

Part 3

Protecting the garden

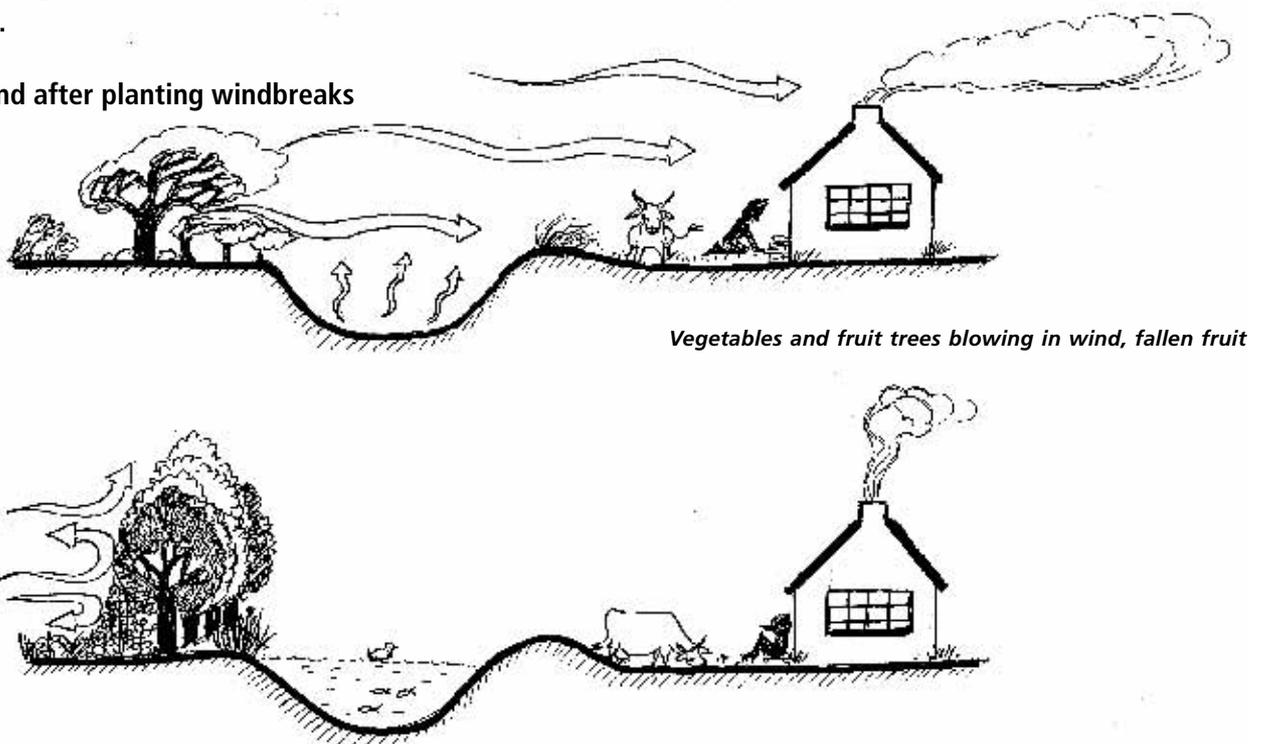
worksheet 3.1

Wind protection

Wind is moving air. Wind can damage plants by breaking their stems or blowing off their flowers and fruits. Strong, hot, dry winds can dry out plants and even burn them.

Windbreaks are essential in windy areas such as the Western Cape. They are also useful in very dry areas, where the winds dry plants out badly. Windbreaks usually consist of hardy trees and shrubs. Shrubs are generally shorter than trees, and have several stems, rather than a single trunk. Planting windbreaks is the first thing to do when establishing a garden.

