

Windbreaks



Background

The arctic outflow winter winds in the Sumas Prairie area create a significant problem with soil erosion in farm fields. Wind erosion physically removes the lighter, less dense soil constituents such as organic matter, clays, and silts. Thus it removes the most fertile part of the soil and lowers soil productivity .



Any soil that is loose, dry, bare, and smooth is a candidate to be blown by the wind. If the soil is also unprotected for some distance, it will erode under windy conditions.

The severity of the soil erosion depends on the alignment and exposure of fields, whether they are on the ‘sandy’ Sumas series soils, and how well their soil surfaces are protected. On the sandy loam soils in the Sumas Prairie Lake Bottom, the loss of soil ‘fines’ translates into lost soil tilth and fertility. It is the smaller soil particles that produce the small pore sizes necessary to retain soil moisture and crop nutrients in the crop rooting zone. On the inherently droughty soils in the Lake Bottom, protecting the soil ‘fines’ from soil erosion can be critical for producing successful field crops.

Under field conditions, soil begins to move when the wind speed reaches about 21 km/h (13 mph) at 30 cm (1 ft) above the ground surface. **It is within 30 cm of the ground surface that most of the soil movement occurs.**

Depending on their size and the strength of the wind, **soil particles move in three different ways:**

1) **Saltation** – movement of fine and medium sand sized particles when they are lifted a short

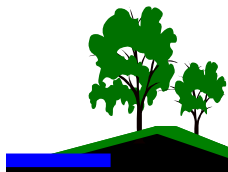
distance in the air and then fall back to the ground to dislodge more soil. **Saltation is the bouncing of particles.** The spinning action and forward/downward movement of these particles give them extra power to dislodge other soil particles and to break down large clods into smaller soil aggregates that can then be carried by the wind. Saltation destroys stable surface crusts to create a more erodible condition and accounts for 50 – 80% of total soil movement. This movement occurs within a foot of the ground, and the amount of soil moved by saltation increases downwind.

2) **Suspension** – the process by which very fine soil particles are lifted from the surface by the impact of saltation, carried high into the air, and remain suspended in air for long distances. **This dust can be blown hundreds of miles.** Although they account for only a small part of the total soil moved by wind, **these small particles are the most fertile part of the eroded soils.**

3) **Surface Creep** – the movement of larger (sand-sized) soil particles along the surface of the soil. These particles are loosened by the impact of saltating particles, but they are too large to be lifted off the ground in most winds. **They move along the surface in a rolling motion.** Surface creep can account to up to 25% of the soil moved by wind.



Wind erosion is prevented by taking the energy out of the wind. It is by disturbing the air flow that soil can be protected.



Benefits of Windbreaks

Rows of trees on the landscape create roughness elements that disturb the air flow in the winds. **Tree windbreaks reduce the windspeed for a determinable distance downwind**, depending on their height, density and angle of planting to the wind.

Ultimately, the object is to reduce the windspeed to velocities below which the soil erosion begins. A slower windspeed is less able to pick up and move the soil particles.



Q. When is the best time to plant a tree?

A. Twenty years ago

Q. When is the second best time?

A. Today!

Windbreaks provide the following benefits:

- ☛ **Covering an area with healthy trees will stop erosion by wind**
- ☛ **Keep fertile soil on the field where it is needed to grow the crops**
- ☛ **Keep ditches and watercourses cleaner**
- ☛ **Can minimize snow blowing and drifting during the winter storms**
- ☛ **Provide shelter for wildlife**
- ☛ **Improve the beauty of the farmland**

In the Sumas Prairie area, the new windbreak planted along the West side of the Canal between No. 4 and No. 5 Roads will provide several important functions. The single row of trees will reduce the amount of wind born soil entering the canal in the summer. The trees will also provide summer shade for the canal - helping to cool the water and provide refuge for the fish. The trees will reduce winter winds on the adjacent farm fields. They will add to wildlife habitat and compliment the two existing stands of Cottonwoods in the area which already host a nesting bald eagle.

Principles and Mechanics of Windbreaks


Usually a single or double row of trees is used to serve as the backbone of a wind erosion control system.

The effectiveness of a windbreak to reduce wind speed depends on its height and density.

Windbreaks can reduce wind velocity on the leeward (protected) side of the windbreak to a distance equal to 30 times the height of the tallest trees. However, the degree of protection gradually decreases with distance from the windbreak. **The most effective area of protection extends to about 10 times the height of the trees.** For example, if the windbreak is 30 ft. tall, good protection can be expected within an area 300 ft. downwind from the windbreak. Wind speed is reduced as the windbreak density is increased, and the area

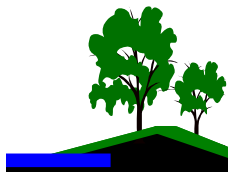
protected tends to be decreased.

