National 5 Life on Earth Summary Notes

Ecosystems

Biodiversity is the variety of different organisms in an ecosystem. An **ecosystem** is the habitat and the community together. A **habitat** is the place where an organism lives. The **community** is all the organisms present.

Habitat (Non-living) + Community (Living) → Ecosystem (Biological unit)

A **population** is a group of organisms of the same species. A **species** is a group of organisms that can breed to produce fertile offspring.

Example:

Ecosystem = forest

Habitat = tree

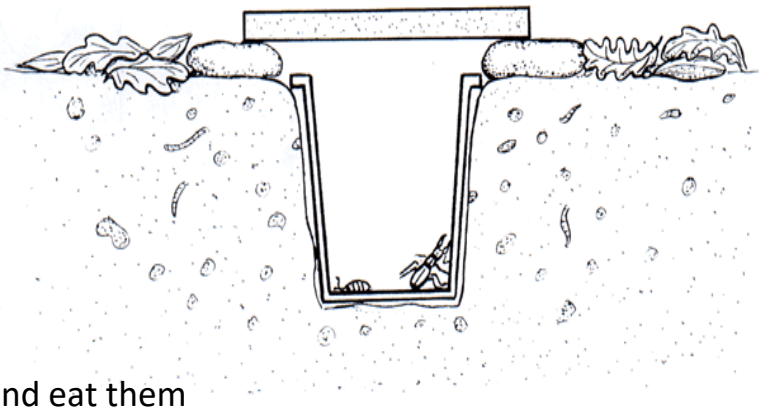
Community = squirrels, deer, fox

Population = fox

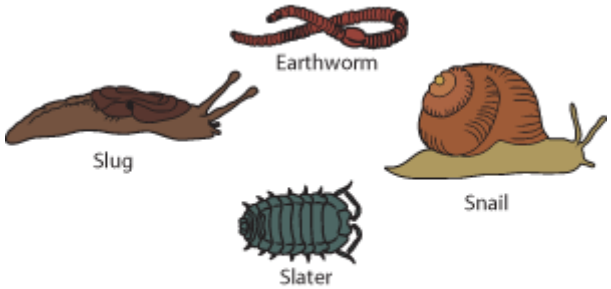
Species = deer (offspring/young in picture is fertile and can reproduce)

Distribution of Organisms

Pitfall trap

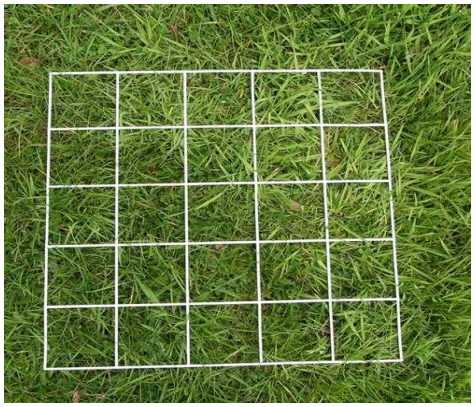


- samples organisms in the soil
- hole dug and cup put in
- cup must be level with the soil
  – so organisms fall in
- cover the top of the cup
  – so birds don't see trapped organisms and eat them
- several traps are set
  – to increase reliability
- traps are checked regularly
  – so animals don't have time to eat each other



Some of the larger soil organisms

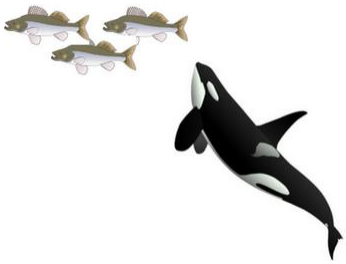
Quadrat



- samples abundance (amount) of plants
- quadrat is thrown at random and the number of squares with a plant in it are counted
- several quadrats thrown
  – increases reliability
- rule for deciding which plants to count as “IN”
  – to ensure consistency
- quadrat thrown at random
  – to get a representative result

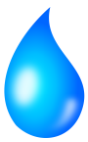
Keys are used to identify organisms – branching key and paired statement key.

Biotic factors are living factors that can affect the distribution of living things.



- **Predation** – predators eat prey
- **Disease**
- **Food availability**
- **Grazing** – levels need to be not too high or too low
- **Competition** – two types
  - **Interspecific**: competition between members of different species for similar resources eg. fox and owl
  - **Intraspecific**: competition between member of the same species for the same resources; more intense eg. two lion

Abiotic factors are non-living factors that can affect the distribution of living things.



