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Field Shelterbelts for Soil Conservation

A shelterbelt is a barrier of trees or shrubs. The term "field shelterbelt" is used to distinguish between rows of trees or shrubs on agricultural fields from those planted in other ways: around farmyards or livestock facilities (farmstead shelterbelts), on marginal lands to change land use or in block plantings to provide woodlots or wildlife habitat.

Although modern agricultural farming practices such as direct-seeding have greatly reduced the amount of wind erosion in Alberta, there continues to be some effects of wind erosion on Alberta soils each year. Eroded soils are less productive, require higher inputs for crop production and are more prone to further erosion than uneroded soils. Erosion results in damage to downwind crops, structures and buildings, requiring costly cleanup and repair. Blowing topsoil has also been cited as a concern in numerous vehicle accidents, with several resulting in personal injury.

Wind erosion still affects Alberta soils each year

Properly designed field shelterbelts, as part of a crop management system approach, prevent or greatly reduce the risk of wind erosion.

This factsheet describes three aspects of field shelterbelts:

- wind erosion control and other benefits of field shelterbelts
- suitable field shelterbelt species for Alberta
- management of field shelterbelts, including planning, establishment, maintenance and renovation

Benefits

Properly placed field shelterbelts provide agronomic and other benefits. The main agronomic benefits include the following:

- reduced soil erosion by wind
- increased moisture for crop growth due to two factors:
  - snow trapping
  - reduced moisture loss through evaporation
- potential for increased crop yields
- reduced wind damage to crops

Other benefits:

- wildlife habitat and shelter
- improved safety in winter travel due to reduced snow drifting
- lower costs of snow removal from roads
- beautification of the prairie landscape
- reduced environmental effects of agriculture
- provide potential source of income for farmers (e.g. biomass, timber and non-timber products)

Reduced soil erosion by wind

A field shelterbelt modifies the microclimate, mostly in its downwind vicinity. This modified microclimate includes reduced wind speed and, therefore, reduced soil erosion. Reduced wind erosion is the primary reason farmers have been planting field shelterbelts on the Canadian prairies for more than 90 years.

A significant reduction of wind speed occurs downwind for a distance extending to approximately 20 times the height of the shelterbelt and also 3 to 5 times its height on the upwind side (Figure 1). Therefore, a shelterbelt 5 m in height will provide a degree of protection for soils and crops for a total distance of up to 25 times its height, or 125 m.

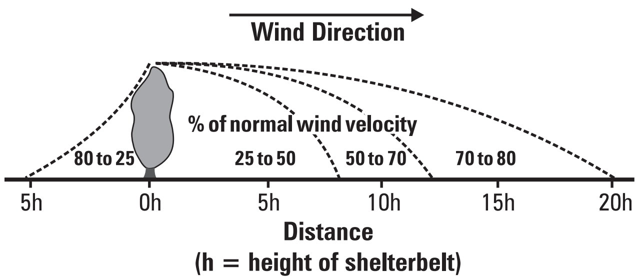

Figure 1. Approximate reduction of wind velocity by a single-row shelterbelt.

Since the zone of protection provided by a single shelterbelt is limited, a series of shelterbelts is required to protect the whole field. Two to four rows are commonly planted per quarter section.

Erosion-prone soils may require as many as eight shelterbelts per quarter section. The shelterbelts must be planted perpendicular to the direction of the prevailing wind to provide more complete protection.

Increased moisture for crop growth

Field shelterbelts reduce evaporation and trap snow providing more moisture for crop growth. Snowdrifts accumulate mostly on the leeward side (sheltered from the wind) of a shelterbelt. A dense barrier such as willow, caragana or spruce traps a narrower, deeper drift than a more porous barrier such as poplar, ash or Siberian larch. Shallow, uniform snow trapping over a greater portion of the field is preferable, but the trade-off for more even snow distribution may be reduced protection. Stubble left as tall as possible enhances snow trapping, and a crop residue cover further reduces evaporation.

Field shelterbelts use moisture and nutrients from a greater depth than most annual crops. However, additional moisture accumulated in the sheltered zone more than compensates for moisture used by the shelterbelt. Maintaining adequate fertility in the whole field should also compensate for nutrients taken up by the shelterbelt system.

Reduced wind damage to crops

Crops benefit from the reduced wind speeds in the protected zone. The plants are less likely to be twisted by the wind or sandblasted by eroding particles.

