit the opportunities they offer. These include the availability of capital, technology and knowledge.
You need to be aware of the **issues of environmental concern** and **sustainable development** within grassland and forest ecosystems.

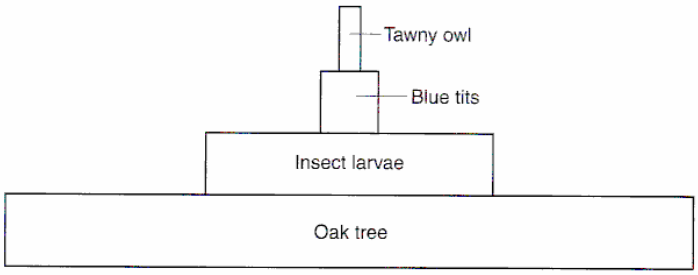
An ecosystem is a community of plants and animals (biotic elements) within a particular physical environment (abiotic elements). There are relationships between these components. Ecosystems range in scale from a small pond to the whole biosphere of the earth. Organisms include autotrophs (producers) and heterotrophs (consumers)

The interrelationships include energy flow, food chains and more complex food webs. Energy, in the form of food, is passed from one trophic (energy) level to the next. As it is passed between each level, energy is lost in **respiration**, **heat excreta** and in the **decomposition of organic wastes**. By the time the highest trophic level is achieved, much of the initial energy, introduced into the system by photosynthesising plants, will have been lost.

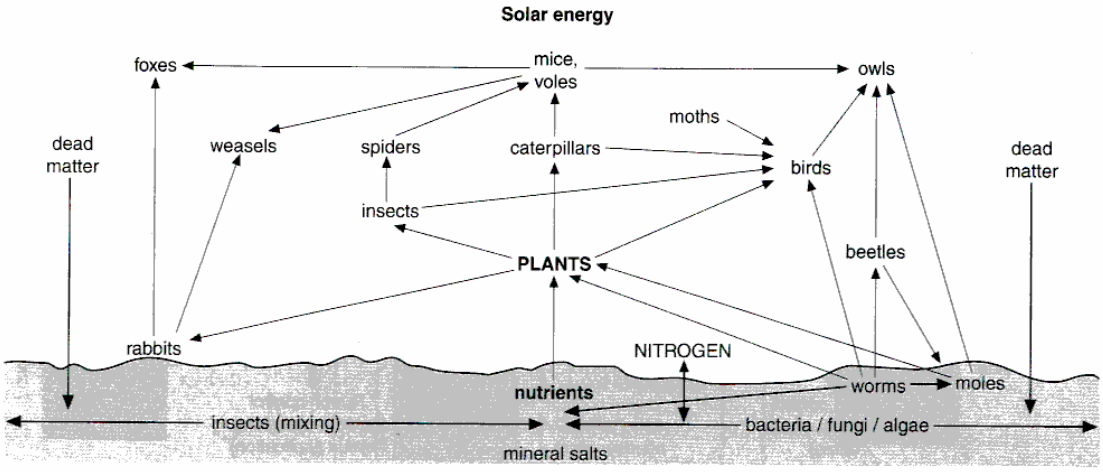
The **trophic classification** or system is based on feeding patterns. Typically there is a **trophic pyramid**, showing a larger plant biomass and a smaller consumer biomass. This occurs because:

(i) no energy transfer is 100% efficient - the transfer of light energy to food energy is only 1% efficient;
(ii) there are large losses of energy at each trophic level due to respiration, growth, reproduction, mobility, and so on.

THE TROPHIC PYRAMID



THE FOOD WEB IN A DECIDUOUS FOREST



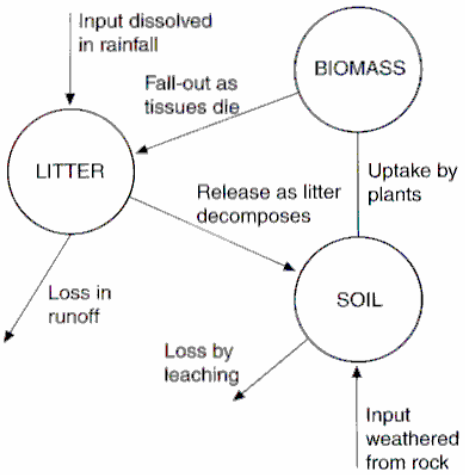
Nutrient Cycling - In addition to energy, ecosystems also contain cycles of nitrogen and other plant nutrients, such as phosphates and potassium.

The pattern of plant nutrients can be shown as a diagram. Nutrients are derived from **weathered rock** or in dissolved in **rainfall** and they may be lost from the system by **leaching**, in **runoff or** through **harvesting** of crops.

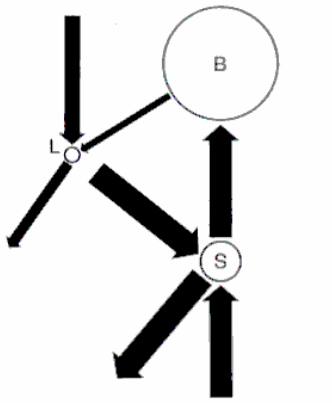
Most nutrients are recycled within the system through **plant uptake**, **leaf fall** (and other "**fallout**" from plants and animals) and **decomposition**.

Nutrients are stored in the **biomass**, the **litter** and the **soil** in variable quantities depending on the type of ecosystem and seasonal changes.

GERSMEHL'S NUTRIENT CYCLES

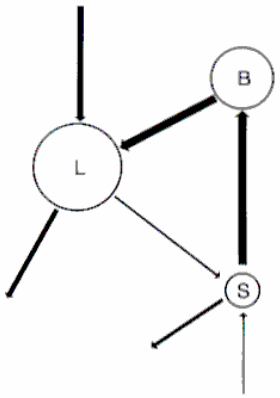


B Biomass
L Litter
S Soil

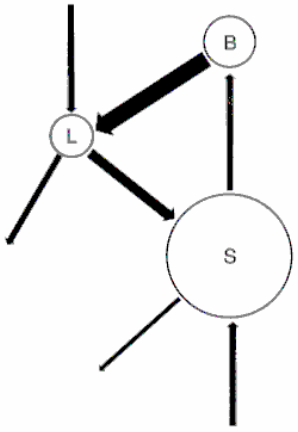


Selvas (equatorial rainforest) environment

The size of the nutrient stores (B, L, S) are proportional to the quantity of nutrients stored. The thickness of the transfer arrows is proportional to the amount of nutrients transferred.



Taiga (northern coniferous forest) environment



Steppe (mid-latitude continental grassland) environment

Nutrient cycles can be **sedimentary based**, i.e. the source of the nutrient is from rocks, or it can be **atmospheric based**, as in the case of the nitrogen cycle. Nutrient cycles can be shown by means of simplified diagrams - indicating the stores of nutrients as well as the transfers. The most important factors which determine these are availability of moisture, heat, fire (in grasslands), density of vegetation, competition, and length of growing season.