Creating practical shelterbelts

A guide for creating shelterbelts using native species

View along fence line of a shelterbelt approximately four years old at Greta, established successfully using direct seeding.

What are shelterbelts?

Shelterbelts, also often referred to as 'windbreaks', have been used to protect stock from extreme weather conditions for hundreds of years. Shelterbelts provide stock with shade in summer and can reduce the impacts of cold and windy conditions in winter. They also provide protection for crops, can reduce erosion and offer biodiversity benefits for your property.

Shelterbelts provide sheltered areas on the leeward (the side away from the wind) and the windward (the side toward the wind) sides of the shelterbelt. As the wind approaches, some goes around the ends of the belt, some goes through the belt and most of the wind goes over the top of the belt. The difference in air pressure between the windward and leeward side of the belt determines the reduction in wind speed through the belt and amount of turbulent air that is created on the leeward side. The more dense the shelter, the greater the difference in air pressure.

Historically, shelterbelts may have been planted using a single species that may have been either native (e.g. Eucalypts or She-oaks) or exotic (e.g. Conifers or Pines). Planting a single monoculture of one species is not desirable. Planting a diversity of species increases the long-term resilience of your shelterbelt to insect attack and changes in environmental conditions. We also know that planting indigenous species (native species that are endemic to your area) means that individual plants are more likely to survive extreme weather events such as flooding and drought as they are more suited to the local topography, soils and water conditions.

This guide offers guidance on how to establish shelterbelts using indigenous species to provide shelter for stock and pastures, and provide a valuable place of habitat for local wildlife.

The establishment of shelterbelts is the most common form of revegetation on farms in Victoria. While the primary objective is to provide shelter for stock and pastures, they can also provide a valuable place of habitat for local wildlife.

What are the benefits of shelterbelts on your property?

Benefits for farm productivity:

- Improved pastoral productivity. Reducing the speed of drying winds means pastures have more moisture available to them.
- Improved condition of stock. Energy that stock would normally expend on maintaining body temperature will be utilised for increased wool, meat and milk production.
- Improved shelter for stock at critical times e.g. lambing, shearing and calving. Trees in a shelterbelt can shelter an area downwind for at least 15 times the height of the trees.
- Shelterbelts can provide benefits for fire protection, by protecting farm buildings from flames, embers and radiant heat. Because shelterbelts slow down the wind, they can be very effective in reducing the impact of bushfires on the farm. In cleared agricultural areas, wind speed and the amount of dry grass on the ground are the primary factors that determine the rate at which a fire moves. A good windbreak can reduce wind speed to 30% of that in the open and can decrease the fire speed to about 20% of that in the open.
- A shelterbelt can act as a 'stock haven' in extreme weather events, when stock are moved directly into the shelterbelt itself for protection.
- Shelterbelts can improve the aesthetic and capital value of your property. Farms with some shelterbelts and remnant vegetation have been known to increase their capital value by about 15%.

Benefits for wildlife:

- Shelterbelts provide nesting sites, food, shelter, corridors for migration and a haven from predators for a range of wildlife, including birds, lizards, mammals, insects and other invertebrates.
- Many birds in North East Victoria are insect eating and forage broadly on farms. Wildlife using the shelterbelts will consume large volumes of insects, which may otherwise prey directly on pasture and crops.
- Shelterbelts can help to reduce fragmentation, by linking patches of native remnant vegetation when sited appropriately. Such linkages are also called wildlife corridors.

Minor waterways like Croppers Creek at Greta, are ideal sites for establishing a new shelterbelt to provide multiple benefits on your property. Scattered paddock trees can also be included in the shelterbelt, providing greater wildlife benefits.

A shelterbelt at Glenrowan adjacent to a road reserve, recently planted using a selection of native shrubs to complement regeneration of tree species.

Establishing a new shelterbelt

The first step in establishing a new shelterbelt is to determine the key purpose or function of the shelterbelt. Do you need summer shade, or a windbreak in certain wind conditions? On the other hand, are you primarily interested in developing a corridor for wildlife?