Potential for increased crop yields

Most of the research conducted around the world reports yield increases due to field shelterbelts (Figure 2). In drought-prone prairie regions that receive snow in winter, about half the yield increase is attributed to extra moisture from snow trapping by shelterbelts.

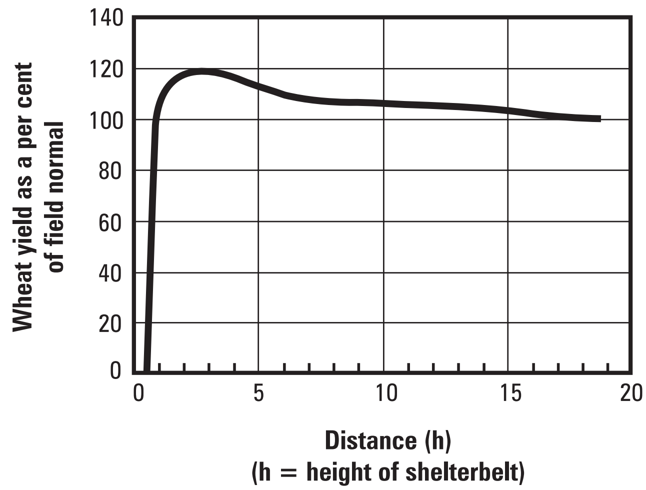

Figure 2. Shelterbelt effect on yield of spring wheat (average results of 116 site years, adapted from Kort, 1988).

Much of the Canadian study of field shelterbelts has been conducted at the Agriculture and Agri-Food Canada–PFRA Shelterbelt Centre at Indian Head, Saskatchewan. Scientists at the Centre have shown average spring wheat yield increases of 5 per cent after taking into account the area taken up by the shelterbelt and adjacent affected area.

Crops vary according to their yield response to shelterbelt protection. Drought- tolerant crops such as annual cereals show the lowest response, forage crops are moderately responsive and weather-sensitive crops (such as specialty crops and vegetables) show the highest response.

Species

Many species of trees and shrubs can be used in field shelterbelts and conservation plantings. Each species has both positive and negative features that should be considered in designing field shelterbelts.

Green ash (*Fraxinus pennsylvanica*) is a hardy and drought-resistant native of Saskatchewan and Manitoba. It adapts readily to a wide range of soils, from dry, sandy locations to heavy clays. Green ash grows more quickly on moist and fertile soils, but with proper care, this tree is useful for shelterbelt planting throughout Alberta. Green ash is late in leafing out and will drop its leaves early in fall. It reaches a mature height of 15 m and has a long lifespan of up to 60 years. New plantings greatly benefit from proper weed control during the early years. Green ash is also less competitive with adjacent crops than poplar. It does not spread by suckering. In-row spacing should be 1.5 to 2 m.

Acute leaf willow (*Salix acutifolia*) was introduced from Asia. Willows do well on moist, well drained soils and tolerate flooding for up to three weeks a year. Willows perform poorly in dry areas. A fast-growing tree, acute leaf willow should reach 5 to 8 m in 8 or 10 years and a height of 15 to 20 m in its 50 to 60-year lifespan. Spreading crown and root habits mean it will compete with adjacent crops. Acute leaf willow is best suited to central regions of Alberta west of Highway 2 or north of Highway 14. Willow should be spaced at 3 m in the row.

White spruce (*Picea glauca*) is a native of the foothills and mixed forests of Alberta. This tall-growing evergreen reaches a mature height of 20 m and a spread of 7 m. Once established, the rate of growth should be 40 cm per year. It has a long lifespan of 80 to 100 years.

Spruce cannot compete with faster-growing poplars or willows, so if it is used in a multiple-row shelterbelt, a minimum of 6 to 7 m should be left between the spruce and the adjacent row. Although spruce does best on moist and fertile soils, it has been planted successfully throughout agricultural areas of Alberta where native tree cover is absent. However, spruce is not very drought-tolerant, especially during the first few years. Spruce is recommended for the Black soil zone regions where moisture is not usually limiting. The recommended spacing is 3 m in the row. Controlling competitive weeds is important.

