

Shelterbelt Guide

Overview

In the southwest we are exposed to strong prevailing winds throughout the year. Landuse activities such as grazing can accelerate wind erosion, which can decrease the productivity and value of your land and increase stress on stock, vines and other crops. The most common shelterbelt is a vegetation barrier.

Trees and shrubs offer the greatest protection by slowing the wind speed. Tree shelterbelts reduce the speed of some of the wind as it passes, while the remainder of the wind rushes over the top.

Livestock exposed to cold winds and rain can suffer from hypothermia, leading to decreased weight gain, wool and milk production, and can lead to stock death.

High winds also damage pasture by reducing growth in winter and increasing moisture loss in spring.

Increased shelter for stock, pasture and crops lead to benefits far exceeding the loss of acreage.

Once established, shelterbelts require little maintenance other than weed control and fence maintenance.

For the Capes Region

Shelterbelt benefits

- Increasing crop and pasture growth by reducing evaporation,
- Improving germination;
- More efficient crop water use;
- Minimise structural damage to crop plants, protection from wind erosion, increasing crop yields and plant quality;
- Prevents loss of topsoil and nutrients.
- If 10% of the property is devoted to properly-designed shelterbelts the potential wind reduction is 35-50%
- Reduce lamb losses by up to 50%, and increase meat yield in cattle by 20-30%
- Alternative source of secondary products such as flowers, honey and food.
- Nature conservation benefits through re-establishing local provenance plants and providing additional fauna habitat or corridors.
- Visually enhances your land, thus improving the economic value.

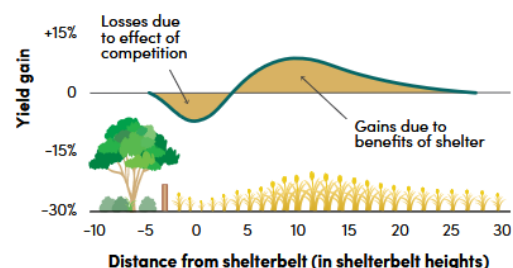


FIGURE 3. The effect of a shelterbelt on crop yields⁹

How do shelterbelts work?

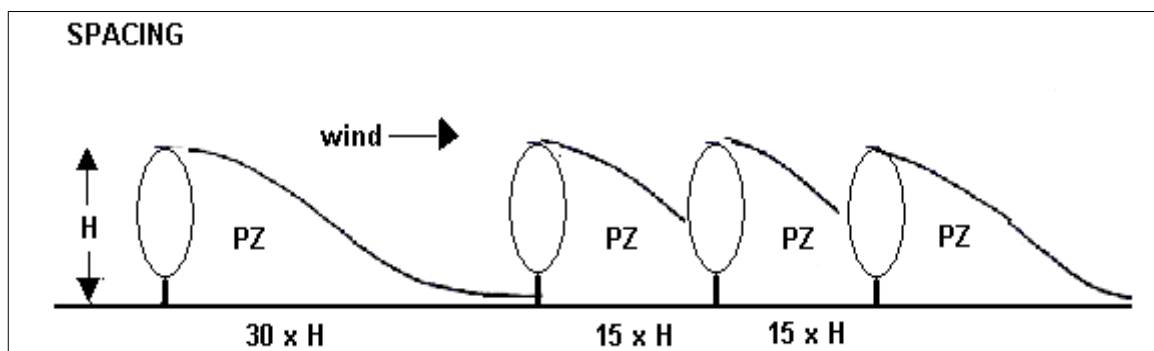
A shelterbelt's effectiveness at providing shelter depends on factors such as height, orientation to the wind, position in the landscape and uniformity, or absence of gaps in the foliage.

Shelterbelt Height

Generally, the taller the tree, the more effective the shelterbelt, and the further shelterbelts can be spaced apart. Having different layers of foliage by incorporating shrubs can improve the function of your barrier.

