

Chapter 2: Ecology Matters

A few definitions...

- ▶ **Habitat:** the exact place where an organism lives.

Organism	Habitat
Ants	Trees
Snails	Grass
Crabs	Rock pools



- ▶ **Environment:** an environment includes the place where an organism lives (habitat), the conditions in that place and all the living things in it.
- ▶ **Population:** all organisms of the same type (species) living in a habitat.

Example: in a field, there might be a population of rabbits, a population of mice, a population of daisies and a population of trees.



- ▶ **Community:** all the different types of organisms living together in one habitat.

Example: a population of rabbits, a population of mice, a population of daisies and a population of trees living in a habitat make up a community.



The Soil

- ▶ There are three main types of soil; Sandy soil, Loam soil, Clay soil

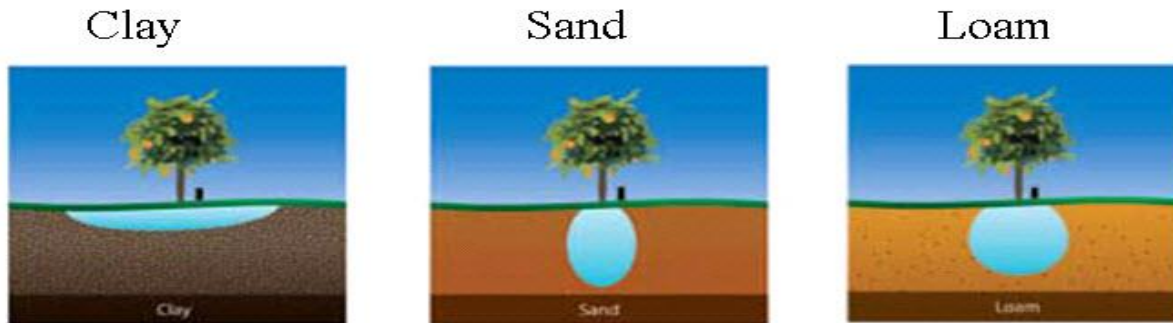
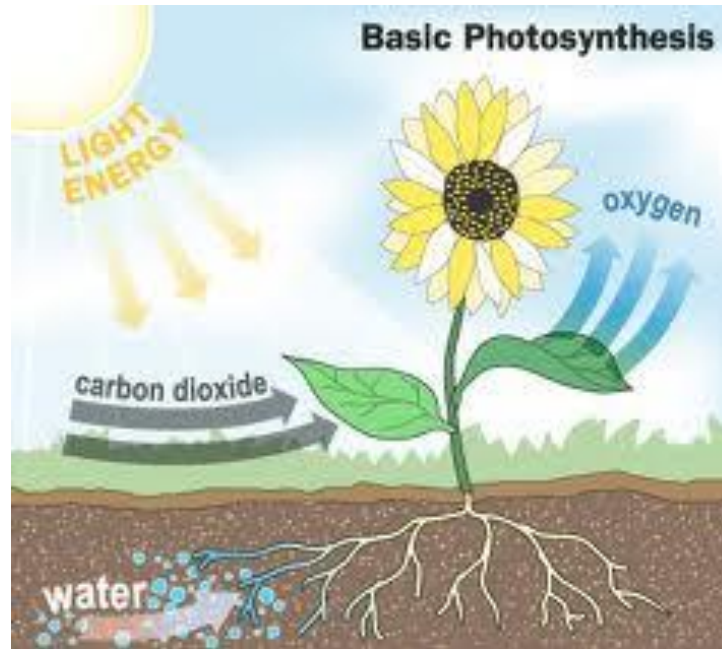


Fig 7.1. Wetting pattern in different soil

- ▶ **Photosynthesis:** process by which green plants make their own food using water and carbon dioxide. This process happens with the help of sunlight.