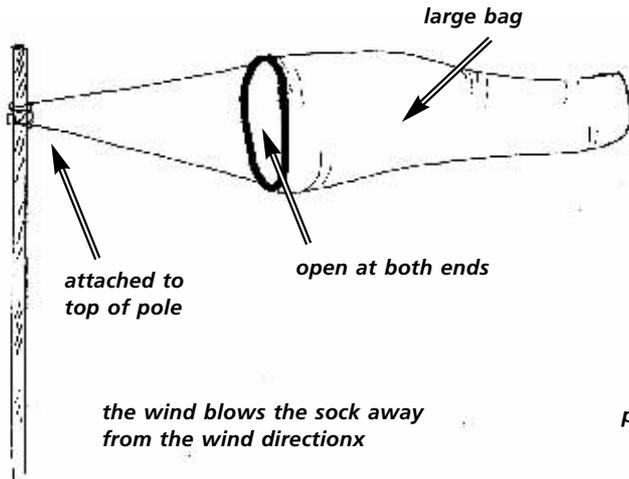
Before and after planting windbreaks



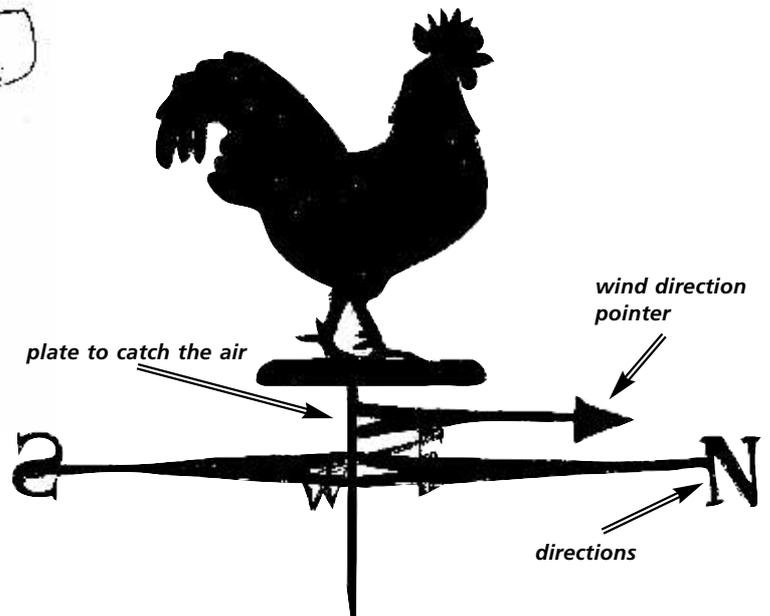
The first step is to choose the best position for a windbreak. To do this we need to know the directions of the prevailing winds. A prevailing wind is a wind that usually blows at a certain time of the year. In Cape Town there are two prevailing winds: an uncomfortable summer wind from the south-east, called the southeaster, and a stormy winter wind from the north-east, called the north easterly wind. As you can see from these examples, winds are named after the direction from which they blow.

There are many simple instruments for showing the wind direction. The wind-sock and wind-vane shown in the diagrams are two examples. Wind-socks are used at airports to show pilots the wind direction as they land or take off their planes. Wind-vanes are usually seen on top of high buildings such as churches.

A wind-sock



A wind-vane



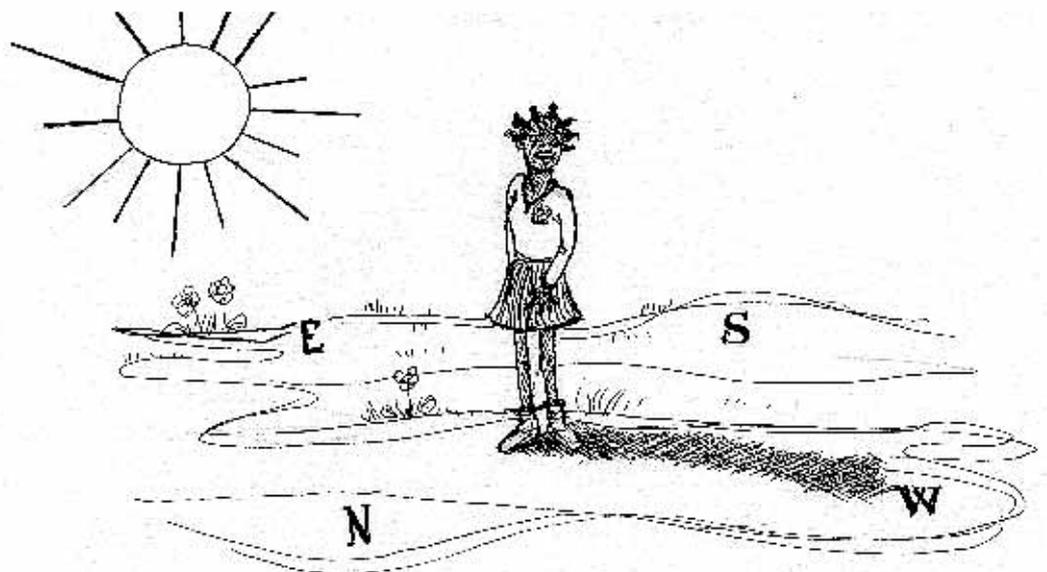
Activity 3.1



Class work

Find the prevailing wind directions at your school

1. To find the wind direction, we first need to know the cardinal directions, that is, in which directions are North, South, East and West. There are two ways you can find the cardinal directions. The more accurate way is to use a compass. If you do not have a compass, then you can use the position of the sun: the sun rises in the east and sets in the west. So, if you stand so that west is on your left and east is on your right, north will be in front of you and south will be behind you.



You can use the sun to estimate the cardinal directions

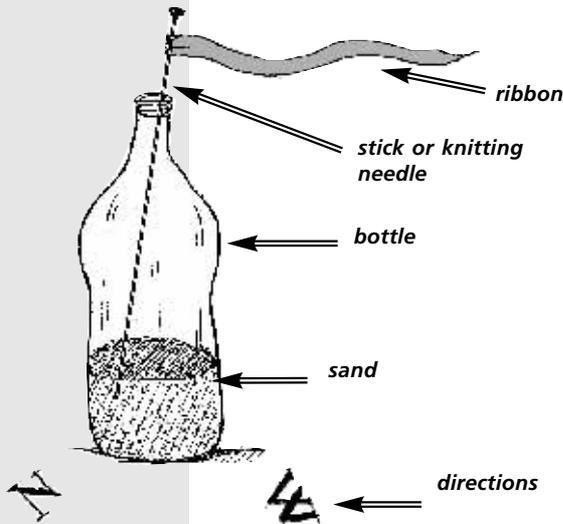
2. Near the garden, permanently mark the cardinal directions for everyone at the school to see. You can either mark them on cement using paint, on the soil using sticks or rocks or using any other way you can think of.