The density of windbreaks protecting homes and livestock areas needs to be greater than the density of windbreaks designed to protect fields from soil erosion.



Many of the problems that occur in old windbreaks are directly related to the trees being planted too close together. Crowding results in reduced vigour and greater susceptibility to insects and diseases, because of competition for sunlight, moisture, and nutrients.

Windbreaks do not have to be planted in straight east-west or north-south rows. However, **they should be generally perpendicular to the prevailing winds.** Exceptions occur when several windbreak rows are planted within a field or when the goal is mainly to provide wildlife habitat. In these cases, the most effective planting is oriented along an east-west direction.




Windbreaks do the best job when they slow down the wind during a snowstorm and allow snow to filter through the trees and spread uniformly across protected cropland.

It is wise not to use the same type of trees and shrubs in every windbreak row. **Diversity in the planting will increase insect and disease resistance and increase wildlife habitat. It is also a good rule not to mix plant varieties within a row.** One variety or another will usually grow faster and eventually suppress the growth of the slower growing plants.

An exception to this rule is when shrubs with comparable growth rates and form are mixed within the row to provide diverse wildlife habitat.

Steps to Successful Windbreak Establishment:

- 1) **Proper site preparation – provides a desirable seed bed for planting the trees, builds up soil moisture, and helps control perennial weeds and grasses.** On sod sites, the sod should be killed or removed and site fallowed for one year prior to tree planting. Site preparation in cultivated fields consists of deep chiseling in the fall and disking prior to tree planting in the spring.
- 2) **Weed control is a critical factor to tree survival and growth.** Weeds, especially perennials and warm season annuals, compete for moisture, nutrients, and sunlight. Weeds also provide habitat for tree-injuring pests. **The success of windbreaks is often directly related to the degree of weed control.** On dry, shallow sites, weed control may be necessary throughout the life of the windbreak.
- 3) **Adequate soil moisture** is needed at the time of planting. If soil moisture is lacking, **irrigate immediately after planting and then as necessary during the first three growing seasons.** Soak the soil thoroughly and then allow it to partially dry before irrigating again.



more windbreak trees are lost because of poor weed control than any other

Irrigating just before the soil freezes in the fall is very helpful for all trees, especially evergreens.

- 4) **Avoid pruning trees** in the windbreak except to remove dead, diseased, or broken branches. Additional pruning reduces the density and therefore lowers the capacity to control wind and snow. **To maintain viability and effectiveness as they age, windbreaks may require thinning and/or replanting.**

Windbreak Tree Species

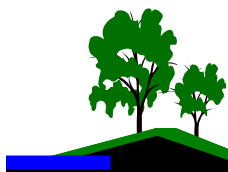
It is important to choose species that are adapted to the soil and climate, compatible with adjacent crops, and have few pest problems.

The model windbreak tree would be tall and fast-growing with a narrow and porous crown, non-spreading root system, non-brittle branches, minimum tendency to sprout at pruning wounds and a high resistance to chemical spray damage. Since no one tree fills this bill, the most adaptable species should be selected

Locally, the Ash tree was chosen for its ability to withstand high winds and because it does not readily self-seed. The trees grow to heights of 60 – 100 feet with a spread of 40 – 60 feet. The branches of this tree extend upwards at about 45 – 59 degree angle from the trunk which gives the tree branches maximum strength. The flowers are sterile so there is no messy fruit or seed which is often associated with Ash Trees. Ash trees have been the tree of choice for shelterbelts in the Netherlands for many years.



a typical Ash Tree and Leaves



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Abbotsford Soil Conservation Association

The Abbotsford Soil Conservation Association is a non-profit society registered in the Province of British Columbia. Key issues the group will be addressing are the following:

- soil conservation and soil conservation practices
- storm water management
- riparian and fisheries issues
- education

The ASCA takes a cooperative approach to solutions regarding these issues, focusing on land stewardship and keeping in mind that farming is a business. The ASCA intends to further the success of the past groups, moving soil conservation and sustainable agriculture into the new millennium.

Memberships - fill in the form below and mail it to the ASCA to activate your membership today!

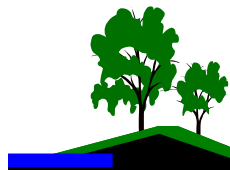
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