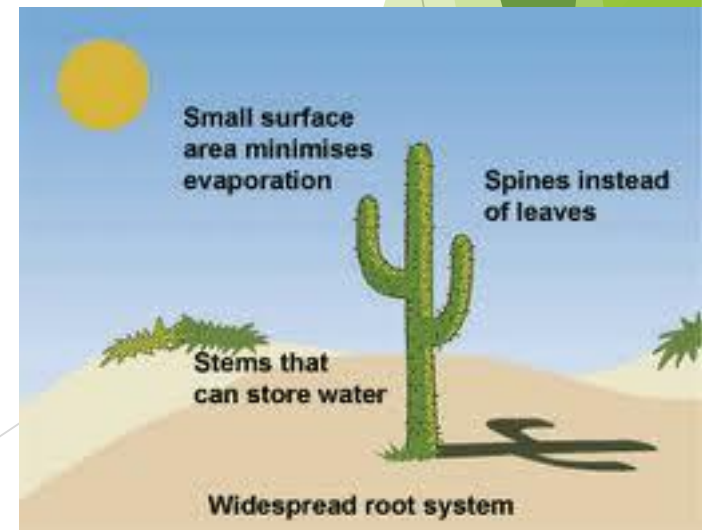


Adaptations

- ▶ Each living thing is most often found in the habitat where it has the best chances of survival.
- ▶ **Adaptation:** the ability of an organism to adjust to its surroundings.
- ▶ These organisms are adapted to their environment. Adaptations can be:
 - 1) Structural adaptations
 - 2) Daily adaptations
 - 3) Behavioral adaptations
 - 4) Seasonal adaptations

1) Structural Adaptations

- ▶ Cactus lives in a dry environment. It is **structurally adapted** against water loss:
 - ✓ Very small leaves
 - ✓ Vast network of roots (to take up as much water as possible)
 - ✓ Swollen stem to store water



1) Structural Adaptations

- ▶ Moles live underground. It is **structurally adapted** to do so:
 - ✓ Small eyes (do not get clogged with dirt)
 - ✓ Short hair (to allow it to move easily through tunnels)
 - ✓ Bristles on its nose (to sense the environment)
 - ✓ Paddle shaped feet (for digging)



2) Daily Adaptations

▶ Hibiscus:

- ✓ Exposes its flower during the day but closes it at night to reduce the amount of dew settling on the flower.



3) Behavioral Adaptations

▶ Crocodile:

- ✓ Swims during the heat of the day in order to cool down.



4) Seasonal Adaptations

▶ Deciduous trees:

- ✓ Leaves will fall in order to reduce water loss in winter and also to allow the growth of healthier ones.

▶ Tortoise / snail:

- ✓ Hibernate in summer - water activates them (first rainfall)

▶ Bear:

- ✓ Hibernate in winter when very cold and food is scarce.

- ▶ Living organisms that cannot adapt reasonably well to their surroundings will become extinct. This may happen when:
 - ▶ Features of the environment change.
 - ▶ Competition from other organisms for food and space (survival of the fittest)
 - ▶ New predators arrive.



Examples of adaptations

Owl → Daily and structural adaptations

- ✓ Head which turns 180⁰ both ways
- ✓ Hunts at night
- ✓ Enlarged eyes for better vision
- ✓ Wing tips which reduce noise when flying



Examples of adaptations

Crocodile → behavioral and structural adaptations

- ✓ Goes into the water to cool down
- ✓ Nose and eyes which stick out of the water whilst the rest of the body is immersed, so that it keeps cool whilst hunting.

Examples of adaptations

Chameleon → behavioral and structural adaptations

- ✓ Changes colour for camouflage
- ✓ Long tail which stabilizes it on branches
- ✓ Eyes can see what's behind it so that it doesn't have to move and turn around
- ✓ Long, sticky and super fast tongue



Examples of adaptations

Cactus → structural adaptations that allow them to survive in hot, dry (arid) regions.

- ✓ Long and shallow roots to search for water and to quickly absorb any water from rain and overnight condensation.
- ✓ Leaves reduced to spine, reducing the surface area over which water can be lost.
- ✓ Succulent stem which can photosynthesize. The stem also contains water-storage tissue.

More adaptations of cacti..