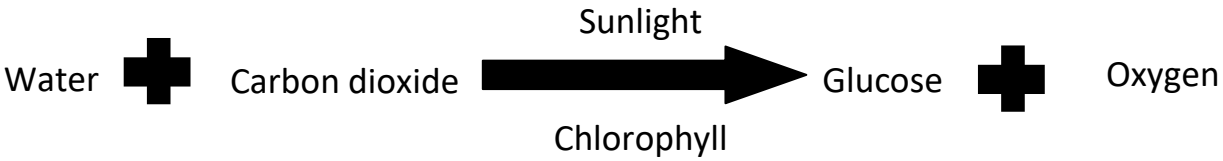
- **Light intensity** – use a light meter; don’t cast a shadow over the meter
- **Moisture content** – use a moisture meter; wipe the probe between readings
- **pH** – use a pH meter; wait for the needle on the meter to stop moving before taking a reading
- **Temperature** – use a thermometer; make sure the thermometer is far enough into the ground

A **line transect** is used to take readings from one area over to another to see how varying conditions affect the distribution of organisms eg. measuring abundance of daises from under a tree into an open area.

An **indicator species** indicates the level of pollution in an area due to their presence or absence. Eg. lichen

Photosynthesis

A plant makes its own food using the sun's light energy using the process **photosynthesis**.



Two stage process:

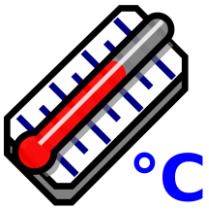
1) **Light reactions**: light is trapped chlorophyll (green pigment in chloroplasts) and splits water into hydrogen and oxygen. Oxygen diffuses out the leaf as a by-product. Hydrogen is used in stage 2. The light is converted to chemical energy which makes ATP, which is needed for stage 2.
2) **Carbon fixation**: hydrogen (from stage 1) combines with carbon dioxide using the energy from ATP (from stage 1). Glucose is made. Reaction is controlled by enzymes.

The glucose made can be:

- Used for **energy** in respiration
- Stored as **starch**
- Built into **cellulose**

Limiting factors are factors which affect the rate of a process. The limiting factors of photosynthesis are:

- Light intensity
- Carbon dioxide concentration
- Temperature



Energy in Ecosystems

Producer – organism that makes its own food for energy

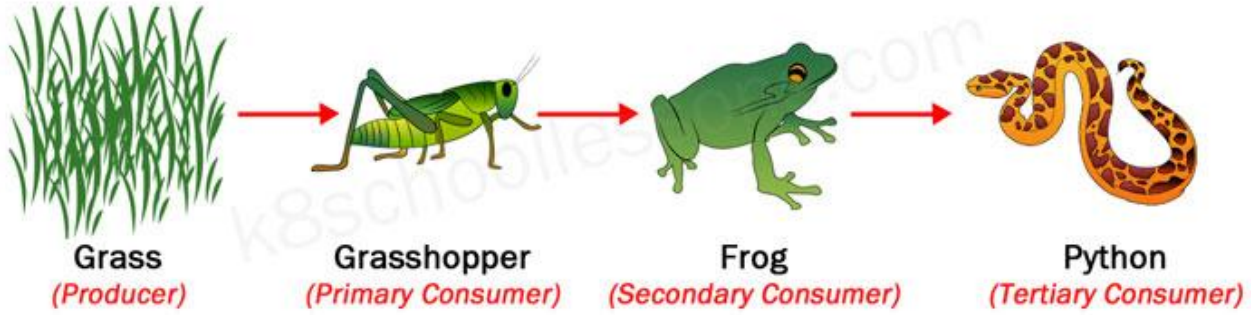
Consumer – organism that eats other organisms for energy

Herbivore – organism that eats only plant material

Carnivore – organism that eats only animal material

Omnivore – organism that eats both plant and animal material

A **food chain** shows what eat what. The **arrows** in a food chain represent the **direction of energy flow**.

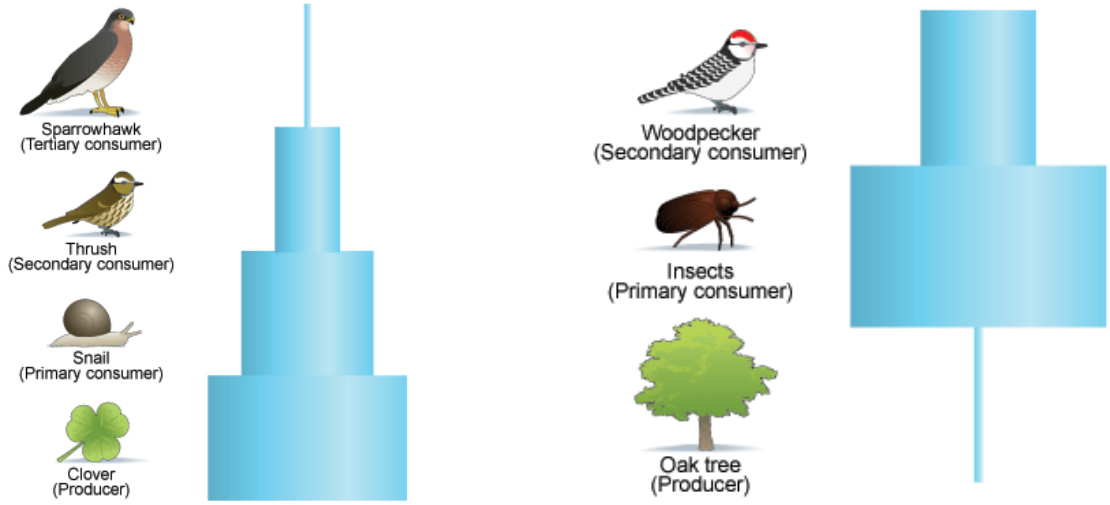


Several food chains linked together make a **food web**.