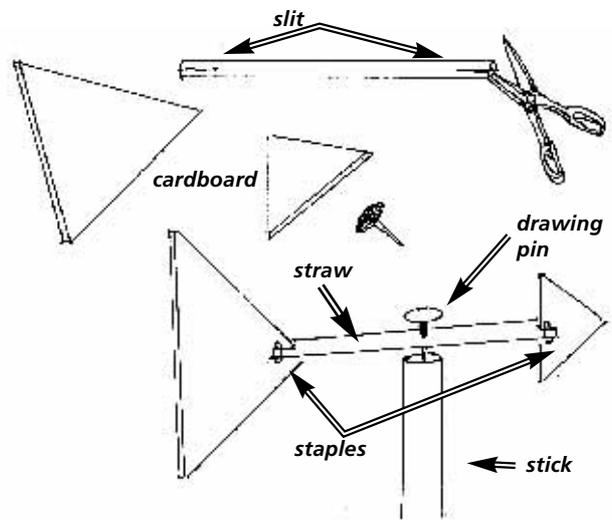
A compass

- Discuss and then list on the board the signs of wind. This could include bent trees, piles of sand next to barriers like fences and pieces of plastic caught on fences.
- Now go on a wind journey: walk around outside to look for signs of winds. Record what wind signs you see and what these tell you about the prevailing wind direction/s at your school.
- The diagrams below show two simple instruments for finding the wind direction. Work in groups to make one of these instruments from the information in the diagrams.

Make a simple wind-sock



Make a simple wind-vane



- Once you have made your instrument place it outside near the marked cardinal points so that you can see the prevailing wind direction.
- After looking at your instrument, record the wind direction every day for a week in the table below.

Day of week	Mon	Tues	Wed	Thurs	Fri
Wind direction					

- Compare the information you got about wind direction in Steps 4 and 7. Write down the prevailing wind direction at your school at the present time of year.

Activity 3.2



Homework

Investigate the effect of wind on the drying of washing

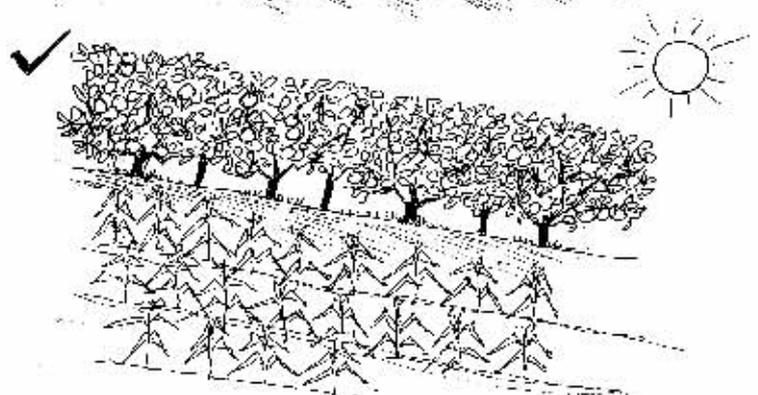
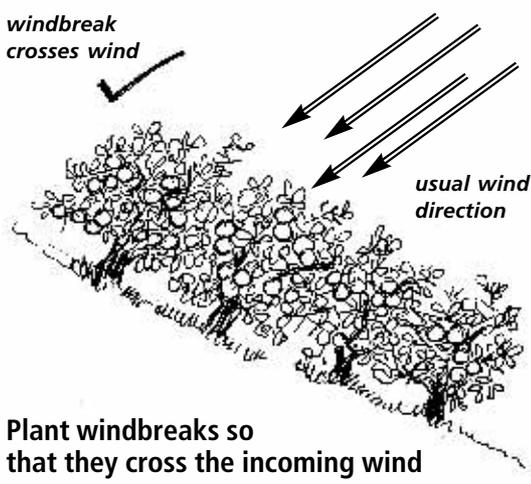
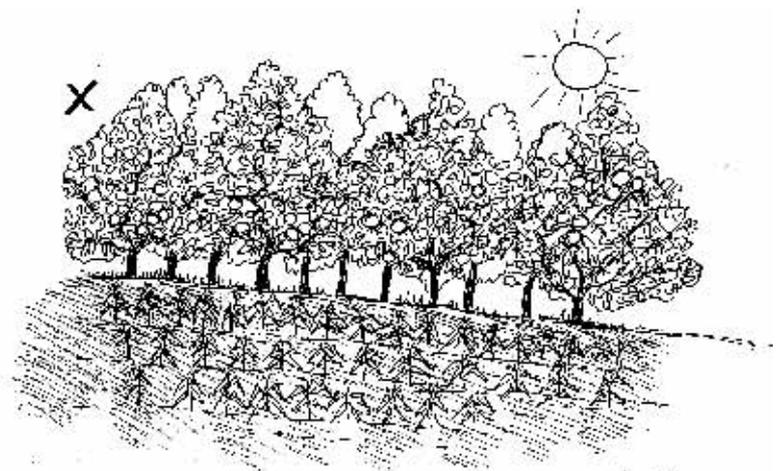
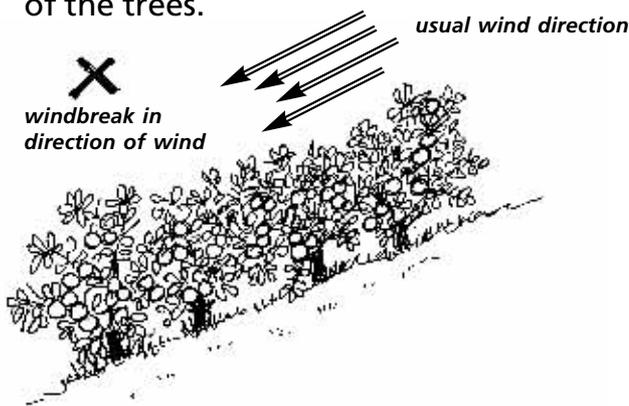
Does wet washing on a line dry more quickly when it is windy or when it is still? At home, carry out an investigation to answer this question. Write a report giving the aim, method, observation and conclusion of your investigation.