- ✓ Some have poison in stem so that when animals try to take their water, they feel sick.
- ✓ A thick, waxy cuticle covers the plant's surfaces and reduces transpiration.
- ✓ Many cacti have a round, compact shape which reduces their surface area to volume ratio, thus reduces the surface area over which water can be lost.
- ✓ They have shiny surfaces that reflect heat and light

Examples of adaptations

Mole → Structural adaptations

- ✓ Small ears and eyes
- ✓ Sharp claws for digging
- ✓ Bullet shaped to move easily through small spaces
- ✓ Short hair and short tail



Broad Footed Mole

Examples of adaptations

Seasonal trees which lose their leaves:

- ✓ In order to reduce water loss in the winter months when the land is iced up.
- ✓ Avoids them getting damaged by the snow

Examples of adaptations

Hibernating / aestivating animals → Seasonal adaptations

- ✓ Bears hibernate in winter due to a lack of food.
- ✓ Snails hibernate in summer due to a lack of water.

Adaptations to extreme conditions

Desert conditions

- ▶ Look at the picture of the camel and try to list down as many adaptations as possible.



Song

Adaptations of Camel

- ▶ It can drink up to 40 pints of water at one go. This takes 10 minutes.
- ▶ The stomach can store up to 500 pints of water for a short time.
- ▶ It loses a little water → there is little urine no sweating.
- ▶ No layer of fat under the skin.
- ▶ Fat is stored in the hump and can be respired to give metabolic water.

Adaptations of Camel

- ▶ It has bushy eyelashes and hair-lined nostrils that can close.
- ▶ The body has a large surface area to volume ratio.
- ▶ It has large feet to spread the load.
- ▶ It has long legs (note that the hottest air is in the first metre above the desert sand)
- ▶ It can withstand an increase in normal body temperature of 9⁰C.

Stretchy Nostrils
- keep out the sand

Long Eyelashes
- help to keep sand
out of eyes

Leathery Mouth
- help camel eat
spiky plants!

Hair on back to protect against
sun!

Hump for storing
food!

Long legs - keep
camel off the hot sand
- help to keep cool.

Padded Feet
- stop sinking into
the sand and to protect
from heat of the ground



Adaptations to extreme conditions

Arctic Conditions

- ▶ Look at the photo of the polar bear and try to list down as many adaptations as possible.



Adaptations of Polar Bears

- ▶ Compact shape. Body has a low surface area to volume ratio.
- ▶ Polar bears have small ears.
- ▶ They have a thick layer of fat stored under the skin.
- ▶ Their very large feet are covered with this, rough skin and long, tough hair.

Adaptations of Polar Bears

- ▶ Their fur is thick and white.
- ▶ Greasy fur which sheds water quickly after swimming.
- ▶ They are strong swimmers and fast runners over ice.
- ▶ The female mates in summer, and pregnancy doesn't occur until autumn.
- ▶ Sharp teeth and long claws.

7Db Adaptations

- ▶ Giraffes are herbivores, living in dry grasslands in Africa.
- ▶ What adaptations do you think a giraffe has?

Tongue: Long, to pull leaves off between tree thorns.

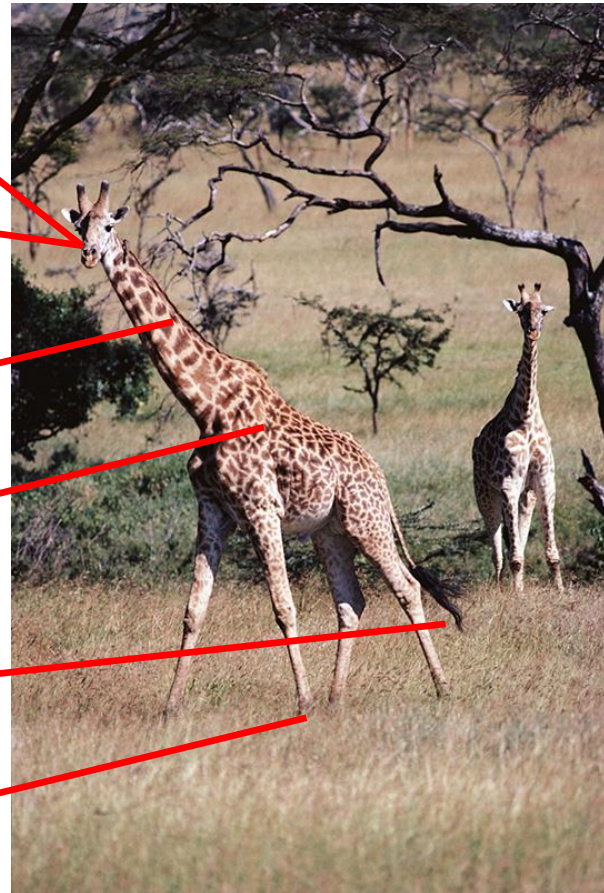
Lips: Tough, protection from tree thorns and tough grass.

