

TAC Environmental Achievement Award Submission, 2010  
Farm Windbreaks-Communications Program and  
Cooperative Projects

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## **1. Introduction**

This submission describes a project that was undertaken with a goal to improve the safety and operational maintenance of provincial highways in Ontario while at the same time providing benefits to adjacent property owners and the environment.

The objective of this project is to establish tree windbreaks on private lands in a way that provides agronomic benefits and meets the needs of landowners, improves the environment and reduces collisions and operational costs by reducing blowing and drifting snow on adjacent highways. This project is based on the premise that a well designed farm windbreak plan is also good for the adjacent highway.

Farm windbreaks set back 20 to 100 metres from a highway provide safety and operational improvements by reducing blowing and drifting snow. On many highways the Ontario Ministry of Transportation (MTO) does not have the property needed to set back these “living snow fences” and purchasing the additional property is not a desirable or viable alternative. Farm windbreaks improve safety and reduce operational costs for the adjacent highway (including frequency of plowing, sanding and salting in problem areas).

## **2. Effects of Blowing and Drifting Snow**

Blowing and drifting snow (as opposed to falling snow and frost) are responsible for approximately 30% of the plowing, salting and sanding on MTO provincial highways amounting to about \$3000.00 per 2-lane km per year in a typical highway maintenance area (Perchanok 1998). Snow drifts can add significantly to the cost of winter maintenance and create serious safety hazards by causing loss of vehicle control, reducing sight distance, obscuring signs, promoting ice formation, reducing effective road width and rendering safety barriers ineffective. Drifts contribute directly to pavement damage by blocking ditches, drains and culverts, and serving as a source of water infiltrating under pavement. The effects of blowing snow on road ice and reduced visibility are of even greater consequence. Blowing snow is the primary cause of icy roads in wind-exposed areas. Ice is formed as the blowing snow melts from the daytime solar radiant heat stored in the pavement and substratum and then freezes, and the quantity of snow blowing across a road can be hundreds of times greater than direct snowfall (Tabler 2003).

In Ontario, virtually all snow drifting problem sites have a common characteristic: they are downwind of large, level open fields with low or no ground cover (Perchanok 1998). Snow is most susceptible to drifting during the first three days following a snowfall, before the surface of the snow bonds into a crust. Winds lift

snow particles from the surface and begin a process called saltation in which they are carried with the wind and fall to the ground again, where they free and mobilize more snow particles from the surface to continue the saltation process. In very strong wind conditions the accumulated snow particles may be carried for tens or hundreds of metres, potentially causing white-out conditions. Windbreaks slow the wind and cause saltating snow to be deposited in drifts.

### **3. Benefits of Windbreaks in Agriculture and Transportation**

Windbreaks are a major component of successful agricultural systems throughout the world. Farm windbreaks have their origins in the mid-1400's when the Scottish Parliament urged the planting of tree belts to protect agricultural production (Brandle 2004). Today in North American agricultural systems, windbreaks contribute to both producer profitability and environmental quality by increasing crop production while simultaneously reducing the level of off-farm inputs. The windbreaks can be single rows of one species, typically conifers, or mixed plantings of several woody species including hardwoods and shrubs and multiple rows. Tree windbreaks help control erosion, improve animal health and survival under winter conditions, reduce energy consumption of the farmstead unit, and enhance habitat diversity, providing refuges for predatory birds and insects (Brandle 2004). Windbreaks increase crop yields in the order of 5 to 25% by reducing crop injury and evapotranspiration, reduce agricultural spray drift, improve crop pollination by insects, mitigate impacts to surface and ground water from excessive nutrient loads, improve air quality through respiration and storage of carbon, and modify the regional climate (Brandle 2004; OMAFRA 1994). Despite these benefits, and the best efforts of agencies that deliver farm environmental programs, only 13% of Ontario farms reported having windbreaks or shelterbelts during the Agricultural Census 1996.

The first well-documented use of a windbreak in the transportation industry in North America was a rock snow fence erected in 1868 to protect a railroad cut on the first transcontinental railroad (Tabler 2003). By the 1880's, a tourist guide book reported innumerable wooden snow fences along the Union Pacific Railroad in Wyoming (Tabler 2003). After automobiles came into general use, the construction of snowfences expanded rapidly in Wyoming. Research on snowdrift control methods also began in the United States in the 1930's with F.A. Finney's wind tunnel experiments at Michigan State College (Tabler 2003). A 15 year study on Interstate Highway 80 in Wyoming found that windbreaks reduced snow removal expenditures by one-third to one-half and crashes in blowing snow conditions are being reduced by over 60% (Tabler 2003). Benefit-to-cost ratios for windbreaks based only on reduced cost for snow removal typically range from 50 to 100:1 depending on the quantity of blowing snow (Tabler 2003). Living snow fences, properly designed, are as effective as structural fences and are less costly (Tabler 2003).

#### **4. Why the Use of Drift Control Measures Declined**

Jim Brandle, a leading agricultural windbreaks researcher at the University of Nebraska-Lincoln states that “one of the biggest challenges we face today, is understanding why producers are reluctant to adopt windbreak technology” (Brandle 2004). The reasons that both farmers and transportation agencies overlooked the benefits of windbreaks in the past half century may be rooted in the same factors. Replacement by brute force and institutional memory loss are two reasons Tabler offers for the lack of progress in drift control in the transportation industry (Tabler 2003). Improvements in trucks, locomotives and snowplows beginning in the 1930’s, together with inexpensive fuel and manpower, favoured a “brute force” approach to snow control. With little incentive to improve passive drift control measures, research came to a standstill. As well the effectiveness of snowcontrol measures once in place are not always evident and appreciated by new workers who, not being around to witness the original problem, have no basis for judging the effectiveness of existing control measures. This “institutional memory loss” weakens support for additional drift control work.