Planting windbreaks

As with any good Permaculture design, windbreaks can have many functions:

- ✂ slow down wind
- ✂ prevent soil erosion
- ✂ protect food plants that are damaged by wind
- ✂ shelter farm animals
- ✂ produce food for animals by planting fodder trees such as honey locust, leucaena, tagasaste and carob
- ✂ give some fuel wood from pruned branches
- ✂ give nectar for pollinator birds, bees and butterflies
- ✂ provide food and shelter for wildlife.

Windbreaks are usually planted so that they cross the incoming wind as shown in the drawing below. In this position, the windbreak lessens the force of the wind and protects the plants in front of it. A windbreak slows wind for a distance of 5 to 10 times the height of the trees.



Plant windbreaks so that they cross the incoming wind

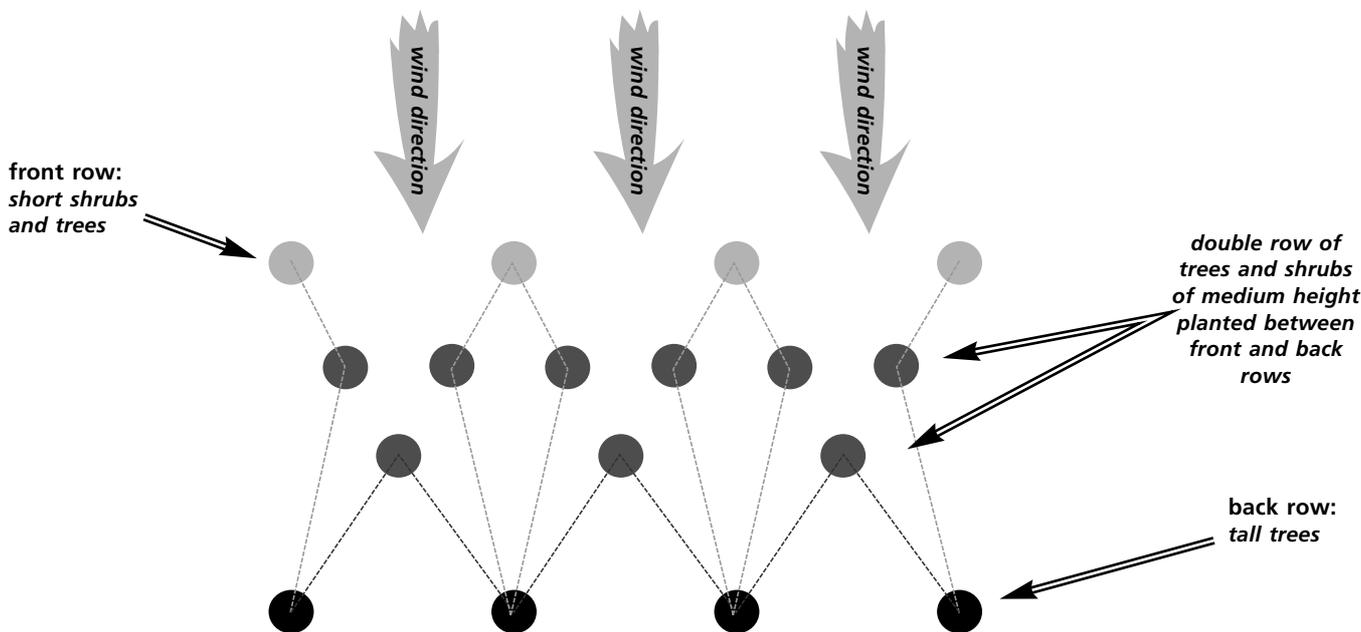
The windbreak plants should not be so tall that they shade the crop plants

Besides finding the right position for windbreaks, you also need to choose and obtain good windbreak plants. For vegetables which grow close to the ground, you can plant reeds, tall grasses or sugar cane as windbreaks. For tall crops or fruit trees, you can plant trees as windbreaks. The windbreak plants should be taller than the crop plants, but not so tall that they make long shadows over the crop plants.

Good windbreak plants are usually wind-tolerant pioneers. Pioneers are plants that are able to grow in unprotected disturbed places. When you choose plants for a windbreak, try to find plants which:

- 🌳 are dense so that they break the wind
- 🌳 are not so tall that they shade the crop plants
- 🌳 are not damaged by wind themselves – look around your area for plants that can grow in the worst conditions
- 🌳 do not use a lot of water
- 🌳 can give you a useful product such as animal feed, fruit, wood or materials for making crafts
- 🌳 grow well in your area
- 🌳 do not spread easily out of the area where you plant them.

Plant windbreaks that have parallel rows of plants as shown in the drawings.



There has been great success with the following indigenous species:

Bracylaena dicolor: A tree with white undersides of leaves. We usually plant one per meter at the back of the windbreak (as a spine to the windbreak).

Crysanthemoides moniflora (Bitoi): Yellow flowers and thick leaves. This shrub grows BIG and can completely take over – needs to be pruned – used in between *Bracylaena* at the back.

Salvia arficana lutea (Brown sage): Grey leaf and unusual brown flower. This is normally placed in the second row.

Rhus crenata (Dune crowberry): Small round leaves and red berries. This is also normally a second row species.



Indigenous species are plants or animals that originally come from a place. Exotic species are plants or animals that were brought to a place from another place. For example, in a circus in Durban, the elephants are indigenous but the grizzly bears are exotic. This is because there were and still are herds of elephants in Kwazulu-Natal, but there were never grizzly bears living in the wild in Africa.

Leonotis leonorus (Wild dagga): Pointy, slightly hairy leaves and normally orange flowers. We tend to use this plant at back and second row.

