Agriculture and Agri-Food Canada
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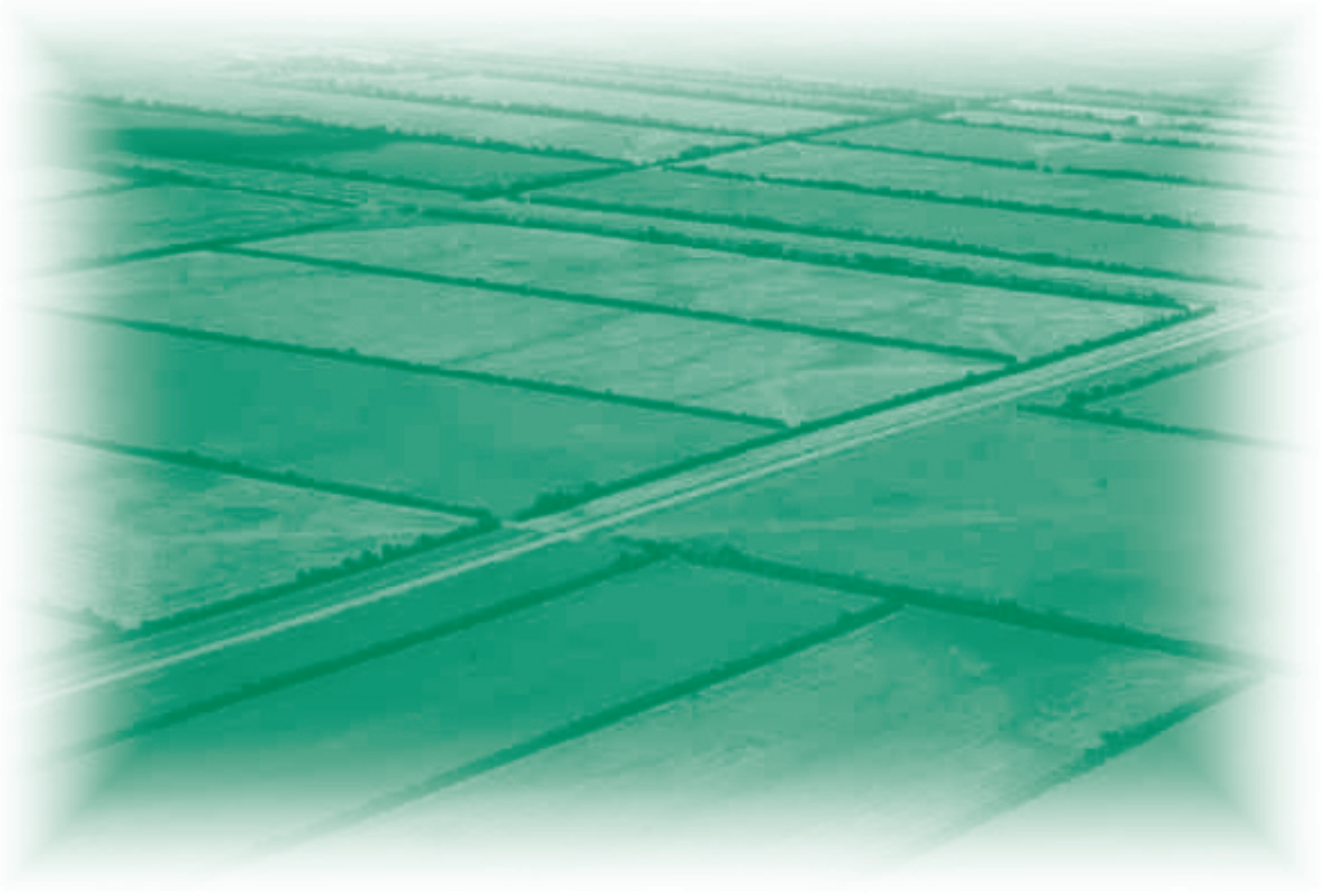
Planning Field Shelterbelts for the Prairies



