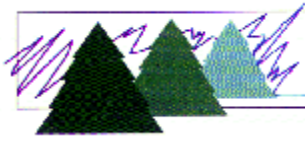


The windbreaks on your farm are an important part of the agricultural landscape. They provide protection for the farmstead, livestock, and crops; provide habitat for wildlife; and contribute to an overall healthy environment for you and your family. They are living systems with youth, maturity, and old age. Like any other living thing they need proper care and management in order to continue to function at their best.

Windbreak management requires an understanding of how your windbreak works. Your goal is to maintain the health and vigor of individual trees and shrubs while maintaining the overall structure of the windbreak as an effective wind barrier. To accomplish this goal, practices such as weed control, protection from large animals and rodents, corrective pruning, insect and disease control, and proper chemical use in nearby fields and farmstead areas need to be included in your management plan. With proper care, a windbreak will serve a long life of protection while providing wildlife habitat and adding beauty to the landscape.



Weed control comes in many forms—chemical, mechanical, mulches, or fabrics. For many situations the old fashioned hoe still provides the best weed control possible.



Windbreak Health and Vigor

Weed Control. Grasses and weeds compete with trees and shrubs of all ages for moisture, light, and nutrients. For optimum tree health, competing vegetation should be managed throughout the life of the windbreak. The level of management is determined by the age of the windbreak, climate and soil conditions, and the objectives for the windbreak. While it is difficult to make specific recommendations for all areas and conditions, new plantings generally require more extensive weed control than older plantings. As your windbreak matures its potential value for many species of wildlife increases and understory vegetation becomes a critical part of its habitat value. By careful design, species selection, and management a practical compromise between total weed control and maximum wildlife habitat is achieved, resulting in both a healthy windbreak and excellent habitat.

New plantings. New plantings are particularly sensitive to drought conditions. Good soil moisture during the first growing season usually assures good root growth and increases the survival of the young seedlings. Over the next several years, weed competition should be kept to a minimum. In dry areas where growing season moisture is limited and on sites where wind erosion is not a problem, it is generally best to control grasses and weeds both within the row and between the tree rows of your windbreak for the first three to five years after planting. While vegetation between the rows does not compete directly with newly planted seedlings, it provides a seed source for invasion of the tree row and makes weed control within the row more difficult. In areas with adequate moisture, mowing may be used to control vegetation between tree rows.

Mechanical cultivation two or three times during the growing season eradicates most annual and biennial weeds and suppresses perennial vegetation. Shallow cultivation (no more than two to four inches) when weeds are small is best since deep cultivation near the trees can destroy many feeder roots and waste soil moisture. Each cultivation loosens and dries the soil and prunes small feeder roots in the tillage zone. Care must be taken to avoid over cultivation and mechanical injury to trunks and limbs as the trees grow.



Landscape fabrics reduce the labor required for weed control and offer many advantages in dry or remote areas where other measures are impractical.

Discontinue cultivation by late summer to slow tree growth and prepare the plants for hardening before winter.

Root pruning late in the growing season stimulates tree growth and retards dormancy, which may lead to winter injury. Annual weeds which appear late in the season offer little competition and may be left until spring. In addition, the standing vegetation will trap snow, reduce abrasion of the new trees by windblown soil, and reduce spring erosion.

Avoid clean cultivation between the rows on soils prone to wind erosion. Instead, plant an annual cover crop such as corn, sorghum, or sudan grass between the windbreak rows and on each side of the windbreak to control soil erosion and protect the soil and young plants from the wind. These strips will trap snow, providing moisture to the new windbreak and valuable food and habitat to wildlife such as pheasant and quail. Conifers, in particular, benefit from the winter wind protection provided by these strips. As the windbreak matures, these between-the-row vegetation strips should be reduced in size and eventually eliminated to reduce competition with the expanding roots of the trees.