Caragana or **Siberian pea tree** (*Caragana arboescens*) is a legume native to Siberia. It is planted extensively throughout the Canadian prairies. It is a hardy, very drought-tolerant shrub able to survive under a variety of tough growing conditions. It will not do well on wet soils or where repeated flooding occurs. An associated nitrogen-fixing bacteria permits good growth in nitrogen-poor soils. Mature height is 5 to 6 m. Caragana should be planted in single-row shelterbelts with a spacing of 30 to 50 cm in the row or on the windward side of a multi-row shelterbelt with at least 5 m between it and the adjacent row. Caragana does not sucker but spreads by seeds. Seeds are thrown when mature pods burst open, but spreading is not usually a problem on cultivated fields. Caragana can live for 80 years or more and can be rejuvenated.

In Saskatchewan, a commonly planted field shelterbelt is the single-row combination of caragana and green ash. Green ash are spaced at 1.5 to 2 m apart, with 2 or 3 caragana between them. The major advantages of this combination are good drought tolerance of both species, greater height than from caragana alone and better porosity and snow trapping characteristics than from green ash alone.

Dogwood (*Cornus sericea*) is a native shrub in Alberta, found in mixed forests and along stream banks. Dogwood can tolerate a wide range of moisture conditions but performs much better in wetter areas. The shrub is not drought-tolerant. Since the height at maturity is usually 2 to 2.5 m, dogwood may be best planted on the windward side of another species in a double-row shelterbelt. Plants should be 1 to 1.2 m apart in the row. Dogwood can spread by suckering. It is a suitable shrub plant in areas that are too wet for caragana, such as those on organic soils. Dogwood provides dense cover for wildlife and summer food for many bird species.

Siberian larch, (*Larix sibirica*) as its name implies, is another native of Siberia. The larch is a deciduous conifer (cone-bearer that drops its leaves (needles) each year). Larch has been difficult to establish using bare root planting stock, but success rates are better now that larch is grown and distributed in containers. Siberian larch grows moderately quickly, reaching a height of 20 m when mature. The useful life of Siberian larch can be up to 70 years. Light green needles turn yellow before dropping in fall. Once established, this tree is winter hardy and drought-tolerant. Very porous in winter, a larch shelterbelt will not collect snow in deep drifts, but will promote good snow distribution. This tree is not competitive with adjacent crops and is relatively free of disease and insect pest problems. Tree spacing should be 1.5 to 2 m in the row.

Common lilac (*Syringa vulgaris*) and **villosa lilac** (*Syringa villosa*) were introduced from Northern China and Mongolia, respectively. Lilacs are suitable for field shelterbelts in a wide variety of growing conditions, except in dry, sandy soils or poorly drained soils. Reaching a height of 3 to 4 m, they can be used as single-row shelterbelts. Common lilac suckers freely, while villosa is deeper rooted and non-suckering. Lilacs are winter hardy but need more care than caragana to establish. Spacing should be 1 m in the row and at least 5 m on the windward side of a larger tree if used in a double-row shelterbelt.

Western chokecherry (*Prunus virginiana*) prefers rich, moist soils in its native habitat throughout the prairies, but it will tolerate dry sites. It is a large suckering shrub growing up to 8 m tall, with a rounded crown. The fleshy, pea-sized fruit is produced in long clusters that ripen in late summer. The fruit, when ripe, is sweet and is used for syrup, juice and jelly, or it can be left for bird feed. The suckering growth habit produces thickets giving good wildlife habitat. Spacing should be 1 to 2 m in the row.

Silver buffaloberry (*Shepherdia argentea*) is native to the prairies. It grows on light soils around sloughs and coulees. This large, erect, thorny shrub or small tree can reach a height of 4 m with a spread of 3.5 m. It suckers freely and forms a dense, irregular hedge. The sour fruit, born on female plants, is reddish-orange, 3 to 5 mm in diameter, and ripens in late August to September; a hard frost improves the flavour of the berry. An associated nitrogen-fixing bacteria permits good growth in nitrogen-poor soils. Spacing should be 1 m in the row. The berries provide food for wildlife, and the shrub's suckering habit provides good cover.

Sea buckthorn (*Hippophae rhamnoides*) is a suckering shrub introduced from Europe. It reaches a height of 2 to 5 m. Sea buckthorn is adapted to a wide range of soil types and grows well on light, sandy soils and slopes. It fixes its own nitrogen, so can grow well on nitrogen-deficient soils. Both male and female plants are needed for fruit production. The yellowish orange, fleshy berries are very high in vitamin C and can persist on the female plants well into the next spring. The berries provide food for wildlife during winter, and the shrub's suckering habit provides good cover. Spacing should be 1 m in the row.