Canada

INTRODUCTION

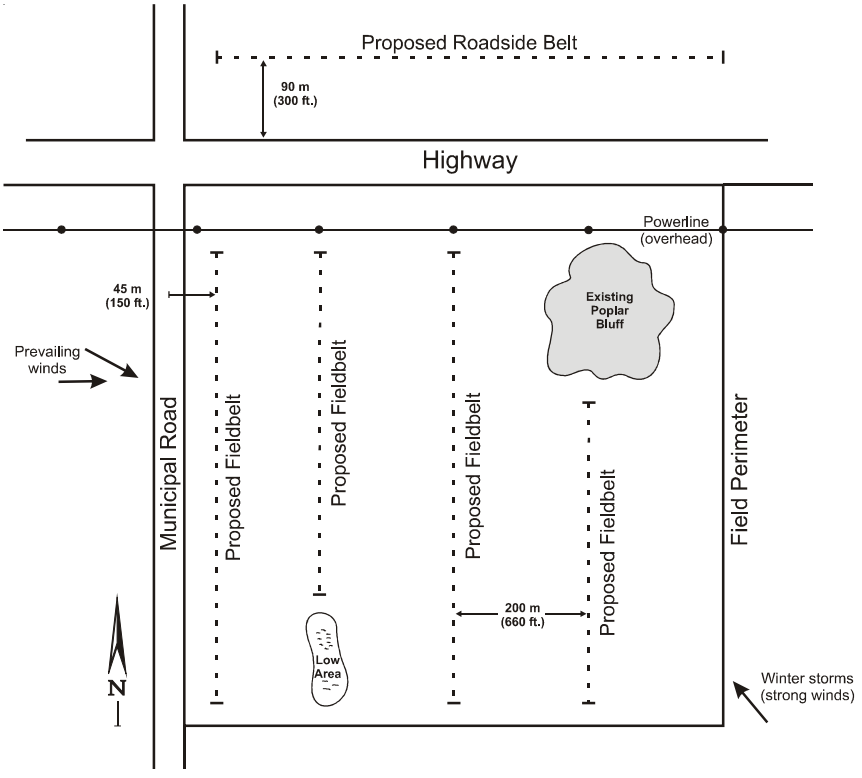
Properly planned field shelterbelts provide many benefits to the agricultural community. The main benefit is wind reduction; shelterbelts reduce wind velocities for a distance of up to 20 times their height. This plays an important role in reducing soil erosion and soil moisture evaporation. Field shelterbelts also increase snow retention and protect crops which increases productivity as well as providing diversification opportunities, habitat for wildlife, reduce greenhouse gas emissions by storing CO_2 and beautifying the landscape.

PLANNING YOUR SHELTERBELT

Proper planning of a shelterbelt involves reviewing your present requirements, assessing your future needs, estimating the quality of existing shelterbelts and planning new shelterbelts for unprotected areas of the field.

Begin by mapping out your field using a scale of 2.5 cm = 134 m or 1 in = 440 ft. Mark out locations of existing trees, sloughs, farm access roads, power lines and farm buildings if applicable. Next, draw in the prevailing wind directions and note areas where wind problems occur and where excessive snow accumulation can cause problems (Figure 1).

To eliminate problems with snow buildup, keep all trees at least 30 m (100 ft) from main farm access roads. Check with your rural municipality to determine minimum set-back distances from municipal roads. Most R.M.'s have a set-back of 45 m (150 ft) from the centre of the municipal road. Set-back for highways is 90 m (300 ft) from the right of way. The Department of Highways and Canadian railroad regulations must also be followed where applicable.



(Figure 1)

SHELTERBELT DESIGN

Decide on the number of shelterbelt rows required to properly protect the field. Up to five rows of trees on a ¼ section planted at right angles to the prevailing winds (usually north-south belts) are recommended on highly erodible soils to provide protection from prevailing prairie winds. Rows on the north and south ends of the field, running east-west, can also be planted to maximize protection. Field access roads should be located in the east or south corners as most erosive winds come from the North or Northwest. In some areas of the prairies the problem winds may be from the south. In these areas the main rows should run east-west to be at right angles to prevailing winds.