For your property, it is important to consider:

- Prevailing wind directions and critical wind directions (e.g. the wind direction most threatening to stock).
- Consideration of potential sites to develop a shelterbelt that will provide the greatest productivity benefits to your farm (e.g. protection of minor waterways, addressing erosion problems, etc.). This could be done in conjunction with developing a Whole Farm Plan for your property.

Designing a new shelterbelt

Some key criteria to consider in the design of your shelterbelt are:

- For maximum area protection, a shelterbelt should contain taller species on the windward side and shorter species such as shrubs on the leeward side. *Maximising the height of the windbreak will lead to the greatest area over which the windbreak has a positive impact.*
- Develop your shelterbelt with an even density from ground level up. If the density of the belt is less at ground level, then wind is channelled through the less dense part of the belt and can actually speed up. This accelerated wind is more dangerous to stock, as they graze at ground level. A windbreak comprising of only trees can create this effect. *The inclusion of shrubs in the windbreak design is essential.*
- Short windbreaks can create more turbulence at the site. *For maximum efficiency, the length of the windbreak should be at least 10 times its height.*
- Avoid gaps in windbreaks. *Gaps can increase wind speed due to the wind accelerating as it funnels through the gap in the shelterbelt.*
- Include gates to allow for weed control or emergency stock access in extreme weather.
- Wide shelterbelts are less susceptible to edge effects and will provide greater value to wildlife.

The structure of the shelterbelt can be altered by modifying the height, density, number of rows, species composition and spacing between plants. These are further discussed overleaf.

Density

- The density of the windbreak (proportion of solid material like branches, foliage, etc.) affects the level of shelter.
    - Low density = low turbulence (as more air passes through) = moderate shelter over a longer area on leeward side
    - High density = high turbulence (as air cannot pass through easily) = high level of shelter over a shorter distance on the leeward side
- Aim to have a medium density shelterbelt, with around 40-60% solid material that is evenly distributed from ground level to the top.
- Density can be increased by having more rows or spacing plants closer (more stems per square metre).

Plant spacing

- Space rows 2-4m apart to allow plants to grow unrestricted.
- Allow at least 2m between the first row and the fence to prevent stock grazing on plants and minimise damage to fences by branches.
- Place taller species in the middle of the belt, with shrubs on either side. You are less likely to have branches falling on fences in this design. Consider staggering trees in middle rows to obtain more uniform density.
- Space trees 3-4m apart, large shrubs 2.5-4m apart, small shrubs 1.5-2.5m apart.
- If designing your belt solely for biodiversity outcomes, you may wish to randomly or irregularly plant species to improve habitat. Some species benefit from clear areas on the ground for foraging. This needs to be balanced against considerations of belt density for shelter, as leaving gaps can lessen the effectiveness of the shelterbelt for wind protection.

Row design

- Avoid single row shelterbelts, unless using a species that has a uniform foliage density from ground level to top.
- Effective design incorporates a minimum of 2-4 rows using a mix of taller trees, and shrub species that provide shelter lower down. This provides a more uniform density overall.
- Include some fast growing species (e.g. wattles) to provide quicker benefits for shelter.
- The addition of more than four rows does not provide greater shelter benefits, but will increase biodiversity benefits and will be more useful as a potential stock haven.

Revegetation of shrubs using tubestock, to complement direct seeding efforts two years earlier which resulted in germination of trees only.

Species

- The use of indigenous native species are preferred, as they have adapted to the conditions of an area over thousands of years. This makes them easier to establish and more likely to survive frosts, fire and pest attack. Over time, these species will naturally regenerate, promoting long-term resilience in your belt.
- Match species to site conditions e.g. floodplains versus ridges.
- Consider biodiversity outcomes when selecting your shrubs species. For example, prickly shrub species (e.g. Wattles, Bursaria, Tree Violet) provide cover, feeding and nesting sites for small birds like wrens and finches.
- Consider using a range of tree, shrub and ground cover species to increase the diversity and reliability of food supply for wildlife.
- You might also like to consider the inclusion of species that are particularly prolific at flowering, to encourage native bees to your shelterbelt. This can help to increase overall numbers of pollinators for adjacent crops.