Wood's rose (*Rosa woodsii*) is a native shrub commonly occurring in bluffs, on ravines and in the sandhills throughout the prairies. It can grow on a wide range of soils. It exhibits great variation in height, spininess and vegetative spread. Livestock and big game find the leaves palatable from spring to fall. During the winter, both game and non-game birds feed on the hips. Spacing should be 50 cm in the row.

Western snowberry (*Symphoricarpus occidentalis*) is an erect, native shrub common in groupings to open prairies, coulees and ravines. The often large numbers of snow-white, waxy berries provide good food and cover for birds, and the foliage is eaten by larger animals. Spacing should be 50 cm in the row.

Northwest poplar (*Populus × jackii*) is a tall, fast growing tree that develops a wide crown. Mature trees on good soils may attain a height of 25 m with a spread of 6 m. The growth and survival of poplar is related to site condition. Therefore, the useful lifespan of poplars may be only 20 to 30 years, a major disadvantage in field shelterbelts. Poplars do well in southern Alberta where irrigation water or subsurface moisture from nearby irrigation is available. Being relatively shallow-rooted, poplars are quite competitive with adjacent crops.

Northwest poplar is resistant to leaf rust and aphids, but is susceptible to poplar bud gall mites, a serious pest in southern Alberta. This poplar is a male and does not produce cotton. Poplars in general are not the most tolerant to severe drought, although Northwest is one of the most drought-tolerant poplars. Under stressful growing conditions such as drought, poplar may die back and be invaded by cankers. Due to its low density, poplar traps very little snow and provides little protection from the wind in winter. Research data indicate that poplar provides little benefit to crop yields. However, they are useful in providing biodiversity, nutrient uptake and sequestration of atmospheric carbon. In a single row, Northwest poplar should be planted 2.5 to 3 m apart. The tendency to spread by suckering can be aggravated by the application of fertilizers near the tree and damage to shallow roots by tillage.

For information on other shelterbelt species see Alberta Agriculture and Food's *Shelterbelt Varieties for Alberta* (Agdex 277/33- 1) and Agriculture and Agri-Food Canada–PFRA's *Designing Tree Plantings* and *Trees and Shrubs for Prairie Shelterbelts*.

Natural shelterbelts

Natural (or native) shelterbelts can be left when clearing land. Strips 10 to 15 m wide of existing mixed stands make excellent shelterbelts. When strips of natural shelterbelt are left, extra time will be required for measuring, marking and clearing, but the result is a fully grown, instant shelterbelt. Savings include establishment costs and time needed to grow a shelterbelt.

Field shelterbelt management

Planning

Field shelterbelts are an investment in both the future and long-term productivity of the soil. The benefits of shelterbelts are not achieved the first few years. At first, a good deal of management is required to establish the trees. Therefore, careful planning is the first and most important process to undertake. Planning takes into account local site and field characteristics and the landholder's management systems and preferences.

Most shelterbelts in Alberta (primary belts) should be oriented north-south, because of prevailing westerly winds. Secondary belts are planted along the north and/or south edges of quarter sections or sections.

In accordance with Alberta's *Public Highways Development Act*, planting trees or shrubs within 30 m from the edge or 60 m from the center line of any primary highway right-of-way (numbered one to 99) or any primary highway with a 3 digit (500 to 900) series number requires a development permit. These permits can be applied for and received from the local district office of Alberta Infrastructure and Transportation. Permits for trees will not be issued if the trees cause shading (icing) or drifting on the provincial highway. This situation will normally occur with trees located on the south or west side of the highway. All other roads and highways fall under municipal jurisdiction in Alberta. The local municipality should be contacted for regulations regarding setback distances from roads and highways, as they vary considerably.

To take the least possible land out of crop production, shelterbelts are often planted on or near the fenceline or edge of the field. However, a setback provides the advantages of safety through better visibility at intersections, reduced risk of snow drifting on roads and reduced costs of controlling the growth of shelterbelt species in the roadside ditches. The setback also maximizes field acreage protected from wind erosion. A strip of 30 to 45 m on the windward side of a shelterbelt is less prone to wind erosion than an open field because of its isolation. Furthermore, shelterbelts set back from fencelines are accessible from both sides. This feature is a decided advantage in weed control during the establishment years and for other maintenance throughout the lifetime of the shelterbelt.