The field shelterbelt should be tall and long-lived. Since the area protected is directly related to the height of the shelterbelt, the planting of tall trees is recommended wherever possible. Wind velocity is reduced over a distance of 20 times the height of the shelterbelt. Species such as green ash and Scots pine are tall and, therefore, can provide a significant area of shelter down wind. The density required will depend on your specific site. The denser the shelterbelt the greater the wind protection. Areas with erodible soils should consider denser shelterbelts. The size of the snowdrift trapped by the belt is also affected by the density. Denser shelterbelts trap snow in a shorter, deeper drift (Figure 2). Green ash is less dense and, therefore, snow distribution on the leeward side of a green ash shelterbelt will be more evenly spread across the field. Shrubs, such as caragana, choke cherry, hawthorn and Villosa lilac, provide superior snow trapping and wind protection due to their density but are not as tall as the ash or pine. These species can be used in areas where snow is not a concern, or where maximum protection is required. For more information see the "Snow Control With Shelterbelts" brochure. To get the appropriate density use species possessing the desired characteristics. Many people choose to mix ash into a shrub row to provide extra height. This results in a shelterbelt with the density of a shrub row, but the height of a tree row.

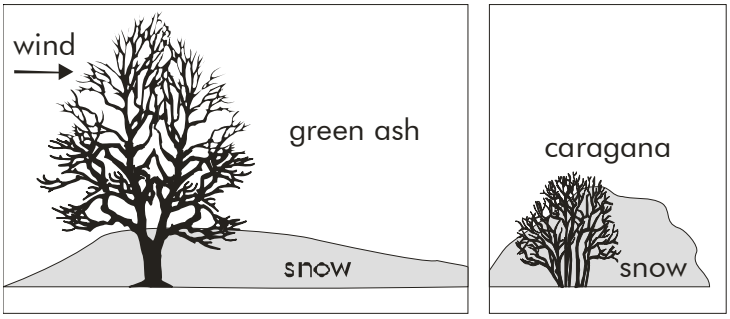
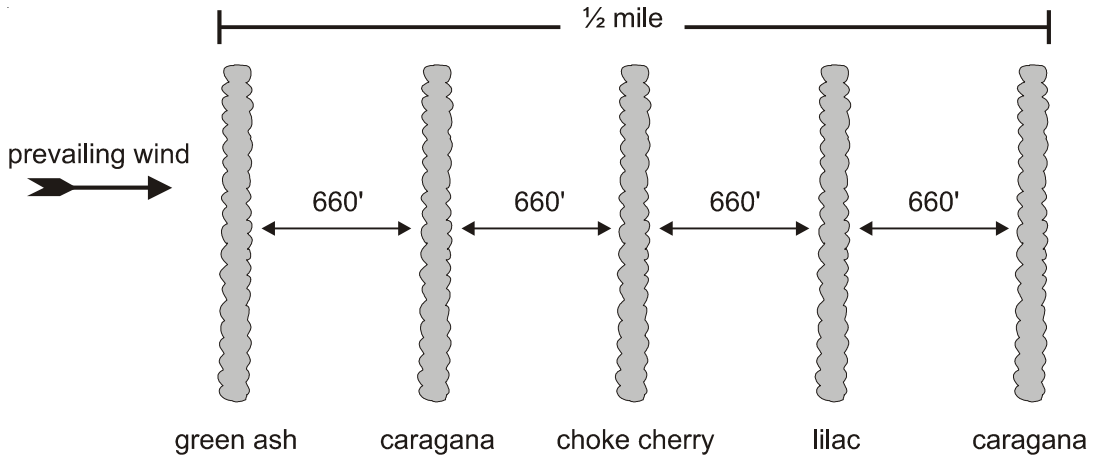


Figure 2. Snow distribution on leeward side.

A series of shelterbelts is a more effective shelterbelt system than a single row planted to protect a large area. The first row to meet prevailing winds should be less dense allowing for a more even snow distribution across the field. As this first row may intercept snow blowing from a considerable distance you should be aware of the amount of snow this shelterbelt could potentially trap. The other rows in the shelterbelt system can consist of denser species as there will be significantly less snow for these trees to trap. These denser shelterbelts further into the system will trap the snow the earlier shelterbelts let through. See Figure 3 for an illustration of such a shelterbelt system. A diversity of shelterbelt species could be used, this would depend on site characteristics.