Neck: Long, to reach leaves and to look out for danger.

Coat: Patterned camouflage, especially in young.

Tail: Fringed tail helps keep flies away.

Hooves: Protect the feet.



7Db Adaptations

Swans are large birds that feed on water plants. What adaptations do you think a swan has?

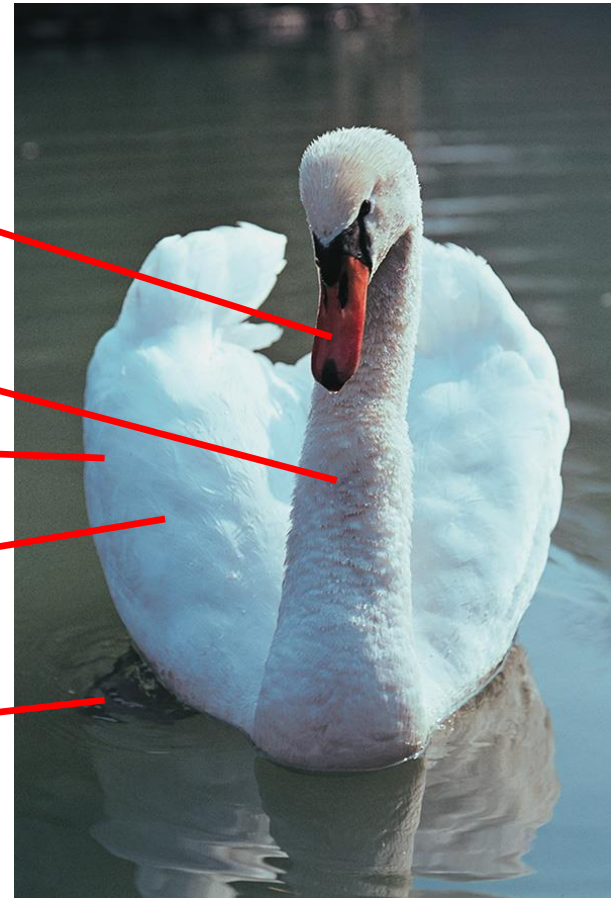
Beak: Sharp, for biting plant stems and roots.

Neck: Long, to reach for food underwater.

Wings: Large, to lift the large body into flight.

Feathers: Oiled, for waterproofing.

Feet: Webbed, for swimming.



7Db Adaptations

Cheetahs are fast-running predators from the grasslands of Africa.

What adaptations do you think a cheetah has?

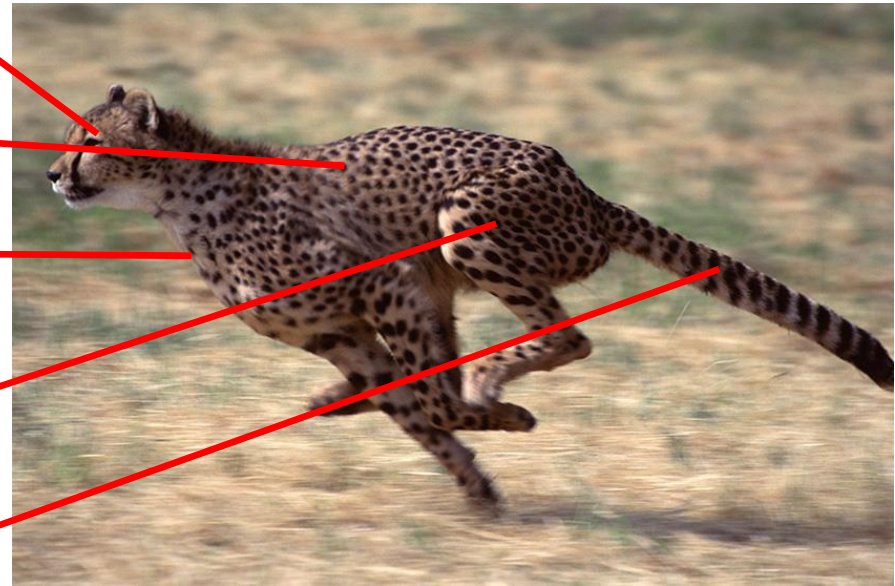
Eyes: Forward-facing for judging distances.