Rows of River Red Gum (Eucalyptus camaldulensis) established along a gully. Native sedges and rushes have recovered following fencing. Shrub species could be included at this site through supplementary planting in the future.

Siting

- Orientate your shelterbelt perpendicular to those winds that are most harmful to your stock. No single orientation will provide protection from all winds.
- The establishment of several belts orientated in different directions will provide shelter during different wind conditions on your property. Ideally, belts should form a grid using north-south and east-west orientations to provide shade for stock at different times of the day and protection from winds coming from all directions.
- If establishing shelterbelts along contours of a hill, you need to consider the inclusion of gaps in the belt to allow air to drain out downslope and avoid creating localised frost zones.
- Consider siting a shelterbelt alongside an existing roadside reserve. This increases the benefits of your shelterbelt for wildlife, as a wider corridor is created. You should also get good natural regeneration from the trees in the road reserve, limiting the amount of planting that may be required.
- Incorporating large old trees (both living and dead) into shelterbelts can increase the habitat value of belts significantly. Old trees provide hollows, a greater range of food and produce larger quantities of nectar over time and more reliably, than younger trees.
- If siting is primarily for a biodiversity outcome, then the shelterbelt should ideally link or incorporate existing native vegetation such as remnants or roadsides, or be placed along waterways or ridgelines. Locating a shelterbelt near a waterway offers additional benefits such as bank stabilisation and improved water quality. Many species also prefer sites near water for drinking, feeding or nest building.

When siting your shelterbelt primarily for a biodiversity outcome, consider the following options for sites in order of priority:

1. Preserve or restore natural corridors, such as gullies, minor waterways and creeks.
2. Add, restore or build on existing corridors. If possible include scattered remnants in new corridors, as this protects these sites from further decline.
3. Create new shelterbelts on green field sites in desirable locations to provide linkages.

Other considerations

- Leave fallen timber or place some from your paddock into the shelterbelt prior to planting. Fallen timber provides important habitat at ground level for invertebrates and insects who depend on decaying wood for their survival.
- Consider placing nest boxes on any young trees (e.g. 5-10 years old) to provide hollows in the immediate future for hollow dependant fauna.

Planting your shelterbelt

- Prepare for the establishment of your shelterbelt in advance.
- Decide on the appropriate technique for revegetation for your site. For example, direct seeding, planting of tube stock, or allowing natural regeneration.
- Undertake necessary weed control to prepare the site, in accordance with your revegetation type. Reducing competition with weeds provides much better chances of successful establishment.
- Assess whether ripping is required at your site.
- Construct any fencing as required prior to planting.
- Consider guarding your new plants and what type of guards may be most appropriate for your site, depending on the key threats (e.g. rabbits, kangaroos, frost, etc.).

More guidance on site preparation and planting techniques can be found in publications listed in the *Other Resources* section.

A shelterbelt approximately 30m wide incorporating remnant scattered paddock trees at Moyhu. The site was direct seeded in 2015 using a mix of indigenous tree and shrub species.

This shelterbelt at Greta West was established approximately 15 years ago along a drainage line. Many trees and shrubs are now naturally regenerating at the site and there is a good diversity of native ground species that have returned after the site was fenced. This is an excellent example of a self-sustaining shelterbelt.