Shelterbelt Design

- Consideration should be given to existing boundary fence lines, roads and soil types
- Priority should be given to areas most prone to wind erosion, areas of crop damage from wind spray and existing infrastructure at risk of spray or drift.
- Ensuring the paddocks adjacent to shelterbelts are large enough to reap benefits of shelterbelts is important.
- Incorporating remnant vegetation into shelterbelts can provide cost-effective shelterbelts and enhance biodiversity values.
- A whole-farm approach is more effective than single paddocks
- Shelterbelts can protect land for a distance equal to 20 times the height ($H = \text{height}$) of the shelterbelt downwind.
- Upwind, land is protected up to 4 times the shelterbelt height.
- The area of greatest protection is between 2 and 10 tree heights downwind.
- Shelterbelts have little or no effect beyond 30 tree heights.
- In most areas, shelterbelts spaced at 25 to 30 tree heights give adequate protection. However, on soils prone to wind erosion, or in hilly areas with complicated wind patterns, closer spacings are going to be more effective.



Shelterbelt Orientation

In winter in the south of Western Australia, strong winds blow from the northwest, west and southwest. North-westerlies can be destructive but south-westerlies are colder and more dangerous for stock. Shelterbelts are most effective when oriented at right angles to approaching winds.

In summer, hot dry winds blow from the east. Commonly, to protect crops, shelterbelts should be oriented north-south, to minimise crop and pasture shading; or north-east to south-west. A north-south orientation also. To protect livestock from cold winter winds, shelterbelts are often aligned north-west to south-east. If stock shelter is the main aim, wide shelterbelts, or dense blocks of trees are more effective than narrow windbreaks.

Barriers become progressively less effective as the wind angle decreases. Farmers will know from experience which winds are most damaging on their farms and can align their shelterbelts accordingly.

Where wind directions are highly variable, a grid pattern of shelterbelts will give the best protection.

Shelterbelt Density/ Length

- Short shelterbelts are less effective than long shelterbelts. Wind has a tendency to flow around the ends of a shelterbelt and increase turbulence at that point.
- Aim for a minimum length of 20 times the shelterbelt height.
- Choose a plant spacing providing a continuous screen of foliage when the trees and shrubs mature.
- Shelterbelts should be 15-25m wide for optimal benefits. Research shows that at 25-30 m wide, they support small insect-eating birds that otherwise only occur in remnant woodland.
- A 1-3 row wide shelterbelts supports fewer species of birds than five or more rows.
- Multiple shelterbelt rows are less susceptible to the impacts of gaps and non-uniform growth
- Smaller trees and shrubs should be placed on the outer rows of a shelterbelt to prevent them from being shaded out