Metalasia muricata (Blombos): Spiky leaves and sprays of white flowers in late autumn. This is another second row species.

Naming plants

The names of plants differ in different areas and in different languages. To avoid the confusion that comes with the many different local names, there is an international system of naming plants.

In the international system, every type of plant and animal has two names. These are in the Latin language and are called the scientific names. The first name is the genus and the second is the species. Plants or animals which are very similar have the same genus name. For example, *Allium cepa* is the name for onions, *Allium sativum* is the name for garlic and *Allium fistulosum* is the name for bunching onions or shallots.

When you buy packets of seeds, you may notice another name on the packet. For example, onion seeds may have names such as Pyramid, Texas Grano or Sphinx on the packets. These are variety or cultivar names. Varieties and cultivars are different types of the same species. Use "variety" if the species is wild and "cultivar" for plants that are cultivated in agriculture or forestry. Onion cultivars, for example, may differ from one another in the size and colour of the onion, how long you can store them, how long they take to grow and where they grow best.

Most cultivated plants have a genus, a species and a cultivar name. We write the genus name with a Capital letter, the species name with a small letter and the cultivar name or names with Capital Letters. We put the genus and species names in *italics* or, if hand written, we underline them. For example, *Allium cepa* Texas Grano.

When we write about more than one species of the same genus, then we write out the genus name the first time, and abbreviate it after that. For example, *Allium cepa*, *A. sativum* and *A. fistulosum*. When we write "spp." after the genus name, we mean all the species in that genus.

In this book we generally use the most common English name. Appendix 1 is a table listing most the plants mentioned in the book. This table also gives the scientific names.



Activity 3.3

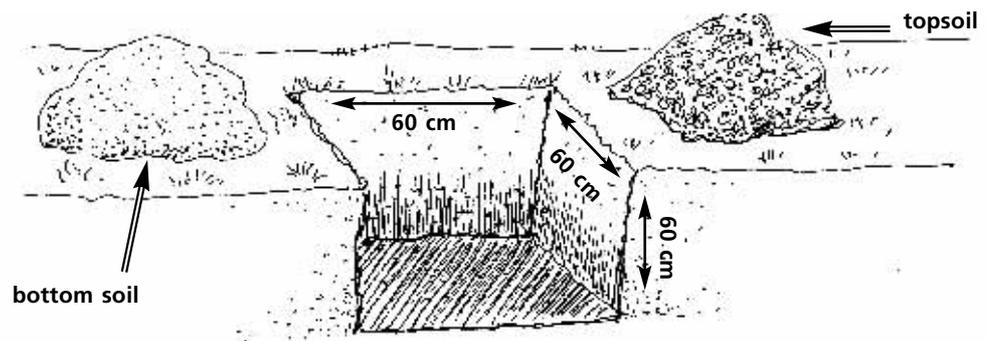


Class work

Planting windbreaks

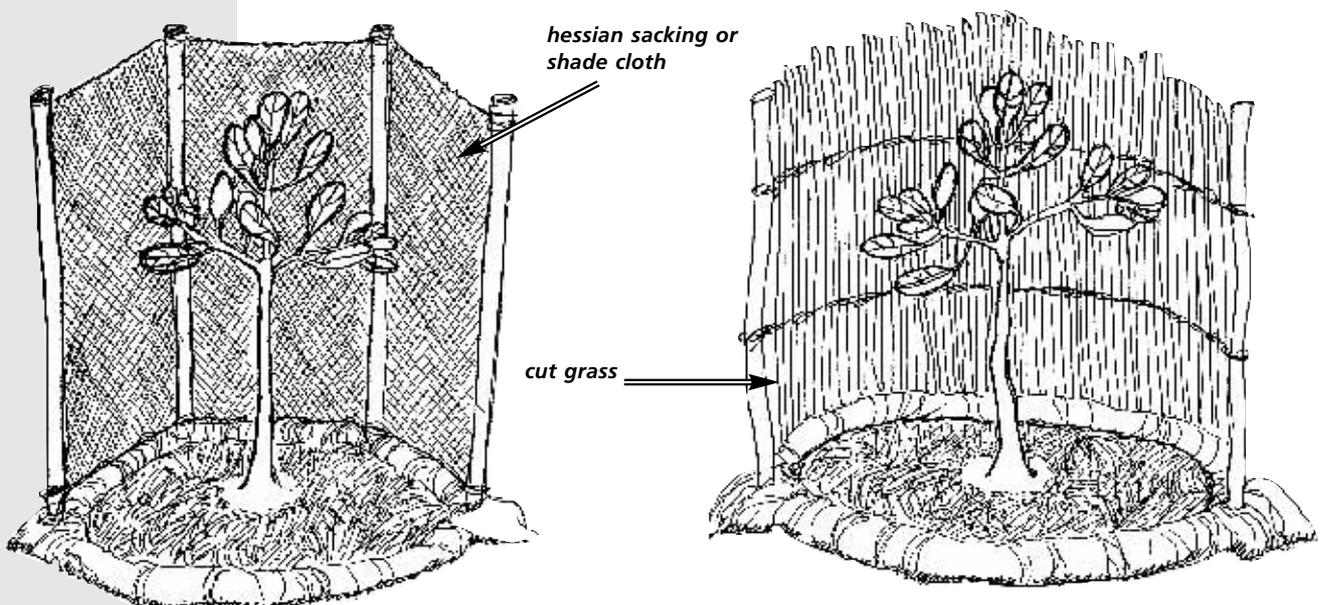
1. The first step is to choose the best position for a windbreak. You got a lot of information about wind direction in Activity 3.1, but that was only for the present time of the year. You could get more information about wind direction by watching the wind behaviour over a period of time or by speaking to people who have lived or worked in the area for a long time. You may have to plant more than one windbreak as the summer wind direction may be different to the winter wind direction. Your teacher will tell you where you will plant the windbreaks.