Maintaining your shelterbelt

As a general rule, some periodic maintenance is required to keep your shelterbelt in good order. The level of management required to maintain your site generally decreases as the shelterbelt becomes established. Things to consider include:

- **Pest animals** - Increased cover can also create habitat for pest species such as cats, rabbits, foxes and Indian Mynas. Control programs may be required.
- **Weeds** - Keep an eye out for the appearance of new and existing weeds and control as required. Over time, litter from trees and shrubs will fall to create mulch, reducing the sunlight and moisture for weeds to become established.
- **Fences** – Undertake regular fence inspections and complete maintenance as required.
- **Grazing** – Stock should be totally excluded from your shelterbelt until trees and shrubs are established (4-5 years). They may then be permitted for short periods for protection from extreme weather, during drought or to reduce grass loads and fire risk (e.g. crash grazing).
- **Fallen timber** – Consider leaving fallen timber on the ground in your shelterbelt to increase structure and diversity of habitat for wildlife.
- **Replanting** – Over time you may have losses in your shelterbelt. Consider replanting both trees and shrubs as needed to maintain an appropriate density of plants.
- **Structural management** – Over time the density of your shelterbelt may change. For example, the shelterbelt may develop a higher density than desired, and this may be addressed by selective removal or pruning of plants to reduce the density. To increase density at ground level, trees may be felled close to the ground to allow them to coppice.

References

Austin, P (2014). The economic benefits of native shelter belts report: Issue 3/2015. Prepared for the Basalt to Bay Landcare Network.

DEPI (2002). Landcare Note 138 – Shelterbelts for Livestock Productivity. Department of Environment and Primary Industries, State of Victoria. Reviewed in October 2009.

Haughton, M (2011). Create practical shelterbelts using native species: A guide for creating shelterbelts using locally native species. East Gippsland Landcare Network, Bairnsdale.

Johnson, H and Brandle, J (2003). Landcare Note 136 – Shelterbelt Design. Department of Environment and Primary Industries, State of Victoria. Reviewed in October 2009.

Johnson, H and Brandle, J (2002). Landcare Note 137 – Shelterbelt Management. Department of Environment and Primary Industries, State of Victoria. Reviewed in September 2009.

Platt, S (2003). Landcare Note 139 – Shelterbelts and Wildlife. Department of Environment and Primary Industries, State of Victoria. Reviewed in October 2009.

Other Resources

In addition to the references listed, the following publications also provide additional information on shelterbelt design and establishment. These references are available electronically on the website **www.gretalandcare.org.au**

NECMA (2017). Healthy Catchments Information Kit. Prepared by the North East Catchment Management Authority, Wodonga.

Greta Valley Landcare Group (2017). Protecting and enhancing remnant native vegetation. Wangaratta.

Greta Valley Landcare Group (2017). Revegetation Planner. Wangaratta.

A shelterbelt located adjacent to a road reserve can extend the value of your planting for habitat by creating a wider corridor.

Acknowledgements

This document is based on a guide originally written by Mike Haughton in May 2011 for the Latrobe Catchment Landcare Network. Permission has been granted to the Greta Valley Landcare Group to make amendments for local relevance and to include best current practice knowledge.

Photos: Manifeasto Photography (www.manifeastophotography.com.au) and Greta Valley Landcare Group members.

Authors: Mary Anderson and Sally Day, with assistance from Vanessa Thompson and Chris Cunningham

Graphic Design: Redsally Design Studio (www.redsally.com)

This publication is supported by the Greta Valley Landcare Group through funding from the Australian Government's National Landcare Programme and the North East Catchment Management Authority, Mid Ovens Landcare Consortium and Ovens Landcare Network.

This document should be attributed as: 'Caring for your rural property: Practical guides for improving the health and productivity of your land, Greta Valley Landcare Group, 2017'.

Published June 2017
Greta Valley Landcare Group
PO Box 971
Wangaratta VIC 3676
ISBN 978-0-646-97389-0

To request a printed copy of this guide or download individual guides or the full publication, please visit **www.gretalandcare.org.au**

Disclaimer: The authors advise that the information presented in this guide, including any management advice, has been prepared with all due diligence and care, and based on the best available knowledge and research at the time of development. The information is provided on the basis that all persons using the publication undertake responsibility for assessing the relevance and accuracy of its content for their situation.