Energy can be lost from a food chain as **heat, movement** or **undigested waste**. Only energy used for growth will be passed on.

Food chains can be shown as pyramids.

Pyramid of numbers – shows the number of organisms at each stage of a food chain. Sometimes atypical shape if there is a tree at the start of the food chain.



Pyramid of energy – shows the energy available at each stage of a food chain. Will always be a typical pyramid shape as energy is lost at each stage.

<u>Food Production</u>

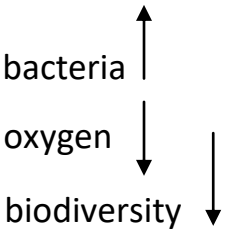
As the human population increases the need for food also increases. Humans therefore use fertilisers and pesticides to help get more crops. However, they have advantages and disadvantages.

Nitrates are needed to make amino acids. **Amino acids** are used to make **proteins**. Protein is needed by organisms for growth and repair. Plants get nitrates by absorbing them in the soil. Animals get nitrates by eating plants or other animals.

Farmers use **fertilisers** to increase the nitrate content of soil.

Fertilisers can leach (run) into rivers. This will cause the following sequence of events:

- Algae increase to form an algal bloom
- Algae underneath die from lack of sunlight
- Bacteria eat algae and increase
- Bacteria use up oxygen
- Fish and plants die due to lack of oxygen



Pesticides are used to kill pests eg. insects. Once pesticide is sprayed on a crop, the plant takes it into its body, if an animal eats the crop the pesticide will go into its body and so on along the food chain. **Bioaccumulation** is when the level of pesticide increases as you move along a food chain. Pesticide level is highest at the top of a food chain.

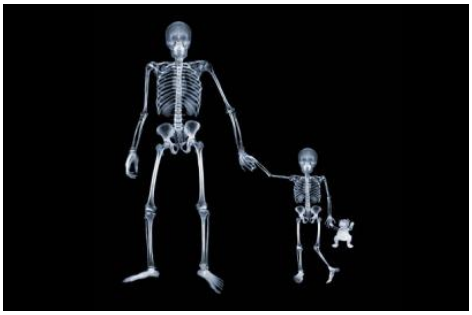
Alternatives to fertilisers and pesticides are:

- **GM crops** – giving crops genes such as disease resistance or pest resistance.
- **Biological control** – using a natural predator of a pest to control numbers eg. ladybirds to eat the pest greenfly.

<u>Evolution of Species</u>

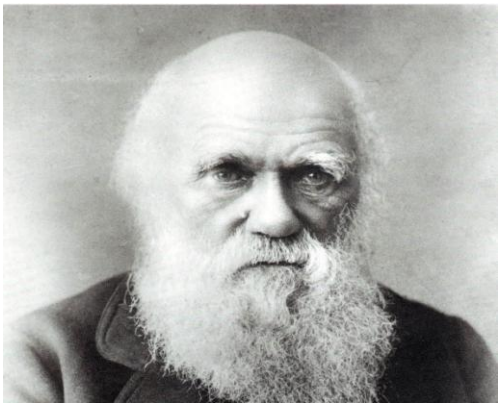
A **mutation** is a change in the structure or quantity of genetic material. It can be good, bad or make no difference to an organism. Mutations are spontaneous and are the **only source of new alleles** (forms of a gene). Things that can speed up a mutation are:

- X-rays
- UV rays
- Gamma rays
- Very high temperature
- Some chemicals eg. mustard gas



New alleles can help plants and animals adapt to their environment. Variation makes it possible for a population to change over time.

Natural selection or “survival of the fittest” occurs when there are selection pressures.



- species produce more offspring than the environment can sustain
- the best adapted individuals will survive
- these individuals will then reproduce and pass on the allele which gave them the selective advantage.
- these alleles increase in frequency within the population.

Speciation is when a new species is produced. The following steps occur:

1. **Isolation** – a group of organisms are split up by an isolation barrier into sub-populations. The barrier can be geographical, behavioural or ecological
2. **Mutation** – random mutations occur in each sub-population
3. **Natural selection** – each sub-population undergoes natural selection and the best adapted survive and pass on their genes

When the isolation barrier is removed, the sub-populations are so different they cannot reproduce. This means a new species has been formed.