Chemical weed control is another effective measure to eliminate competing vegetation, especially within the tree rows where cultivation may be difficult. Herbicides are relatively inexpensive and a single application usually lasts longer than mechanical cultivation. The application of a pre-emergence herbicide will reduce germinating weed and grass seeds. On established or perennial grasses and weeds, it may be necessary to use a contact or translocating herbicide. Remember, herbicides also kill or injure trees and shrubs and should be used with caution. Read and follow label directions carefully, wear the appropriate protective clothing, and protect sensitive plants during application.

Mulches, such as wood chips, can reduce weed competition around trees and shrubs, moderate soil temperatures, and help retain soil moisture during dry periods. Mulches help you see the trees and reduce the potential for injury when mowing or cultivating the rest of the windbreak area. Place a three- to four-inch thick layer of mulch around trees and shrubs immediately after planting, and maintain it for a minimum of five years. Keep the mulch three to four inches away from the stem of the tree or shrub to reduce small rodent damage. Avoid using hay or straw as these tend to attract small rodents which may damage the young seedlings.

In regions of low rainfall, woven, black plastic weed barriers are effective in reducing weed competition and soil moisture loss in new windbreak plantings. They come in several sizes and thicknesses. Small squares (typically three feet by three feet) and continuous strips (six to eight feet wide) are most common. When properly installed, these landscape fabrics last five to ten years and significantly reduce weed control efforts during this period. Although they reduce the workload associated with weed control, they are not maintenance free. Weeds still occur between the rows and along the edge of the fabric and care must be taken to avoid damage to the fabric when mowing or cultivating. While the initial cost of fabric mulch is higher, its long life makes it cost competitive with other weed control practices. When selecting a fabric mulch, look for one that is resistant to ultraviolet light with a guaranteed life of at least five years.

Installing individual squares is fairly easy, but the long continuous strips require a fabric laying machine and are best installed by someone with experience. The fabric should be tight and well anchored to prevent the wind from tearing or blowing the fabric off of the site. It is best to apply fabric on cool, cloudy days but this is not always practical. Best results are obtained when

someone follows the laying machine and immediately releases the seedlings from under the fabric. Studies have indicated that on sunny days, temperatures under the fabric may exceed 160° F or more within several minutes even when air temperatures are quite cool. Temperatures in this range will stress the young seedlings and under some conditions even kill young seedlings in less than five minutes.

Mulches and landscape fabrics provide consistent weed control throughout the growing season and eliminate the

need to find time to control weeds mechanically several times a year. When moisture is limiting, mulches and landscape fabrics effectively reduce moisture loss and weed competition, increasing seedling survival.

Older plantings. Older plantings benefit from good weed control too. The control of competing vegetation within the tree row will increase growth rates and reduce the time needed to produce an effective windbreak. Within the row, weed control should continue as long as practical but typically for five to ten years following planting. Beyond 10 years, weed control should focus on reducing the presence of noxious weeds and sod forming grasses. Grasses such as smooth brome, quack grass, or crested wheat grass can choke the life out of an otherwise healthy windbreak and should be controlled. Effective sod control throughout the life of the windbreak can add decades to its useful life. Remember that total removal of all ground vegetation will severely reduce the wildlife value of the windbreak and increase the potential for erosion damage.

As a windbreak matures there is a natural tendency for the lower portion of the trees to die back decreasing density. In order to maintain an effective structure some type of understory vegetation is necessary. Native trees and shrubs are best and often become established naturally. While some species such as thorny honey locust may be a concern, other species such as cedar, honeysuckle, dogwood or mulberry provide valuable food and cover for wildlife. If regeneration does not occur naturally, it may be necessary to interplant shade tolerant shrubs to enhance the understory structure.

When windbreaks contain conifers and suckering shrubs, weed control should become more selective. As conifers mature, they will provide shade and a carpet of needles that will effectively control most weeds. Tillage practices should be discontinued in these areas to allow this natural weed control method to become fully established. In some cases, spot spraying or hoeing may still be necessary in order to control sod-forming grasses or noxious weeds. Suckering plants should be allowed to sucker and fully occupy the site providing they do not reduce the effectiveness of the windbreak. A thicket of sprouts will effectively control most weeds with shading but may increase windbreak density to the point of causing deep snow drifts in some locations.

