

# Farmstead Shelterbelts

Planning, planting and maintenance



# Benefits of Farmstead Shelterbelts



- Odour reduction: Odour plume extension is reduced by 33%. Within the plume, the odour concentration is reduced by a factor of 3.
- Heating costs can be reduced up to 25%.
- Livestock is protected from cold winds. This translates into greater livestock weight gain and increased survival rate .
- Tree shade increases animal comfort.
- Noise heard from neighbouring road traffic can be cut down by one third.
- Costs associated with snow removal around livestock buildings and on farm lanes are reduced.
- Surroundings are visually improved and beautified.
- Reduction in net greenhouse gas emissions: Each km of windbreak can sequester 300 tons of atmospheric carbon over a 40-year period.
- Dust interception: Up to 40% of total dust volume can be intercepted.
- Provides wildlife habitat and increases biodiversity.

# Shelterbelt Planning

Because shelterbelts are perennial structures, careful planning is essential and should start one year prior to planting. Once planted, the shelterbelt cannot easily be moved.

The first step in planning a shelterbelt is choosing the location. The following elements must be considered in order to identify the best possible location:

- Direction of prevailing winds;
- Distance from buildings and access lanes;
- Proximity of neighbours (where odours are a factor);
- Presence of ditches, field tiles and utility lines as well as other obstacles;
- Available space.

The shelterbelt should be positioned perpendicular to prevailing winds and located approximately 30 metres (100 feet) away from buildings or other structures in order to allow drifting snow to accumulate to the lee of the hedge. This distance allows the trees to provide excellent protection when they reach a height of 15 m (50 feet). Buildings are located in the area of maximum wind-speed reduction, i.e., from 2 to 4 times the height of the windbreak (see Figure 1).

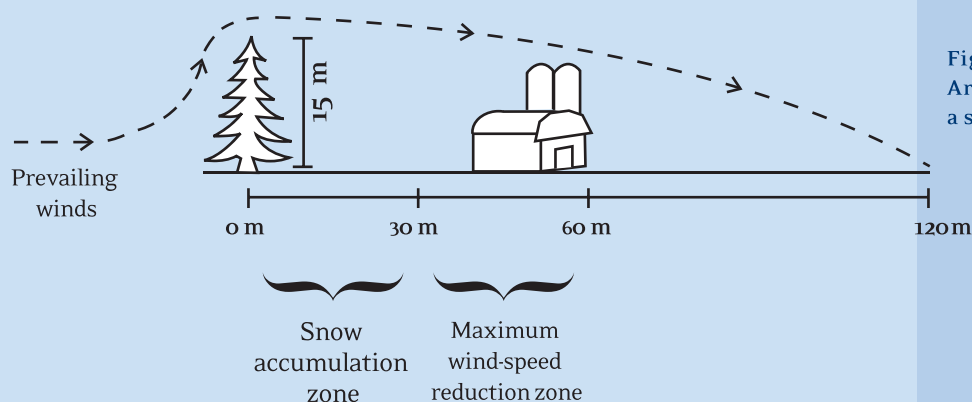


Figure 1:  
Area protected by  
a shelterbelt

The shelterbelt should extend in length between 30 and 60 metres (100-200 feet) beyond the buildings in order to prevent side winds from reaching the buildings.

The presence of ditches, utility lines or other obstacles may influence the location of the shelterbelt. Caution must also be taken in order to minimize the loss of cropped area, which is the most important cost associated with establishing a shelterbelt.

In the case of buildings with natural ventilation, it is recommended that a distance equal to 8 times the height of the windbreak be left from the buildings so as to allow adequate air circulation. For example, a windbreak with a mature height of 20 m should be located at least 160 m from a naturally ventilated barn.



# Selection and Arrangement of Trees and Shrubs in a Shelterbelt

A farmstead shelterbelt consists of one, two or three rows of trees or shrubs, depending on the space available and the shelterbelt objectives. Planting two or three rows will make it easier to rejuvenate the hedge without losing the benefits of its protection. Furthermore, a larger shelterbelt usually contains a greater variety of trees. The following pages outline six types of rows commonly used in shelterbelts in Eastern Canada and detail the advantages and type of protection for each, as well as suggestions regarding layout.



Red oaks and red ash at 2 metre spacing, 17 years old.

