Shelterbelts for fire protection

by Rod Bird

The role of trees in providing shelter on farms is well known. Shelterbelts generally improve the productivity from pastures and crops while providing many other benefits. Modelling studies have indicated that when 10 percent of a farm is planted in belts and blocks of trees, with no further grazing on that land, there is an overall long-term improvement in farm productivity.

Shelterbelts can play an important role in fire protection on farms. Shelter reduces wind speed, the most important factor driving the speed of a fire. Shelter can also assist in protecting buildings.

Shelter reduces wind speed

On open land the passage of a firefront is largely dependent on wind speed and the amount of dry grass on the ground. At high wind speeds a small increase in wind speed results in a proportionally greater increase in fire speed. The opposite is the case where the wind speed can be reduced and this is where the benefit of a shelterbelt arises.

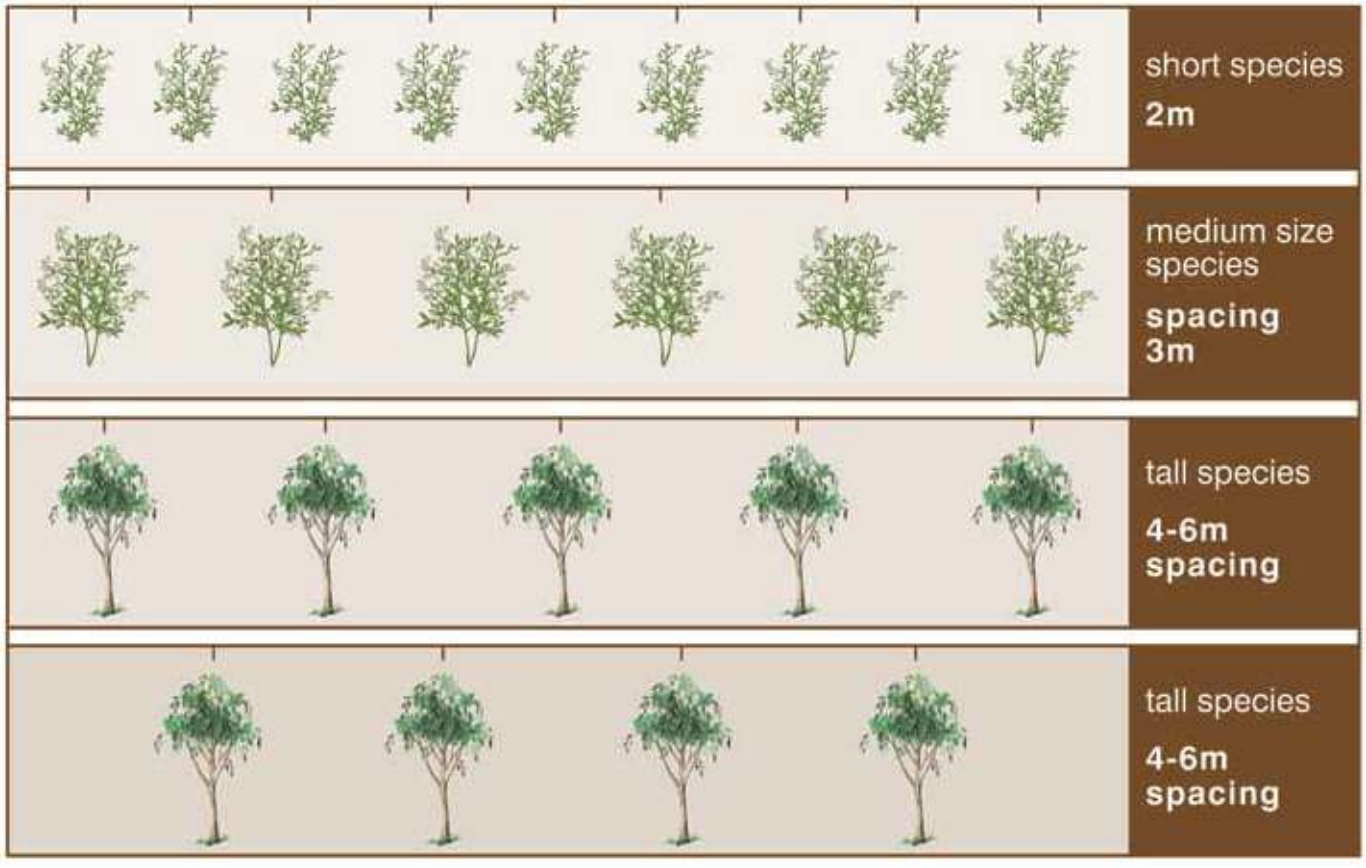
The use of shelterbelts to reduce wind speed will enable the speed of the firefront to be reduced. A good windbreak like the shelterbelt at Helm View shown in the photograph on page 20 (bottom) can reduce wind speed to 30 percent of that in the open – this will decrease the fire speed to about 20 percent of that in the open. Even a very poor windbreak might still reduce the wind speed to 70 percent of that in the open – reducing the fire speed to about 60 percent of that in the open.