Other variables in planning shelterbelts are height, porosity (or density) and spacing. A tall shelterbelt will provide wind reduction and snow trapping over a greater distance than a shorter one. A porous shelterbelt will spread the trapped snow over a greater distance than a denser one. Some trees are naturally more porous in the lower portion. If protection from wind erosion is the highest priority because soils are highly erodible, then a denser shelterbelt such as caragana may be needed.

Many combinations of site-specific factors influence the designs of shelterbelts. Figure 3 shows a hypothetical design to provide both protection from wind erosion and snow management on a half section that is oriented north-south. This plan and the data in Table 1 are included to provide approximate numbers of plants. They may also be used as a guide in the planning process.

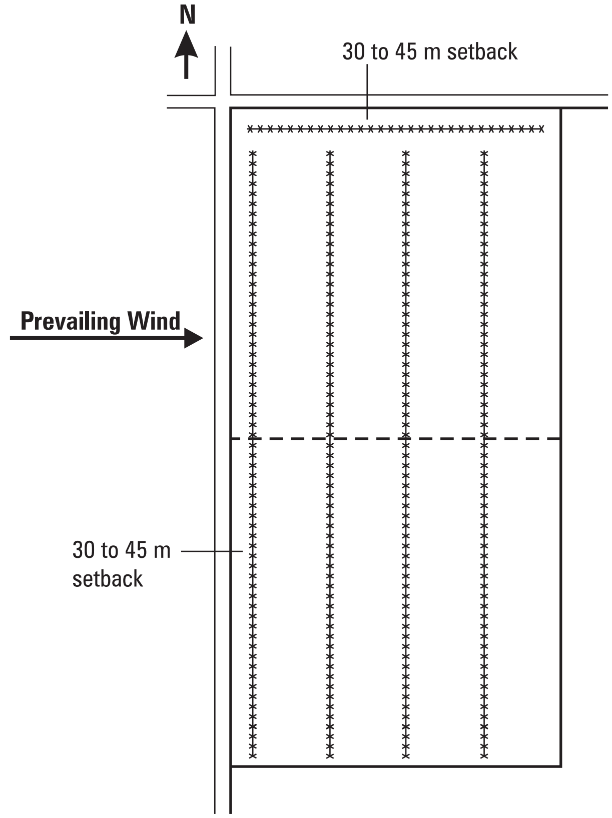

Figure 3. Example design of a single-row field shelterbelt system for a half section oriented north-south.

Table 1. Numbers of plants required for planting field shelterbelt system shown in Figure 3.

Species	In-row spacing	Number of plants required*
White spruce	3.0 m	2,290
Acute leaf willow	3.0 m	2,290
Siberian larch	2.0 m	3,435
Green ash	2.0 m	3,435
Dogwood	1.0 m	6,870
Chokecherry	2.0 m	3,435
Sea buckthorn	1.0 m	6,870
Buffaloberry	1.0 m	6,870
Lilac	1.0 m	6,870
Caragana	50 cm	13,740
Snowberry	50 cm	13,740
Wood's rose	50 cm	13,740
Caragana/ green ash **	60 cm	7,635 caragana, 3,820 green ash

* assumes both west and north setbacks are 30 m and total length of shelterbelt in Figure 3 is 6,870 m.

** caragana and green ash planted in the same row in the sequence of two caragana followed by one green ash.

Assuming a cultivation strip of 2 m on each side of the shelterbelt row and 1 m occupied by the plants, then the width taken out of crop production by a young shelterbelt is 5 m. The total land lost from crop production in Figure 3 would be 5 m x 6,870 m = 34,350 m^2, or 3.4 ha (8.5 acres). This total represents 2.6 per cent of the 320-acre field.

Four primary shelterbelts planted per half mile would significantly reduce wind erosion, but this design will not protect the whole field. Although wind speeds are reduced to a distance of 20 times the shelterbelt's height, protection from wind erosion is generally considered to extend to only 10 times the shelterbelt's height. Eight primary shelterbelts with a mature height of 5 m would be needed per half mile to better protect erodible fields from wind erosion.

For more information on determining the economics of shelterbelts, refer to Kort, J. and J. R. Brandle, 1991. *WBECON: A Windbreak Evaluation Model: 2. Economic Returns from a Windbreak Investment in the Great Plains*.