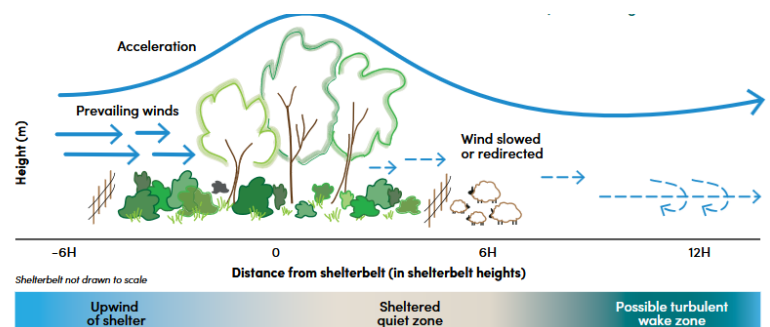


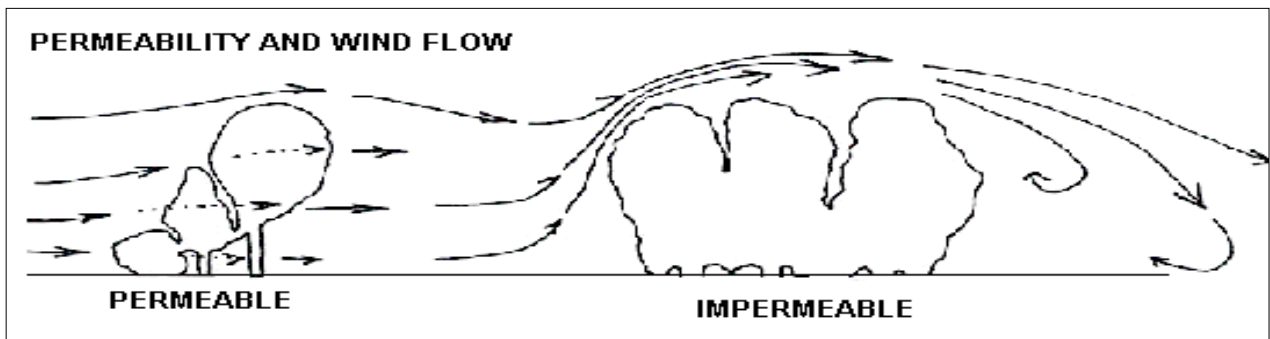
FIGURE 1. The effect of a shelterbelt on wind.² Planting dense shrubs and grasses helps maximise wind protection, while tall trees closer to the eastern and southern edges of a shelterbelt help maximise shade.

Shelterbelt Permeability

The aim is to allow 30-50% of the prevailing wind to pass through the shelterbelt. A dense shelterbelt will provide excellent shelter close up, but may increase wind velocity and turbulence further downwind.

Ideally, shelterbelts should allow roughly one-third of the prevailing wind to pass through.

If access tracks are needed through wide shelterbelts, place them diagonally through the trees, or in areas where wind speed is lowest, or erosion is least likely. For access tracks passing through a series of parallel shelterbelts, stagger the gaps to avoid making continuous passages for wind.



Fencing

All shelterbelts need to have stock excluded, at least while they are establishing. Unless shelter is needed for stock, it may be best to fence them out permanently.

Grazing compromises the biodiversity value of replanted areas through trampling and removal of vegetation. Reptiles are particularly affected. Intense grazing can lower breeding success of some species of birds, such as superb fairy wrens, due to habitat simplification.

Which Species?

A natural shelterbelt with a good species mix of trees and understorey plants will perform much better than a very sparse or very dense / impermeable shelterbelt. Many species are suitable for use in shelterbelts and combinations of species can be used.

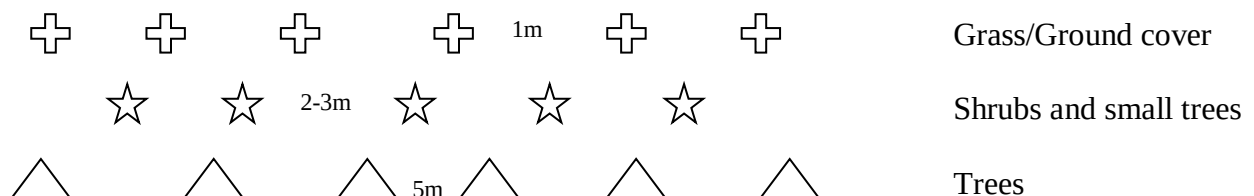
Choose species with consideration to their suitability to the climate and soil type, and the shelterbelt's purpose. We recommend the use of locally adapted native species. Endemic species to our region are preferable to non-endemic or invasive species for a variety of reasons, such as

- Their suitability to the weather conditions of our region
- They are the preferred habitat and food sources for our local fauna
- They will not become problematic, invasive and expensive to control weeds
- You are helping to retain the biological diversity unique to our Capes region

Seedling Placement

The form column in the tables on the next page indicate what size the seedlings will grow to. This provides a guide to spacing between each seedling. In general trees should be placed five (5) metres apart, shrubs and small trees should be two to three (2-3) metres apart and grasses/groundcovers one (1) metre apart.

It is important when planting seedlings they are spaced alternately as depicted in the diagram below. This allows for a consistent wind break.



A mix of the species below will provide you with a natural looking shelterbelt that will attract birds and insects.