Coat: Spots give camouflage in dappled shade.

Shape: Streamlined and flexible back for running fast.

Legs: Powerful back legs for running fast.

Tail: Long and thick, for stabilisation and turning when running.



7Db Adaptations

Snowy owls live in polar regions where snow lies on the ground in winter. They hunt small animals such as mice.

What adaptations do you think a snowy owl has?

Eyes: Forward-facing for judging distances.

Ears: Acute hearing to hear prey under deep snow.

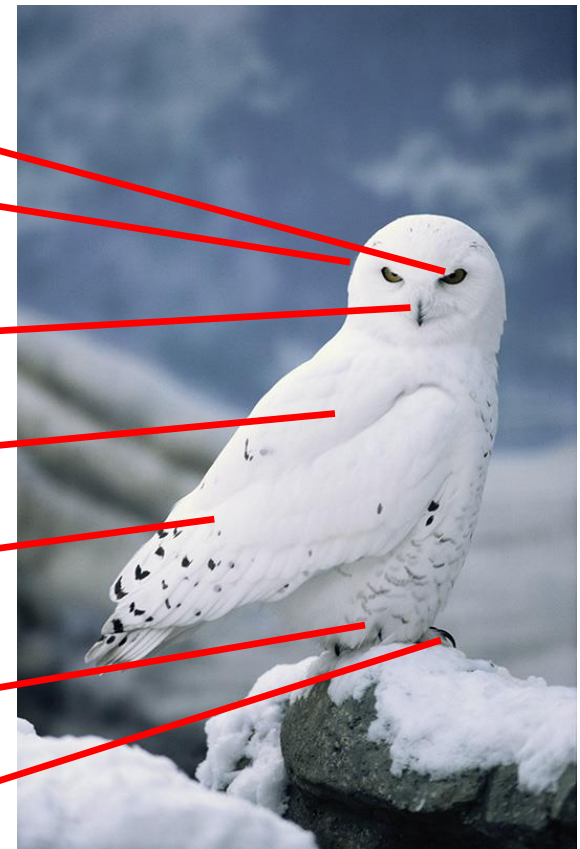
Beak: Sharp, to rip flesh.

Feathers: Camouflage so prey doesn't see it.

Feathers: Specially shaped tips for silent flight.

Legs: Feathered for warmth.

Talons: Sharp, for catching prey.



7Db Adaptations

Otters are predators of fish, so spend a lot of time in water.
What adaptations do you think an otter has?

Eyes: Forward-facing for judging distances.

Ears and nostrils:
Can close underwater.

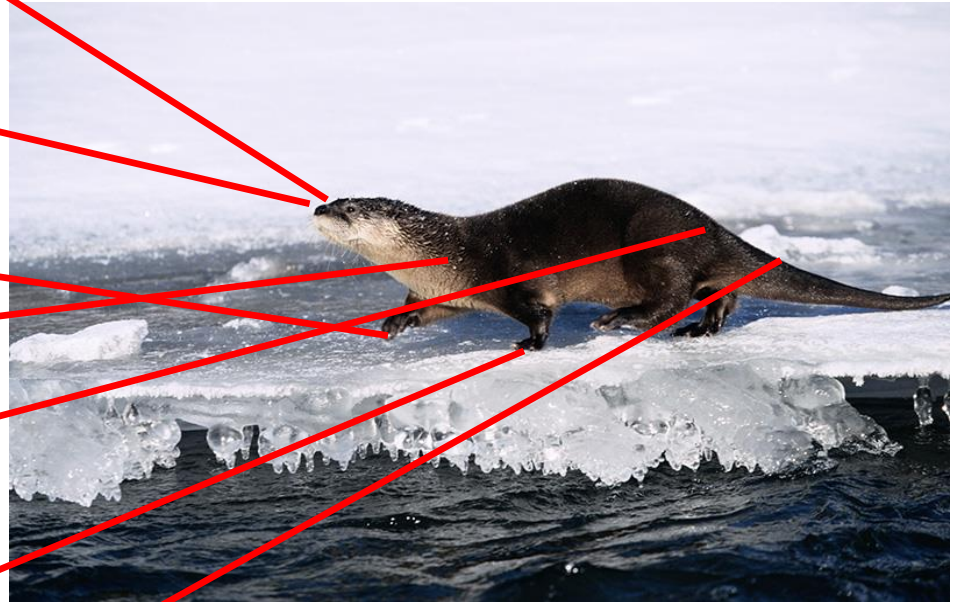
Teeth and claws:
Sharp, to hold and eat
slippery fish.