## Type 1 - Hardwoods planted at 2- or 3-metre spacing

- Shade production .
- High quality timber production .
- Aesthetic value.
- Greater protection when trees are in foliage; minimal protection otherwise.
- It is recommended to alternate large crowns and intermediate crowns.
- In the case of 2-metre spacing, planting species two by two (e.g. two oaks, two ash, two maples) will preserve diversity after removing one tree out of two.

## Type 2 - Hardwoods and shrubs planted at 2-metre spacing

- Aesthetic value and food source and habitat for wildlife.
- Shade production .
- Production of berries and high quality timber.
- Greater protection when trees are in foliage; minimal protection otherwise.
- Shrubs will cover the lower portion of the hedge.
- Shrubs will trap snow.



Oaks, viburnums, ash and pea shrubs at 2 metre spacing, 17 years old.



Norway spruce at 3 metre spacing, 25 years old.

## Type 3 - Evergreens planted at 2- or 3-metre spacing

- Continuous protection year-round.
- Early growth in these species is slow.
- Trees are planted at 2-metre spacing for single-row hedges and at 3-metre spacing for two- and three-row hedges.
- An irrigation system is highly recommended when planting large size conifers.

# Selection and Arrangement of Trees and Shrubs in a Shelterbelt

## Type 4 - Hybrid poplars or hybrid larches planted at 2-metre spacing

- Timber can be harvested after 15 to 20 years.
- Rapid growth in these trees (1 to 2 metres per year) ensures early protection.
- Greater protection when trees are in foliage; minimal protection in winter.
- Short term protection in the case of poplars; larches are longer-lived but are slower-growing than poplars.



Hybrid poplars at 2 metre spacing, 12 years old.



Hybrid poplars and Norway spruce at 2 metre spacing, 12 years old.

## Type 5 - Poplars and spruces planted at 2-metre spacing

- Timber can be harvested from poplars after 15 to 20 years.
- Poplars provide short term protection; spruces provide long term protection.
- Poplars must be pruned to remove branches likely to stunt spruce growth.



Various shrubs at 2 metre spacing, 10 years old.

## Type 6 - Shrubs planted at 2-metre spacing

- Berry production .
- Aesthetic value and benefits to wildlife.
- Also serves as a snow fence.
- This type of hedge is useful when vertical space is limited.
- Provides short distance protection.

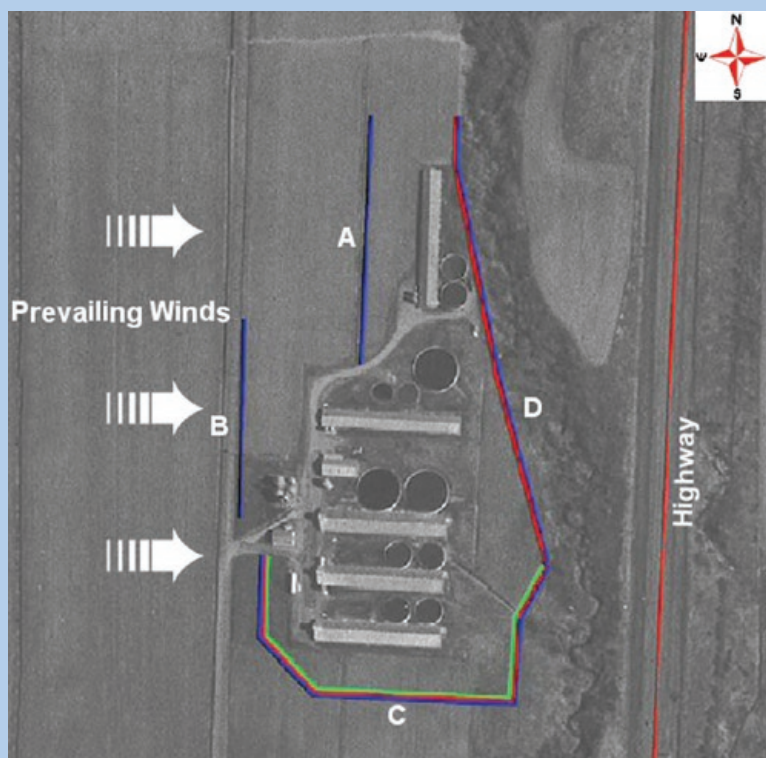
Selection criteria of species in each row include hardiness zones, types of soil (texture and drainage), objectives pursued in establishing the shelterbelt as well as the owner's personal preferences. Numerous publications are available regarding soil requirements for trees and shrubs.

