

Background information

Year 5–6, unit 2: Survival

Adaptation

An adaptation is a physical or behavioural characteristic that has developed over time to enable an organism to survive in the environment in which it lives. Plants and animals have evolved numerous strategies to help them survive in a range of environments, including the extremes of the desert and the freezing temperatures of the polar regions. Over time, plants and animals that are better suited to their environment survive and breed, passing on their adaptations to future generations. Those plants and animals that are not well adapted to their environment may not survive and will not compete well against those which have adapted. Therefore, the characteristics that help a species survive in an environment tend to be passed on, and those that don't help will disappear over time.

Some adaptations are structural while others are behavioural. **Structural adaptations** are those that relate to the physical features of an organism that enable it to survive in its environment. Some examples of structural adaptations include the specialised shape of the beak of a bird, the ability of desert plants to retain water through the shape of their leaves and the ability that some animals have to blend into their environment through the use of camouflage.

Behavioural adaptations are the behaviours or actions that animals have developed in order to help them survive. Some examples of behavioural adaptations include birds migrating during the winter months, desert dwellers resting during the extreme daytime temperatures and being more active in the cooler nights.

Desert and semi-arid regions

There are many different definitions of deserts and semi-arid regions. Some of the things taken into consideration when defining a desert include the amount of rain per annum, the temperature and the humidity. Deserts are dry areas that generally have less than 250 mm of rain per annum while semi-arid regions have between 250 and 500 mm per annum.

There are two kinds of deserts: hot and cold. Hot deserts are those we are most familiar with. Hot deserts, such as those found in central Australia, have extremely high daytime temperatures, but the temperature at night can drop below freezing. This happens because in a desert region there is not much moisture in the air. This moisture usually acts as a blanket and traps some of the heat. In a desert, when the sun goes down, the heat escapes and the temperature drops dramatically.

Cold deserts are found in places such as Antarctica and Greenland where the main form of precipitation is snow, with a large amount of snowfall in winter.

Plant adaptations to conserve water

Plants that live in desert and semi-arid regions have adapted in different ways to conserve water. These adaptations help them survive the extreme temperatures and

limited water supplies found in such harsh environments. One of the most common ways for plants to reduce water loss is through adaptations to their leaves.

- As plants can lose a lot of moisture through their leaves, many have evolved leaves that reduce water loss. These include much smaller, thinner, needle-shaped leaves to reduce the surface area. This reduces the amount of water that can evaporate from the leaves. It also means that less heat is absorbed by the plant, thereby reducing the need for transpiration. Having smaller leaves also reduces the amount of leaf area available for photosynthesis, which is one reason why desert plants are often slow growers.
- Some desert plants known as succulents have thick, fleshy leaves to store water. This enables them to draw on the water stored in their leaves during dry periods. The thick succulent leaves also help reduce evaporation.
- Some plants have grey or light-coloured leaves which reflect sunlight. This reduces the amount of heat absorbed and the amount of moisture lost.
- Some plants have an outer, waxy coating on their leaves called the cuticle. This helps reduce water loss by reflecting light and reducing evaporation.
- Some plants have the ability to drop their leaves in dry periods.
- Some plants have leaves that curl or roll away from the harsh sunlight. This helps reduce the amount of water lost through the leaves due to evaporation.
- Plants that grow in drier environments have fewer stomata, the pores found on the epidermis (the outer layer of the leaf). By having fewer stomata the plant reduces the amount of water lost through the leaves by evaporation. Many desert plants also have the ability to only open their stomata during certain times of the day, such as at night, when the water loss is greatly reduced due to there being no direct sunlight and a reduction in temperature.

Other adaptations apart from those to leaves include the following.

- Having a double root system. Plants use their roots to bring water from the soil into the body of the plant. A double root system means that the plant has a set of roots near the surface of the soil and another set of roots that go much deeper. This enables the plant to spread their roots both wide and deep to maximise the amount of water it can get from the soil.
- Completing their life cycle within a year or less. These annual plants take advantage of the times when moisture is available to flower and set seeds before the dry period arrives. The seeds from this type of plant can lie dormant in the soil until the conditions are right for growth, thereby avoiding the drought conditions.

Indigenous desert life

Before the colonisation of Australia, Indigenous people lived in all areas of Australia including desert and semi-arid regions. The availability of water is a huge issue in such regions. The Indigenous people had a variety of strategies to overcome this problem and make survival in these regions possible.

Traditional life in these areas was nomadic, with groups of people following the cyclic patterns of available resources. It was chiefly the supplies of water that formed the basis for the movement of the groups. The Indigenous people had a good knowledge of the landscape. This meant they were usually able to move from one water supply to the next. They learnt the location of different waterholes through stories and songs.

They reduced the evaporation rate of the water they found in springs by placing large rocks over the openings. Containers were also used to carry water on journeys between water supplies. Indigenous people also knew which plants indicated the presence of water and they would dig into the ground around their roots to get it. Tree roots also store water and the Indigenous people dug and harvested water from the roots of trees such the red mallee, as well as collecting dew from plants in the early morning. They could also obtain water from animals such as the water-holding frog.

For additional information see:

Skatssoon, Judy '[Aboriginal people built water tunnels](http://www.abc.net.au/science/articles/2006/03/15/1590192.htm)', ABC Science website, <http://www.abc.net.au/science/articles/2006/03/15/1590192.htm> (15 March 2006)

How to draw an annotated diagram

An annotated diagram is a drawing that is used to illustrate an idea, object or concept. For students, the drawing needs to contain related descriptive notes or words to help explain and demonstrate their level of understanding. Diagrams should:

- be neat, clear and scientifically accurate
- be of a reasonable size so that details can be clearly added
- be clearly labelled, using arrows to show each feature. Arrows should be straight lines that do not cross over each other
- contain accurate notes and information relating to the subject
- have an appropriate title
- show the scale of the drawing.