- The next step is to choose and obtain your windbreak plants. Since windbreaks protect other plants in a garden, a good way to get started is to get your windbreak plants from a nursery. Your teacher will give you windbreak plants.
- You will need to prepare planting holes into which to transplant the windbreak trees and shrubs. Dig each planting hole about 60 cm deep and 60 cm square. Dig out the top 30 cm of soil and put it to one side of the hole. Then dig out the bottom 30 cm and put it on the other side of the hole. Loosen the soil at the bottom of the hole.



Ideally, you need a bucket of compost for each tree. Mix the topsoil with the compost. You can also add a handful of bonemeal to the mixture. Use this mixture to fill the hole. Carefully remove the container without disturbing the soil or the roots. Plant the tree into the hole as deep as it was growing in its container. You can tell this depth from the soil mark on the tree trunk. If you plant the tree too deep, the trunk may rot where it is covered in soil. If you plant too shallow, the roots that are out of the soil may die.

- You will also need to protect young windbreak trees from animals or wind by staking them, and putting hessian bags, shade cloth or thatch grass around them.

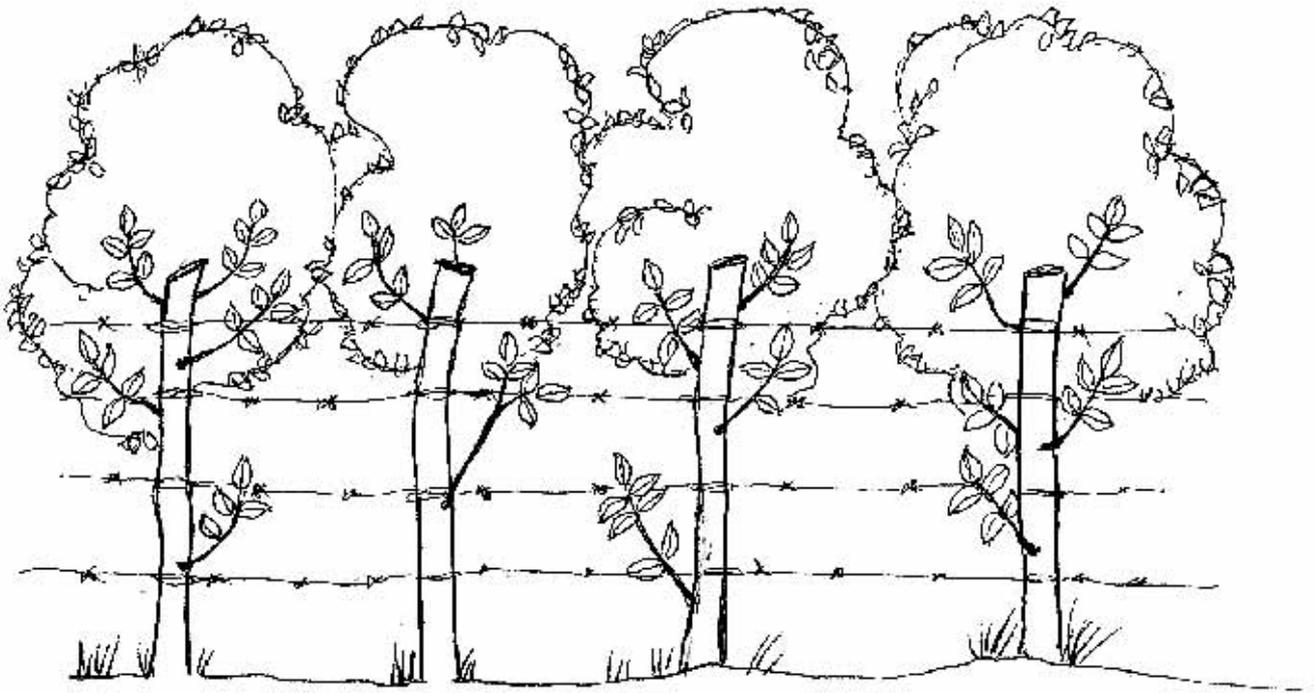


Protect young windbreak trees with cut grass, hessian sacking or shade cloth

Protecting with fences

We may also need to protect our gardens from damage by people and animals like dogs, goats, rats and chickens. To do this we need to put up one or more strong fences along the perimeter. The perimeter is the edge or boundary of an area. One way to build a fence is to collect materials such as wood, thorny branches, stones, bricks, metal drums and sheets of roof iron. You then place these materials together to form a fence. You can either tie them together or plaster them with mud or cement.

You can also plant living fences. A living fence is a line of plants which are planted close together so that they form a fence. These fences last a long time and are cheap to grow. They also protect the plants you are growing from the wind. You can also use plants as fence posts between which you stretch lengths of wire.



Living fence posts grown from truncheons

A quick way to grow living fences is to use truncheons. Truncheons are branches, which are about as thick as your arm, that you cut from a tree and then plant to grow into new plants. Most trees which drop a white sap when you cut them grow from truncheons.

There are many plants that make good living fences. Depending on your position and your needs, choose plants which:

- ☒ are not eaten by grazing animals
- ☒ grow thickly
- ☒ have thorns
- ☒ grow well in your area

- 🌱 do not shade the crop plants
- 🌱 do not use a lot of water otherwise they will take water from the crop plant or dry up the groundwater
- 🌱 can give you a useful product such as animal feed, fruit, wood or materials for making crafts
- 🌱 do not spread easily out of the area where you plant them.