Upland areas		
Scientific name	Common Name	Form
<i>Acacia pulchella</i>	prickly moses	shrub
<i>Acacia saligna</i>	orange wattle	large shrub/small tree
<i>Agonis flexuosa</i>	peppermint tree	tree
<i>Allocasuarina fraseriana</i>	sheoak	tree
<i>Allocasuarina humilis</i>	Dwarf sheoak	shrub
<i>Banksia grandis</i>	Bull banksia	Small tree
<i>Bossiaea linophylla</i>	broad-leaved brown pea	shrub
<i>Calothamnus quadrifidus</i>		shrub
<i>Chorilaena quercifolia</i>		shrub
<i>Conostylis aculeata</i>	Prickly conostylis	Grass/herb
<i>Corymbia calophylla</i>	marri	tree
<i>Eucalyptus calcicola</i>	Hamelin Bay Mallee	tree
<i>Eucalyptus cornuta</i>	Yate	tree
<i>Eucalyptus marginata</i>	Jarrah	tree
<i>Eucalyptus megacarpa</i>	Bullich	tree
<i>Hakea lissocarpha</i>	honeybush	shrub
<i>Hakea oleifolia</i>	Frog hakea	Small tree
<i>Hakea varia</i>	variable hakea	shrub
<i>Hardenbergia comptoniana</i>	native wisteria	climber/ground cover
<i>Kennedia coccinea</i>	coral vine	climber/ground cover
<i>Kennedia prostrata</i>	running postman	climber/ground cover
<i>Kunzea ciliata</i>		shrub
<i>Melaleuca lanceolata</i>	Rottnest teatree	tree
<i>Neurachne alopecuroidea</i>	foxtail mulga grass	grass
<i>Orthrosanthus laxus</i>	morning iris	grass
<i>Patersonia occidentalis</i>	Purple Flag	grass
<i>Sollya heterophylla</i>	australian bluebell	shrub
<i>Spyridium globulosum</i>	Basket bush	shrub
<i>Xylomelum occidentale</i>	Woody pear	tree

Wet areas		
Scientific name	Common Name	Form
<i>Acacia myrtifolia</i>		shrub
<i>Acacia saligna</i>	Golden Wreath Wattle	large shrub/small tree
<i>Agonis flexuosa</i>	peppermint tree	tree
<i>Anigozanthos flavidus</i>	Kangaroo paw	herb
<i>Astartea fascicularis</i>	Tea tree	large shrub
<i>Banksia littoralis</i>	swamp banksia	tree
<i>Beaufortia sparsa</i>	Swamp Bottlebrush	large shrub/small tree
<i>Calothamnus sanguineus</i>	silky-leaved blood flower	shrub
<i>Casuarina obesa</i>	swamp sheoak	tree
<i>Eucalyptus diversicolor</i>	Karri	tree
<i>Eucalyptus patens</i>	Blackbutt	tree
<i>Eucalyptus rudis</i>	Flooded gum	tree
<i>Hardenbergia comptoniana</i>	native wisteria	climber/ground cover
<i>Hypocalymma angustifolium</i>	white myrtle	shrub
<i>Juncus pallidus</i>	pale rush	grass
<i>Kunzea recurva</i>		
<i>Melaleuca incana</i>	grey honeymyrtle	shrub
<i>Melaleuca lateritia</i>	robin red breast	shrub
<i>Melaleuca preissiana</i>	modong	tree
<i>Melaleuca raphiophylla</i>	swamp paperbark	tree
<i>Melaleuca viminea</i>	mohan	large shrub/small tree
<i>Mirbelia dilatata</i>	Prickly mirbelia	shrub
<i>Paraserianthes lophantha</i>	Cape Leeuwin Wattle	large shrub
<i>Taxandria linearifolia</i>	Swamp Peppie	tree
<i>Taxandria parviceps</i>	Fine teatree	tree
<i>Viminaria juncea</i>	swish bush	large shrub/small tree

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