Protection from Animals

Livestock benefit from the protection provided by a windbreak, however, grazing livestock within the windbreak will cause serious damage to your investment. Damage from trampling, browsing, and breakage leads to slower growth, weakened trees, and premature death. When



Wood chip mulches are an attractive alternative to cultivation or herbicides and provide good soil moisture conservation and weed control.

livestock congregate near trees, soil compaction can cause problems by limiting the amount of water and oxygen available to tree roots. All windbreaks located in areas where they may be subject to grazing should be fenced.

Effluent from concentrated livestock operations can kill individual trees and over time, entire sections of the windbreak may be lost due to the high nitrate content of the feedlot runoff. This damage can be prevented by

properly locating the windbreak, installing drainage ways to safely remove runoff from the feedlot, and by constructing waste holding facilities as needed.

Wild animals, particularly deer, rabbits, and mice are more difficult to control. In young plantings, repellents, traps, and placing mesh guards around seedlings will provide some control. Fortunately, older plantings are not as sensitive to damage by wild animal feeding. In fact, many landowners are interested in attracting wildlife to their land and careful management can provide significant wildlife habitat benefits. Consult your local forester or wildlife biologist for safe and effective methods for controlling or attracting wildlife.

Pruning

Resist the urge to prune windbreak trees to look like residential yard trees. Pruning live branches from older trees will decrease density and reduce the efficiency of the windbreak. Remember that the effectiveness of a windbreak is dependent on the overall structure of the windbreak and not on the shape of any individual tree. Although good windbreak management may require pruning under some circumstances the best rule of thumb is to avoid pruning windbreak trees unless there is a very specific reason to do so.

Branches damaged by ice, wind, animal grazing, or bird roosting should be removed. Damage to the central leader of a conifer causes the lateral branches to assume the role of the central leader and begin to grow upward. If left to grow, a double leader may develop, creating a weak spot in the trunk as the tree matures. Forked and multi-stemmed trees are prone to wind breakage, and don't grow as tall as single stem trees. However, before they are removed make sure the structural integrity of your windbreak will be maintained after removal.

Pruning is often regarded as a labor intensive effort, but when required, it pays off in a healthy windbreak. A yearly inspection to look for and prune damaged or deformed trees will keep the task manageable and will contribute to a long-lived, healthy windbreak. Pruning on a regular basis, generally in late winter, will reduce the likelihood of an expensive pruning or salvage effort later in the life of the windbreak and may limit storm damage. If done on a regular basis, effective pruning can be done with hand clippers and a small pruning saw. A clean cut will heal quickly, reducing the potential of invasion by insects or fungi. Make the cut just outside the swollen branch collar at the base of the branch. If large limbs must be removed, make a small undercut first immediately below the final cut, to prevent the weight of the falling branch from tearing the bark on the trunk. When pruning trees suspected of harboring diseases, all pruning tools should be sanitized after each cut with a solution of one part chlorine bleach and 10 parts water. This will reduce the likelihood of spreading disease to healthy limbs or trees.

In some agroforestry applications involving high value hardwoods, pruning to improve sawlog quality may be an integral part of windbreak management. Under these conditions additional plantings of shrubs or conifers may be required in order to increase the density of the lower portion of the windbreak.

Insects and Diseases

Insects and diseases are not usually a problem in healthy trees. Trees that are under stress and growing slowly or losing vigor because of weed competition or animal damage are more susceptible to insect and disease problems. Frequent inspection and alertness in recognizing the early stages of injury from insects and diseases will make correction of the problem easier. Walk through your windbreaks each spring and fall. If control measures are needed, consult your local conservation or extension office for the best control methods.

Herbicides

Many windbreaks are planted to protect agricultural operations which may require the use of various herbicides.