The propagation column of Appendix 1 lists plants that you can grow from truncheons.

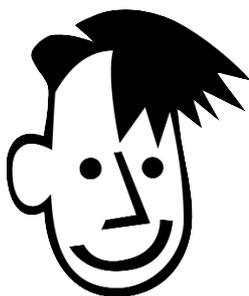
Activity 3.4



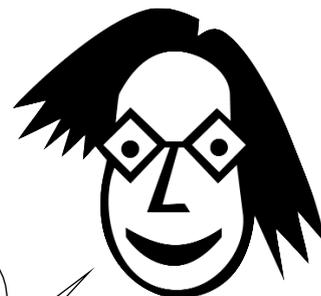
Class work

Grow a living fence from truncheons

1. The best time to cut truncheons is in June, July or August when trees are growing slowly because it is cold. Cut truncheons from trees that drop a white sap when cut. Only cut truncheons once the trees have formed new buds. You will not have much success if you plant truncheons later than November.
2. Cut thick branches with a saw or an axe. The branches can be as tall as an adult person. Cut the top of the truncheon at a slant, so that water runs off and does not cause the truncheon to rot. The slant also shows you which way up to plant the truncheon.
3. Leave the truncheons to lie in the shade for a few days so that a hard layer forms over the cut ends. If you put the truncheons into the soil soon after cutting them, then they may rot.
4. Dig a narrow hole. Place half to two-thirds of the truncheon into the soil. Pack the soil firmly around each truncheon.
5. If there is no rain, water the truncheons until they are growing strongly.



My dad planted a living fence around our home. Now we have a steady supply of planting material for fencing our animal paddocks.



I like the idea of living fences – for zero cost you get to enclose an area and green it at the same time!

Learners need to answer Question 3 according to the fruit trees, vegetables and crops that they saw.

worksheet 2.3 Rainfall

Activity 2.3 Choose which plants are suited to the rainfall of your school's area

Pair work

Instruct the learners to work in pairs to follow the steps of this activity. They find the answers with use of the maps and the tables in Worksheet 2.3. They should write their answers in their exercise books.

worksheet 2.4 Microclimates

Activity 2.4 Bring it all together

Pair work

Again instruct learners to work in pairs to complete the table. Learners can EITHER copy the table into their exercise books for completion OR complete the table on the worksheet.

Curriculum Links

Core knowledge and content

NS Planet Earth and Beyond

- Weather may change from day to day. Weather can be described by measurable quantities such as temperature and precipitation.
- Other changes take longer to occur. An example of this type of medium-term change is annual seasonal changes which may be described in terms of changes in rainfall, average wind direction, length of day or night and average maximum and minimum temperatures.

SS Geography

Grade 4: Mapwork – map symbols and key; map of South Africa showing provinces.

Grade 5: Climatic regions of South Africa and their temperature and rainfall. Mapwork – cross-referencing information on different maps.

Outcomes

NS LO2: Learners know, interpret and apply scientific knowledge.

SS Geog LO1: Learners use enquiry skills to investigate geographical and environmental concepts and processes.

Assessment

Assess the written work from all four activities together.

Part 3: Protecting the garden

worksheet 3.1 Wind protection

Activity 3.1 Find the prevailing wind directions at your school

Class work

Each group will need

straw, cardboard, drawing pin or ribbon, bottle, stick or knitting needle, sand, a compass if available

Marking the cardinal directions is a good activity for an afternoon club as it takes some time to do and does not require a full class of learners. Ask learners to suggest ways to mark the cardinal points of the compass in a permanent way.

After finding and marking the cardinal points, start the wind lesson in the classroom, discussing the signs one would see in the environment of the movement of wind. Then go outside and look for any of these signs.

Then go on to the making of the wind instruments. There are many ways to organise this. You can supply the materials or learners could supply the materials themselves. You could ask them to bring the materials to school, or they could make the instruments for homework and then bring them to school.

Once the groups have completed their instruments, let them place the instruments outside near the marked cardinal points so that they can see the prevailing wind direction.

Remind the groups to take their readings every day. They can record them in the table on the worksheet or in a similar table drawn in their exercise books.

Answers to questions

Step 4. Check the signs of wind they may have seen. If you live in a windless or protected area, there may not be any clear signs of wind.

Step 7. Check that learners complete the table and questions after the table. The wind direction of their instrument readings and the signs they saw on their wind journey should be the same.

Curriculum Links

Core knowledge and content

NS Planet Earth and Beyond

Weather can be described by measurable quantities such as wind direction and speed.

SS Geography

Grade 4: Mapwork – directions (eight points of the compass).

Outcomes

NS LO2: Learners know, interpret and apply scientific knowledge.

SS Geog LO1: Learners use enquiry skills to investigate geographical and environmental concepts and processes.

Assessment

Assess the written answers to Steps 4 and 7. For Step 4, assess how well the learner was able to see signs of wind in the school environment. For Step 7, assess how well the learner interpreted the readings from the wind instrument and recorded the readings over the week period. You can also assess the groups' interpretation of the diagrams of the wind instruments, and how well the instruments were constructed.

Activity 3.2 Investigate the effect of wind on the drying of washing

Home activity

Learners should design a simple investigation to determine whether wet washing dries more quickly when it is windy or when it is still. They can do this by comparing the time it takes for washing to dry on a windy day and on a still day. For this to be a fair scientific test, all the conditions – the wetness of the clothes, the amount of sunshine, the time of the day, etc – other than the amount of wind, should be exactly the same.