By combining the various types of rows, it's possible to obtain adequate farmstead protection.

# Example of Shelterbelts around Hog Facilities

The main objectives on this site are :

- Reduction of odours carried towards highway
- Reduction of heating costs
- Aesthetic enhancement



## Description of shelterbelts

HEDGES A AND B : SINGLE ROW OF WHITE SPRUCE (TYPE 3) SPACED AT 2 METRES

- Single row, in order to limit the loss of crop area.

HEDGE C : THREE ROWS SPACED AT 3 METRES : HARDWOODS (TYPE 1), EVERGREENS (TYPE 3) AND POPLARS (TYPE 4)

- Within-the-row spacing is 3 metres.
- This arrangement provides both aesthetic value and rapid growth.
- The outside row consists of hardwoods to provide a visual effect.

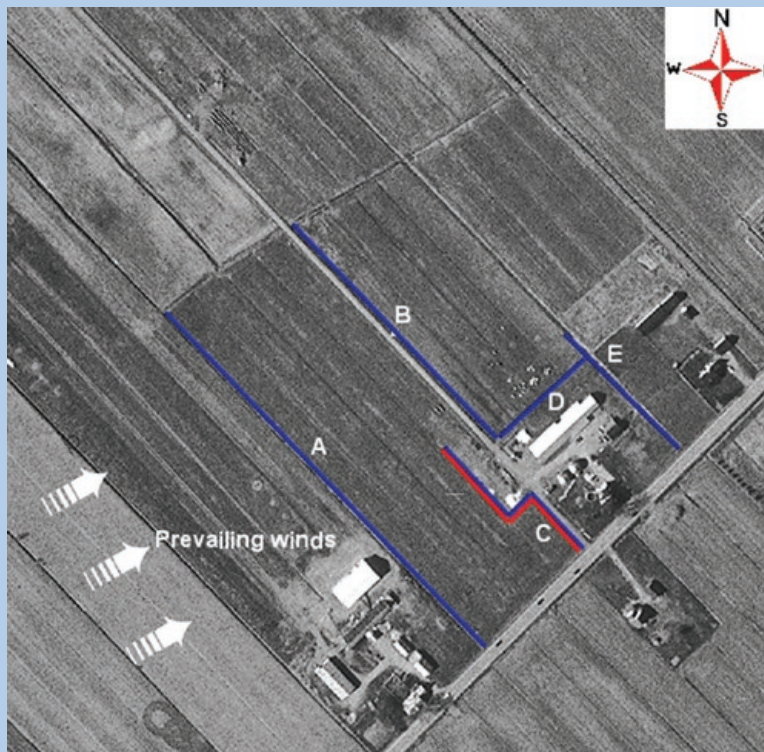
HEDGE D : TWO ROWS SPACED AT 3 METRES : NORWAY OR WHITE SPUCE (TYPE 3)

- Within-the-row spacing is 3 metres.
- Although a wooded area is already established on the eastern side of the property, the owner would like to reduce, on a medium and long term basis, the odours carried to the highway during wintertime.



# Example of Shelterbelts around a Pasture

- The main objectives on this site are :
- Creation of shade for livestock
  - Reduction in snow removal costs
  - Aesthetic enhancement



HEDGE A : SINGLE ROW OF HARDWOODS AND SHRUBS SPACED AT 2 METRES (TYPE 2)

- Designed to protect crops and reduce snow accumulation resulting from hedge C.

HEDGES B AND D : SINGLE ROW OF HARDWOODS SPACED AT 2 METRES (TYPE 1)

- Designed to protect fields and livestock in the summer.
- Alternating large crowns (e.g. oaks or maple) and intermediate crowns (e.g. ash or birch).

HEDGE C : TWO ROWS SPACED AT 3 METRES : WHITE SPRUCE (TYPE 3) AND POPLAR (TYPE 4)

- Within-the-row spacing is 3 metres.
- Provides early year-round protection for buildings.
- If space is limited, a single row alternating poplar and spruce (type 5) can be used, although it will require more maintenance.

HEDGE E : SINGLE ROW : SPRUCE (TYPE 3) SPACED AT 2 METRES

- Protects buildings and livestock from cold northern winds.