Most field shelterbelts planted in the prairies are single rows. While single-row shelterbelts take a minimum amount of land out of production, double or multiple-row shelterbelts also have advantages. With these types of shelterbelts, there is a greater reduction of wind speed in the sheltered zone. There is also better habitat and protection for wildlife. However, wider shelterbelts occupy more land and require proportionately more work to establish and maintain.

Two-row shelterbelts usually consist of a shrub and a taller tree, and 5 m should be left between the rows. If poplar and spruce are used, the distance between them should be 6 to 7 m. This spacing may seem excessive at planting time, but mature trees will require this space. Furthermore, poplar or willow will grow much more quickly than spruce, and the branches of the faster growing trees will damage the new growth on the spruce trees.

A number of other considerations should be taken into account during the planning process:

- Water erosion is a risk when field shelterbelts follow long or steep slopes. This risk can be greater when accumulated snowdrifts melt in spring or when cultivation leaves ridges up and down the slope.
- Locations of field approaches and widths required for machinery will help determine gap size and locations.
- The usual working widths (seeding, cultivation, spraying and harvest) will help decide setback distances.
- Cattle will damage and eventually kill shelterbelts. Shelterbelts in fields to be grazed must be fenced. When fencing a newly planted shelterbelt, leave room for cultivation on both sides of the tree row inside the fenced corridor.
- Stubble or grass fires will very quickly kill shelterbelts, especially young ones.

Site preparation

Moisture accumulation, especially in the drier regions of the province, and weed control are the major priorities when preparing a site. Summerfallowing the 2 to 3 m wide planting strip the year before planting will address both issues. Trees should never be planted on newly broken sod. Shelterbelt sites in fields with solonetzic soils or any soils with hard layers should first be ripped to break up compacted layers.

Proper site preparation is also required to control troublesome perennial weeds. A combination of a well timed glyphosate (Roundup) application and tillage will help control perennial grasses, sow thistle and Canada thistle. The final pre-planting application of herbicide should be trifluralin (Treflan or Rival). This application and incorporation can be done in late fall or early spring, before tree planting, to control a wide spectrum of annual grasses and broad-leaved weeds. Trifluralin will not control the mustard family of weeds that includes stinkweed, flixweed and shepherd's purse. These troublesome weeds can be controlled after planting. Also, do not plant poplar or willow cuttings (non-rooted sticks) into soil treated with trifluralin.

Some herbicides used in crop production can leave residues that will harm young shelterbelt plants (Table 2).

Table 2. Prior use of some residual herbicides and restrictions for proposed tree planting sites [a,b]

Trade name	Common name	Susceptible species and comments
Tordon	Picloram	Caragana and villosa lilac are very susceptible. Depending on product and rate, avoid use on proposed planting sites for one to five years before planting. Leaching may occur in sandy soils low in organic matter. Picloram products should not be used near or under existing shelterbelts.
Sencor, Lexone	metribuzin	Phytotoxic levels do not persist from one season to the next.
Atrazine, Aatrex	atrazine	All shelterbelt species are susceptible. Persists longer under cold, dry conditions. Avoid use for one year before planting.
Banvel	dicamba	Not tested but could be injurious to tree roots because it is relatively mobile in soil. Persists longer in dry soils. Avoid use for one year before planting.

[a] Many other products not dangerous at prescribed rates are often used at much higher rates in spot application to control persistent weed patches. Resulting higher residues can harm young shelterbelt plants.

[b] This list is not comprehensive. For up-to-date herbicide recommendations, refer to the latest edition of **Crop Protection, Agdex 606-1**, Alberta Agriculture and Food.

When a field shelterbelt will be planted on soils with low nutrient levels, a pre-plant fertilizer application will aid in establishment. Conduct a soil test and apply fertilizer to bring the soil up to 75-75-150 (N-P-K, nitrogen, phosphorus, potassium). However, fertilizing shallow-rooted trees can encourage growth of shallow roots and suckering.

Planting

Tree seedlings are highly perishable. These plants cannot be left to dry out or the roots left exposed for more than one or two minutes. Trees should be planted as soon as possible after delivery. Moist burlap or peat moss can be used to help keep the plants cool and the roots protected before and during planting.

Trees should be planted about 1 cm deeper than they were growing in the nursery. Shallow planting will cause the roots to dry out, and deeper planting may cause suffocation. Immediately following the tree planter, each tree should be heeled in to firm the soil and ensure good contact between the roots and moist soil. If the soil is dry, the seedlings should be watered in immediately after planting.