Curriculum links

Outcomes

NS LO1: Learners conduct investigations and collect and evaluate data and communicate their findings.

SS Geog LO1: Uses enquiry skills to investigate geographical and environmental concepts and processes.

Assessment

Assess the written report giving the aim, method, observation and conclusion of the investigation.

worksheet 3.2 Planting windbreaks

Activity 3.3 Planting windbreaks

Class work

This activity involves learners in the work of establishing the infrastructure of a food garden.

You will need to be clear on the position of the windbreak to be planted. The windbreak should be positioned between the identified prevailing wind and the food garden. You also need to be clear on the shape of the windbreak. We normally plant bigger species at the back of the windbreak and use smaller species to fill in the gaps with the smaller species. We also sometimes wrap the windbreak around the garden so that its arms protect the garden.

Before planting, discuss with learners where they would place windbreaks to protect the food garden. If there are existing windbreaks in place, discuss whether they need to be filled in, or whether a new windbreak should be planted to protect the garden further.

After planting, label the trees in the windbreak and say whether they are indigenous or exotic.

You could also draw a map of the school to indicate the prevailing winds and the windbreaks you have planted. This map can be added to as the projects grow. The map could be stuck up in your school foyer.

Curriculum links

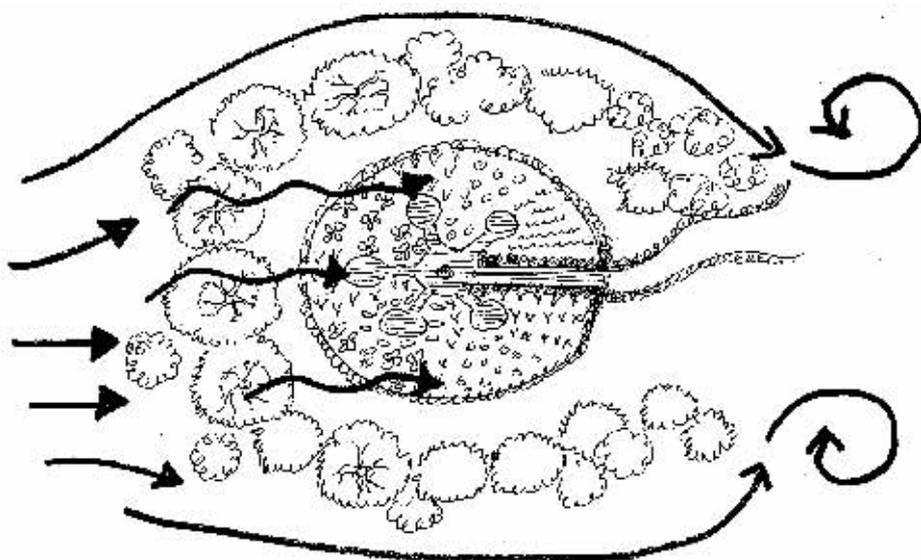
Outcomes

CO2: Learners work effectively with others as members of a team, group, organisation and community.

NS LO3: Learners demonstrate an understanding of the interrelationship between Science and the environment.

Assessment

This activity gives a good opportunity for assessing CO2: Learners work effectively with others as members of a team, group, organisation and community.



Plant the windbreak so that it puts its arms around the garden. Wind always curls back in at the edges of the windbreak, so the edge needs to be wider than the garden itself.

worksheet 3.3 Protecting with fences

Activity 3.4 Grow a living fence from truncheons

Class work

This activity is similar to Activity 3.3 in that it involves learners in the work of establishing the infrastructure of a food garden. The time of planting truncheons is important (the best time to cut truncheons is in June, July or August when trees are growing slowly because it is cold. You will not have much success if you plant truncheons later than November.) so wait until the cooler months to do this activity.

Curriculum links

Core knowledge and content

NS Life and Living

New plants can grow from certain parts of a parent plant. This is called vegetative reproduction and does not need seeds.

Outcomes

CO2: Learners work effectively with others as members of a team, group, organisation and community.

NS LO3: Learners demonstrate an understanding of the interrelationship between Science and the environment.

Assessment

This activity gives a good opportunity for assessing CO2: Learners work effectively with others as members of a team, group, organisation and community.

Part 4: Nutrient cycles

worksheet 4.1 Plants get green suntans

The major plant nutrients

Here is some additional information about the roles in the plant and deficiency symptoms of the three major mineral nutrients: nitrogen, phosphorous and potassium.

Nitrogen: plants need nitrogen for the leaves to grow properly. When plants have enough nitrogen, the leaves are a dark green colour. If the soil is short of nitrogen, growth is slow, the plants are small and the leaves, especially the older leaves, are yellow.

Phosphorous: plants need phosphorous for root growth and for producing flowers, fruit and seeds. If the soil is short of phosphorous, the root system is small, and the flowers and fruit drop. Many plants have purple streaks on their leaves when they do not have enough phosphorous.

Potassium: plants need potassium for fruit to ripen properly, for filling seeds, for lengthening stems and for resistance to pests and diseases. If the soil is short of potassium, fruit do not ripen properly, seeds are small and may not germinate, plants are easily attacked by pests and diseases, stems are short and the leaves are yellow and brown along the edges.

Activity 4.1 Think about plant food

Group work

Work through the theory before the activity first and then allow the learners to work in groups to answer the questions. The aim of the first question is to get learners thinking about the differences between plants and animals in terms of nutrition. It is important that they realise that plants produce their own food while animals need to eat.