Trees and shrubs in your windbreak may be sensitive to the herbicides applied to nearby fields or lawns. Multiple exposures each year to damaging chemicals may cause stress, increasing the risk of insect damage or disease and reducing the effective life of a windbreak. Be aware of wind conditions that may cause herbicides to drift and exercise caution when applying herbicides in or near your windbreak.

Fertilization

In most cases, your trees will not require fertilization. Over-fertilization can cause rapid growth, which leads to large, weak leaders and reduced density. Fertilization late in the season slows the onset of dormancy and may lead to winter injury. If you suspect that your soils are low in a critical nutrient be sure to have a soil test done before applying fertilizer.

Structural Management

The old saying, "You can't see the forest for the trees," is often the case when people look at a windbreak.

People still tend to look at the shape or form of individual trees within the windbreak and expect those trees to look the same as a tree in the front yard. But in a windbreak situation it is the structure (the amount and arrangement of the leaves and branches) of the entire windbreak that determines its effectiveness. Trees are selected and planted close together in order to create a windbreak with a desired structure capable of meeting your objective. Just as the health and vigor of a windbreak requires management, so may the overall structure of a windbreak require care.

The best time for structural management decisions is during the planning stage. Decisions on species selection, number of rows, and spacing determine the future density of the windbreak and are the most important aspect of structural management. Planting trees close together will provide protection in a shorter period of time but may result in a windbreak that is too dense for your objective and may lead to higher levels of insect and disease problems. Planting trees too far apart may result in little or no protection.

As trees grow, the relationships among them change. The density and position of tree crowns change in relation to height above ground and neighboring trees. Most of these changes are small and with good planning your windbreak will continue to meet your objectives. Occasionally, these changes may affect the overall windbreak structure to the point that the windbreak no longer meets your objectives. In this case some type of structure management may be required. For example, if the windbreak is too dense, structure can be significantly altered by careful tree removal. Similarly, if the windbreak is not dense enough, interplanting or underplanting may be needed. This type of management is very tricky and it is extremely important to keep your objective in mind. It is best to get the advice of an expert before undertaking this type of windbreak management.

Fencerow Windbreaks

A unique opportunity occurs when fencerows containing trees and shrubs are properly managed. Careful selective



Sod forming grasses compete for moisture and nutrients and reduce tree growth rates. In older windbreaks contact herbicides are an effective control method.

cutting within a fencerow can convert it to an effective field windbreak. Most native species of trees and shrubs are suitable for retention in a fencerow that is being modified into a windbreak. When making selections, favor species that are long-lived, disease resistant, breakage resistant, and have dense crown development, such as oaks, ashes, hard maples, and eastern redcedar. If possible, trees should be left every 10 to 16 feet and in a relatively straight line. If gaps occur, plant the open spaces with small saplings of the most common species in the row. You may also try planting nuts or seeds of desired species. It is a good idea to plant more trees than are needed, especially if you try direct seeding, since survival rates may be low due to the high degree of competition that is present. This is especially true in dry regions and in these circumstances supplemental water and weed control may be needed for the first several years. With a little imagination and common sense, a relatively low value fencerow can be converted to a valuable windbreak investment.



In many areas fencerows have grown up with native trees and shrubs. Instead of removing these trees they can be managed to provide excellent windbreaks.

Summary

Windbreaks are an integral part of many farming and ranching operations. All windbreaks, even well designed ones, need regular maintenance beginning the day of establishment. Regular attention to weed control, corrective pruning, insect and disease monitoring, replanting if needed, and proper use of chemicals on adjacent fields and yards will help ensure an effective windbreak for many years.

A regular program of windbreak management naturally leads to consideration of windbreak

renovation. Quite often the two are intertwined and indistinguishable from each other. More details on the techniques of windbreak renovation are contained in EC 97-1769. *Windbreak Renovation*. For copies of this and other windbreak publications in this series see your local district forester, extension educator, or district conservationist.

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