Although several rows per quarter section are recommended, any shelterbelt in the field will be a benefit. Many shelterbelt systems have begun with the planting of a single half-mile field shelterbelt row.

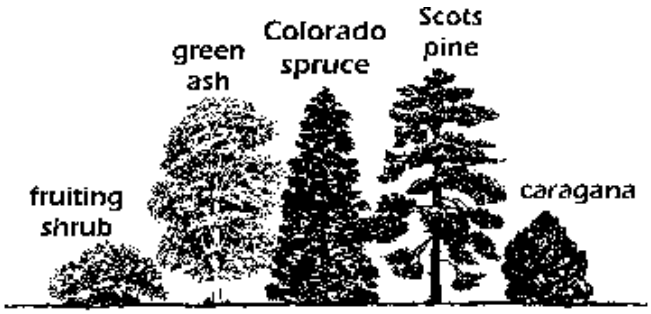
Selection of appropriate tree and shrub species is very important. Each species has its own characteristic height, width, density, longevity, growth rate and resistance to insects and diseases. See Table 1 for further information on species recommended for field shelterbelts, or refer to "Trees and Shrubs for Prairie Shelterbelts" brochure.



(Figure 3)

MULTI-ROW MULTIPURPOSE BELTS

Although field shelterbelts in Canada have traditionally consisted of single row, single species shelterbelts, there are several benefits to planting multiple row, multiple species shelterbelts called forest belts. These multiple row belts provide superior wind protection as there are more rows of trees to slow the wind. They also trap more snow but some of this snow is held within the tree rows themselves and, therefore, is not a hindrance to regular field work. By planting multiple species you can reduce the risk of a single disease or insect wiping out your shelterbelt system. Dutch elm disease is a classic example of what can happen when too much dependence is placed on a single variety of tree or shrub. Finally, a world of diversification opportunities reside in these multi-species, multi-row shelterbelts as Manitoba maple can be tapped for syrup, choke cherry and other fruiting varieties can provide a valuable food supply for jam and jelly production, and wood can be gathered for a variety of uses. In addition, these multi-row belts provide prairie wildlife species with better habitat. See Figure 4 for an example of a forest belt design.



5 row belt

(Figure 4)

SHELTERBELT SPACING

The spacing recommendations within and between rows is very important (Table 2).

Remember, you are planting seedlings which will eventually develop into mature trees reaching heights up to 15 m (50 ft) and widths up to 10 m (30 ft). In forest belt plantings leave sufficient space between shelterbelt

rows to permit the passage of maintenance equipment in the early years. Correct spacing between trees within the row allows adequate light, moisture and nutrients for proper growth (refer to Table 2).

When you have selected appropriate tree species and determined the number of rows, draw them on your field shelterbelt plan. Attach a copy of your plan with your application for trees. The Shelterbelt Centre accepts applications on a first come first served basis starting June 1 for delivery the following spring.

WEED CONTROL IN SHELTERBELTS

Site preparation and weed control are necessary to ensure a successful shelterbelt planting. Like our gardens, shelterbelts will suffer when weeds are allowed to grow unchecked. There are a variety of different weed control strategies including herbicides, plastic mulch, flax shive mulch and others. For more information refer to the "Herbicides for Shelterbelt Weed Control" and "Non Chemical Weed Control Methods" brochures.

Care should be taken when applying herbicides to crops near shelterbelts. Careless application can result in injury or death of the shelterbelt trees. Follow label instructions and adhere to regulations regarding buffer zones. If you have questions, contact the chemical representative for the herbicide(s) in question.

Other planning brochures available from the PFRA Shelterbelt Centre include: "Shelterbelts for Dugouts", "Planning Farm Shelterbelts", "Designing Tree Plantings for Wildlife" and "Basic Shelterbelt Establishment Guidelines For Prairie Livestock Facilities".

POINTS TO CONSIDER IN PLANNING

1. Keep all trees at least 30 metres (100 feet) from roads, buildings, etc. Check with your rural municipality and Department of Highways regarding tree planting regulations next to roads and highways.

2. Plant only as many trees as you can care for. Competition from weeds and grass will jeopardize the survival and growth of newly planted trees.

3. Avoid any access roads or openings in the shelterbelt which will allow the prevailing winds to blow unchecked across the field. Place field access openings where the least amount of wind will pass through.