Aerial photographs clearly show the sheltering effect of shelterbelts. This is illustrated in the photograph on page 20 (top) taken after the 1982 fires. It should be noted that the area behind the shelterbelt is often burned after the firefront has passed, either by a slow flanking fire or by fire creeping through the belt.

Designing a multi-purpose shelterbelt

The best shelterbelt design for fire protection on a large property has four or more rows. This layout is achieved by putting short and medium height species in two rows (rows one and two in the illustration) on the southern side of a belt aligned east-west, or on the eastern side for belts aligned north-south. The tall trees are together in rows three and four.

The layout can be varied for belts on western and northern boundaries, when the tall species would be put on the



paddock side of the belt to allow part of the belt area to be grazed once the trees are established. At that time the fence on the windward side may be moved to a permanent position below rows two and three, allowing stock access beneath the tall trees to reduce fine fuel levels there. This is a good agroforestry design that is multi-purpose, with the tall trees high-pruned to produce timber free of knots. The structure of the shrub rows is preserved by keeping stock out of that section. The function of the low shelter is to prevent burning debris blowing through the belt.

Consideration should be given to planting some species which are less flammable in the belt. Blackwood *(A. melanoxylon)* is a good choice for row two (*Casuarina glauca, Casuarina obesa* or *C. cunninghamiana* for wet sites). Sticky boobialla (*Myoporum viscosum*), saltbush (*Atriplex nummularia*), most acacias, Hop Goodenia *(Goodenia ovata)*, Moonah *(Melaleuca lanceolata)* and other species of low flammability could be used in the shrub row. In a fire, the shrubs in row one may ignite, but there is less danger of the taller trees catching fire if the second row is resistant. Clean-limbed species, such as spotted gum *(E. maculata)*, or sugar gum *(E. cladocalyx)* in rows three and four would reduce the danger, as would high-pruned pines or cypress.

The ends of shelterbelts are critical points. Wind speed is accelerated at these points and this could allow a breakaway. Shelterbelts that have lost the lower level of branches, or the shrub layer, pose another problem. Wind speed under such belts may be 30 percent greater than in the open. This would allow burning debris to blow through the belt, across a firebreak, and against or under buildings.

While the wind speed further away from such a belt is much reduced the fire can burn out beyond the shelter and break away again. While efforts should be made to remove fine fuel from the edge and from under shelterbelts, removing the lower limbs or shrubs will markedly reduce the value of the belt as a windbreak and degrade its appearance.

Paradoxically, shelterbelts which are open at the base (perhaps because the fences have been removed to allow stock access) do not readily burn – fuel levels are low and the fire sweeps through quickly. Where there are more than two rows the leeward rows are more likely to be damaged.

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A grassfire was deflected by the shelterbelts in this photograph taken in the western district after Ash Wednesday 1982. The areas behind the shelterbelts provide important shelter for livestock.

Shelterbelts for protecting buildings

Shelterbelts can be planted to protect buildings from windblown embers, direct flame contact and radiant heat. The shelterbelt acts as a filter to reduce ember attack. Direct flame contact can be reduced when species with low flammability are used as they are less likely to catch fire and the shelterbelt may act as a physical barrier to radiant heat.

Shelterbelts to protect buildings need be only two rows in width if space is limited. Experience has shown that grass fires, at least, are deflected over such belts, leaving an unburned island of buildings or paddock behind the belt.

The short species should have low flammability while the tall species should be clean-limbed or deciduous species. The belt should, ideally, be placed about four to six heights from the building, the point of maximum shelter. This would also reduce the danger from radiant heat if the belt catches fire.

Shelterbelts are one of a number of tools landholders can use to reduce fire risk on their properties. Shelterbelts will have their effectiveness reduced, or may not be effective at all, in extreme weather conditions.

Rod Bird is a retired DPI officer from Hamilton. The material in this article was drawn largely from Trees and Shrubs for South West Victoria *(1996) by PR Bird, GA Kearney and DW Jowett (Agriculture Victoria) and from* Farm Forestry in Southern Australia – a focus on clearwood production of specialty timbers *(2000) by PR Bird (Agriculture Victoria).*

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A shelterbelt of eucalypts and casuarinas on the western district property, Helm View. This is an average type of shelterbelt common to many farms. While the belt doesn't look particularly dense it substantially reduces wind speed. Belts that are taller and more dense (but with no gaps) will provide even better shelter close to the belt and for a much greater distance across the paddock.