Photo 10



Photo 11



Photo 12

## Establishing a Shelterbelt

### SOIL PREPARATION (LATE AUGUST TO EARLY SEPTEMBER)

Soil preparation consists of loosening the soil to a depth of 15 to 20 cm (6 to 8 inches) to promote adequate root development and facilitate the installation of plastic mulch. The soil should be tilled over a width of 3 metres (10 feet) in the case of a single row, 5 metres (15 feet) in the case of two rows and 8 metres (25 feet) in the case of three rows. Subsoiling is then performed if the soil shows signs of excessive compaction. It may be necessary to remove rocks and debris and to level the ground before preparing the soil.

Crop land fertility is usually sufficient to ensure proper growth of woody plants. Should soil amendments be necessary, the application of composted manure is recommended (20 tons/ha) - rather than raw manure - because nitrogen release is slower. Regular cultivation (fallow) during the summer before planting or chemical weed control (glyphosate) in late August will facilitate soil preparation and control weeds.

### MULCH INSTALLATION (SEPTEMBER TO OCTOBER)

Mulch will help promote rapid initial growth and better plant development by reducing competing vegetation and retaining moisture in the soil. Use an embossed long lasting plastic mulch with a thickness of 0.06 mm. This type of mulch is available in two formats : either 1.2 metre (4 feet) or 1.5 metre (5 feet) in width. The latter is recommended, because it ensures a larger area is free of weeds.

The mulch material is installed on the soil using a mulch layer driven by a tractor. Both edges should be firmly imbedded and the plastic should fit snugly over the ground. The mulch is installed over the location of each tree row while ensuring that between-the-row spacing (from centre to centre) remains constant. The distance between rows is usually 3 metres (9 feet) or 4 metres (12 feet).

### ORDERING PLANTS (SEPTEMBER TO DECEMBER)

Plants should be ordered in the fall from specialized nurseries. Height should be 60 cm (2 feet) for trees and 30 cm (1 foot) for shrubs. In certain situations, it may be necessary to plant taller trees (2 metres or 7 feet) although, in this case, planting costs will also be much higher.

### PLANTING (MAY TO MID-JUNE)

The first step is creating an opening in the mulch that will be sufficiently large to accommodate the tree or shrub. The seedling or sapling is then planted in the ground and the soil surrounding the plant is firmly compacted. Watering the roots immediately will help compact the soil and eliminate air pockets that could dry out roots. After planting, a plastic, 30 cm (12-inch) square, designed to inhibit growth of competing vegetation, is installed around the tree and the edges tucked under the plastic. The plastic square is kept in place with metal clips or rocks.

Trees and shrubs should be planted as soon as possible after delivery. Should there be a delay in planting, they should be kept in a dry and shaded area and watered regularly. If they cannot be planted shortly after delivery, they should be kept in a cold storage room (3 to 5°C).





Photo 13



Photo 14



Photo 15

## Maintenance : A Few Hours well Invested

### WEED REMOVAL

Weeds surrounding the mulch must be removed 3 to 4 times a year using a brush cutter or a lawn tractor.

### INSPECTION FOR DISEASES

When removing weeds, it is important to evaluate tree/shrub health. Any variation in colour or loss of leaves should be considered warning signs. Consult a specialist without delay.

### REPLACING DEAD TREES

Death rate in plants in the first year following planting is usually 5 to 10%. Dead trees and shrubs should be replaced as soon as possible to prevent gaps in the hedge.

### PRUNING AND THINNING

Pruning will help ensure the trees grow upright and maintain a branch-free stem. Pruning is done each year until the trees reach a height of 5 metres (15 feet), preferably in late spring but can also be done in the fall. Deciduous species usually require more pruning than conifers.

Lower branches need to be pruned on hardwood species in order to promote even diameter growth and prevent branches from breaking due to snow accumulation. It is also necessary to prune branches that interfere with farm operations or are detrimental to the growth of other plants such as neighbouring trees. Pruned branches should be chipped and deposited under the tree.

Some shelterbelts are planted at 1.5 m to 2 m spacing to provide faster protection. Thinning is then often required after 10 to 20 years. It will consist of removing one tree out of two.

### PROTECTION FROM BROWSING AND RODENTS

Electric fencing will protect plants from browsing livestock and white-tailed deer. In September, a repellent should be applied on tree trunks or a plastic spiral installed in order to protect trees from rodents and deer. The plastic spiral should be removed in April at the time of pruning. Fall removal of weeds will prevent rodents from establishing.

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