4. Protect shelterbelts from livestock as they will eat, trample or rub the trees, thereby destroying them. Fence off the planting if necessary.

5. Include fruit-bearing shrubs, such as choke cherry, buffaloberry, hawthorn and sea buckthorn, to benefit wildlife. Consider planting forest belts consisting of multiple species and multiple rows.

6. Ensure replacement trees are replanted as soon as possible in the new shelterbelt.

7. The root systems of some species, including willow and maple are very fibrous and competitive with field crops, therefore not recommended. Poplar is not recommended for field shelterbelts due to its competitive root system and short life span.

Table 1 SPECIES RECOMMENDED FOR SHELTERBELTS

Species	Mature Size Height m/ft	Mature Size Width m/ft	Life Span[1] (years)	Moisture Requirements[2]	Growth Rate[3]	Salt Tolerance[4]	Potential spread by seed or suckers[5]	COMMENTS
Arnold hawthorn	4/13	3/10	Moderate	L	M	L	M	Large thorns, susceptible to cedar apple rust and pear slug infestations
Silver buffaloberry	4.5/15	3.5/12	Moderate	L	M	H	H	Silvery foliage, edible red fruit, spines, suckers
Ross caragana	5/16	3/10	Long	L	M	M	M	Avoid planting on poorly drained sites
Choke cherry	7/23	3.5/12	Moderate	M	M	M-L	M	Shade intolerant, suckers
Indian summer sea buckthorn	5/16	3.5/12	Moderate	L	M	H	H	Silvery foliage, edible orange fruit, spines, suckers
Villosa lilac	4/13	2.5/8	Long	M	M	M	M	Non-suckering, performs poorly on sandy soils, shade intolerant
Bur oak	20/65	6/20	Long	L	S	L	L	Difficult to transplant
Plains green ash	15/50	6/20	Long	M	M	M	L	Slow growth under dry conditions and susceptible to 2,4-D damage
Manitoba maple	14/45	12/40	Moderate	M	F	M	M	Susceptible to aphids and 2,4-D damage
Acute willow	15/50	15/50	Moderate	H	F	L	L	Long, narrow foliage
Silverleaf willow	15/50	15/50	Moderate	H	F	L	L	Foliage is a silver color
Colorado spruce	18/60	6/20	Long	M	S	M-L	L	Requires protection during establishment
White spruce	18/60	6/20	Long	H	S	L	L	Requires protection during establishment
Prairie green Scots pine	18/60	6/20	Long	M	M	L	L	Faster growth rate than spruce, requires protection during establishment
Lindquist Siberian larch	18/60	6/20	Long	H	M	M	L	Deciduous conifer losing its needles in the fall. Difficult to establish on dry sites

[1] Life Span: Short = 20-30 years, Moderate = 30-50 years, Long > 50 years.
[2] Moisture Requirements: Low = <300 mm, Medium = 300-400 mm, High = >400 mm.
[3] Growth Rate: S - Slow, M - Moderate, F - Fast, VF - Very fast.
[4] Salt Tolerance: L - Low, M-L - Medium-Low, M - Medium, H - High.
[5] Potential Spread by Seed or Suckers: L - Low, M - Medium, H - High.

Table 2 RECOMMENDED MINIMUM SPACINGS WITHIN ROWS

DECIDUOUS SHRUBS	SPACINGS m	SPACINGS ft.	DEDICUOUS TREES	SPACINGS m	SPACINGS ft.	CONIFEROUS TREES	SPACINGS m	SPACINGS ft.
Buffaloberry	1	3	Bur oak	2.5	8	Colorado spruce	3.5	12
Caragana	0.3	1	Green ash	2.5	8	Scots pine	3.5	12
Choke cherry	1	3	Manitoba maple	2.5	8	Siberian larch	2.5	8
Hawthorn	1	3	Willows	2.5	8	White spruce	3.5	12
Sea buckthorn	1	3						
Villosa lilac	1	3						

For a more detailed description of tree species, refer to the "Trees & Shrubs for Prairie Shelterbelts" brochure.

For more information contact:
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Internet: www.agr.gc.ca/pfra/shelterbelt.htm
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