Fur: Waterproof

Shape: Long, slim and
flexible for swimming.

Feet: Webbed for swimming.

Tail: Thick, acts as a rudder.



7Db Adaptations

Moles live underground, digging tunnels in which they catch small animals, particularly worms.

What adaptations do you think a mole has?

Eyes: Tiny, because there is little light.

Fur: Very fine and short to keep out dirt.

Nose: Special cells to detect movement of prey.

Feet: Broad front feet, with an extra 'thumb' for digging.

Blood: Lots of haemoglobin to cope with low oxygen levels underground.



Adaptations to extreme conditions - Plants in dry places

Conifers:

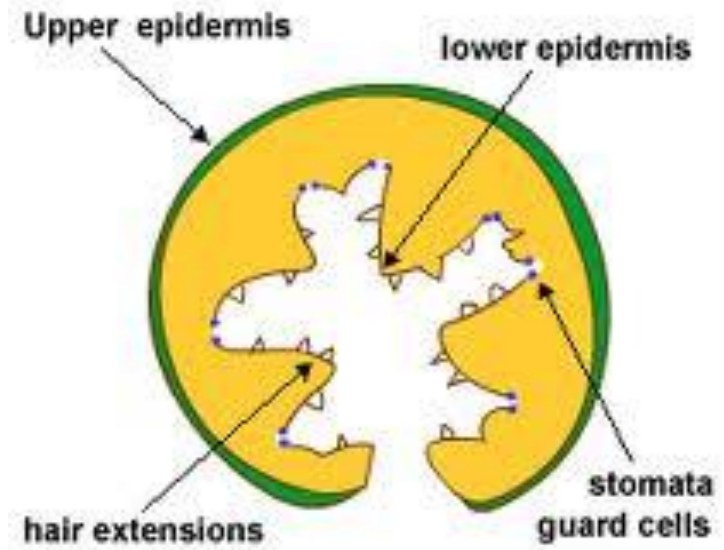
- ▶ Like cacti, these are also adapted to withstand water loss.
- ▶ These trees are often found high up on mountain slopes.
 - ▶ Here it can be very windy and normal leaves would easily lose water by transpiration.
- ▶ The leaves of a conifer are reduced to needles.
- ▶ Like cacti, they have a reduced surface area to volume ratio, so that there is less surface area over which water can be lost.



Adaptations to extreme conditions - Plants in dry places

Sand dune plants:

- ▶ Plants like Marram have long thin leaves.
- ▶ The leaves are also rolled up along their length.
- ▶ The stomata are found inside the groove formed by the rolled up leaf.
- ▶ Humid air becomes trapped in the groove and so less water vapour passes out of the stomata to be lost to the plant.



Activity - Does this feature help the animal live in a hot or cold habitat?

- ▶ Long eyelashes
- ▶ Small ears
- ▶ Long tail
- ▶ Big ears
- ▶ Thick fur
- ▶ Huddling with other animals
- ▶ Thick feathers
- ▶ Burying itself
- ▶ Hibernating
- ▶ Storing food
- ▶ Thick layer of fat
- ▶ Long trunk
- ▶ Not much fur
- ▶ Sleeping in daytime
- ▶ Small wings and feet