Field shelterbelts should be continuous. Aside from the unsightliness of gaps due to dead plants, wind erosion can be accelerated in areas lying behind gaps in field shelterbelts. Therefore, dead or missing trees must be replaced the following spring and again the year after, if necessary.

Weed control during establishment

For information on weed control in field shelterbelts, refer to *Weed Control for Alberta Shelterbelts*, Agdex 277/645-1, Alberta Agriculture and Food.

Maintenance

Field shelterbelts should not be fertilized routinely if they are healthy and are on fields that receive proper fertilizer management.

Spray drift from herbicide use in adjacent fields and pastures often damages shelterbelt trees. Damage ranges from minor damage to mortality. Even though some shelterbelt species are more tolerant to spray drift than others, it is important to use care when applying any herbicides near tree plantings.

The herbicides that are a threat to most trees are the phenoxys (2,4-D and MCPA), dicamba, bromoxynil and picloram. One product particularly dangerous to trees is dichlorprop plus 2,4-D (Estaprop). This mixture is used as a potent brush control treatment. Note that some herbicides can be mixed or are pre-mixed formulations containing MCPA or the ester formulation of 2,4-D (e.g. Achieve Extra, Triumph Plus).

Renovation

Pruning of field shelterbelts should be restricted to the removal of diseased, dead or broken branches during the first 10 years.

An old poplar shelterbelt can be rejuvenated by cutting alternate trunks at a 45 degree angle just above the ground. If the trunks are alive, shoots will develop. The dominant shoot can then be encouraged by trimming out the others. When these shoots have grown to a useful size, the remaining old trees can be removed.

Coppicing, or topping, is not recommended for renovation. This practice results in masses of new but weak shoots that will need to be trimmed back every few years. Furthermore, the centre of a cut stump cannot heal and eventually rots.

In Saskatchewan, some 50-year-old caragana shelterbelts are being renovated by trimming with large, boom-mounted vertical trimmers. Trials are also being conducted there to determine the best age for trimming caragana shelterbelts. Pruning or trimming shelterbelts is best done during the winter when the plants are dormant.

Maintenance of elm shelterbelts

Shelterbelts with American or Siberian elm require some special maintenance because of the threat of Dutch elm disease.

Elm bark beetles carry the disease. They breed in dead and dying elm wood. Therefore, pruning is necessary to eliminate breeding sites in elms. Preventative pruning of dead branches from healthy elm trees must be done between September 30 and April 1, when elm bark beetles are not active. Wood removed during pruning must be burned or buried immediately because stored wood can provide a breeding site for the beetles. Elm tree stumps must be removed or ground to 10 cm below the soil surface and the resulting hole filled with soil.

Monitoring for Dutch elm disease symptoms is vital to controlling the spread of the disease. The early signs of the disease appear from the latter half of June to the middle of July, when the leaves on one or more branches may wilt, droop or curl. If the tree is infected later in the summer, the leaves will droop, turn yellow and drop prematurely. Late season infections are easily confused with normal seasonal changes in leaf colour. All these symptoms are accompanied by brown staining in the sapwood that can be seen by removing the bark of infected twigs.

Report the suspected presence of Dutch elm disease or signs of beetle activity in Alberta by calling the Provincial Dutch elm disease hotline toll-free, dial 310-0000 and ask for telephone number (403) 782-8613.

Summary

Field shelterbelts reduce soil erosion by wind, conserve soil moisture and reduce wind damage to crops. They complement good crop residue management and other conservation practices to protect the soil.

Field shelterbelts should not be considered as an alternative to good residue management, but as a complement. Field shelterbelts are a part of conservation management systems that will help safeguard the productive quality of our soils.

Field shelterbelts offer many other benefits beyond conserving soil and soil moisture. For example, they provide shade and shelter for livestock and opportunities for supplemental farm income from the sale of berries, firewood, pulpwood or lumber. Shelterbelts also generate a variety of social benefits such as enhancing wildlife habitat, maintaining the regional groundwater balance, protecting watersheds, cycling oxygen (by taking in carbon dioxide, a greenhouse gas, and releasing oxygen) and providing a varied and attractive landscape.

With good planning, site preparation and maintenance, field shelterbelts can play a significant role in sustainable food production systems.

Prepared by Brendan Casement and the late John Timmermans.

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