In agriculture in North America, the availability of tractors and harvesting equipment since the 1930’s and the focus on larger farms growing single crops, favoured the establishment of large open fields. Windbreaks and fencerows between fields were removed to make way for even larger planters and combines. Institutional memory loss and loss of appreciation for the benefits of windbreaks is furthered in a sector distracted by a bombardment of marketing messages from suppliers of agricultural inputs, chemicals, seeds and equipment. By comparison, windbreaks are an “orphaned” technology, lacking a commercial champion and the marketing resources needed to effectively compete for attention.

#### **5. Development and Delivery of the Communications Plan**

To help address the awareness issue, James Corcoran, an Environmental Planner with MTO applied for and received funding through an Ontario Public Service Innovation Fund Grant. The funds were used to hire a professional agricultural communications-advertising agency. The agency was purposely selected from recognized specialists in the agricultural marketing industry with demonstrated experience in the marketing of crop production inputs, chemicals, seeds and fertilizers to Ontario farmers.

MTO next approached and obtained support from interested government agencies to collaborate in the project including the Ministry of Natural Resources (MNR), the Ministry of Agriculture Food and Rural Affairs (OMAFRA), the Grand

River Conservation Authority (GRCA), Conservation Ontario and the grower group the Ontario Soil & Crop Improvement Association (OSCIA). A small project team of volunteers was assembled from this group who otherwise had no direct organizational relationship but who share a passion for agroforestry and the environment. The project teams' main tasks were to provide technical information to the communications-advertising agency and review and comment on the communications plan and draft communications materials.

A few challenges were overcome along the way. Some individuals within the larger agencies who were not direct members of the project team were initially uncomfortable with wording of the key message proposed by the communications firm which utilized humor to get farmer's attention ("Break wind. Make money."). This objection was overcome when the communications firm obtained feedback from a farmer focus group in support of the messaging.

An ongoing challenge was deciding on the best host/venue for the "call to action" - where does an interested farmer go to get answers to questions, develop a farm windbreak plan and get it planted? A terrific alternative emerged, when Conservation Ontario offered their website and toll free number as the single point of contact on the promotional materials. Conservation Ontario represents the network of 36 Conservation Authorities, the local watershed management agencies that deliver services and programs that protect and manage water and other natural resources in partnership with government, landowners and other organizations. Conservation Authorities promote an integrated watershed approach balancing human, environmental and economic needs. Conservation Authority programs include delivery of agroforestry tree planting projects.

The communications campaign was launched in the fall of 2009 (see Appendix). Deliverables from the communications agency included press releases at major agricultural shows, a brochure available in English and French, ads in the Ontario Farmer Publication and a feature story in the Ontario Farmer. The brochure provides information on the diverse benefits of tree windbreaks or shelterbelts to farmers, including safer roads. It also includes testimonials from some farmers about how windbreaks helped them. The brochure is being distributed this winter to farmers across Ontario by Conservation Authorities, OMAFRA, MNR and OSCIA at grower meetings, conferences, trade shows and workshops.

## **6. Windbreak Planting Activities**

In addition to communications support, MTO is endeavoring to provide support to agencies and groups that deliver farm windbreak planting programs by participating in the cost of plantings at agreed upon locations.

Two essential elements to the success of the program at MTO are firstly the recognition that windbreaks must be designed with the needs of the landowner in mind and, secondly, community based organizations such as Conservation

Authorities are better positioned than a transportation agency to get landowner cooperation for windbreak planting initiatives.

MTO works with different partner agencies depending on what opportunities exist in a given region. Problem areas come to attention in various ways. During a highway project for expansion or rehabilitation, the study project team typically identifies problem areas through public and agency (police) consultation and discussions with highway maintenance patrol staff. In some cases a detailed snowdrift study and remediation plan may be prepared. Problem locations are shared with the partnering agency which contacts the landowners and prepares planting plans with landowners who wish to participate. Participation is voluntary. MTO reviews the plans for funding approval. In most cases there is a large range of placement options for an effective highway windbreak. Adjustments in height and porosity of the windbreak, achieved through plant species selection, and/or adjustments to the amount of snow storage provided in highway ditches, allow for placement from as close to 20 metres from the edge of pavement, to up to 100 metres from the highway. This flexibility allows partnering agencies many alternatives to arrive at a farm windbreak plan that works for the individual landowner.

To date, using this approach, approximately two kilometres of windbreaks has been planted on private lands adjacent to Highway 21 in a traditional snowbelt area in the lee of Lake Huron. More windbreaks are scheduled to be planted on private lands adjacent to Highway 21, Highway 6 and Highway 401 in Southwestern Ontario during 2010 and beyond.

## **7. Summary**

As described, the project contributes to the protection and enhancement of the environment and is aligned with the Ontario government priorities of promoting sustainability, reducing greenhouse gas emissions, mitigating the effects of climate change, reducing environmental contamination by road salt and improving the safety and operational effectiveness of transportation infrastructure.

The approach of working jointly with non-transportation agencies to develop a communications program targeted at farmers represents an innovative and effective way to benefit the agriculture industry and transportation. Farm windbreaks provide agronomic benefits, improve safety and reduce operational cost for the adjacent roadway. The partnership approach and brochure can be modified and applied to other snowy jurisdictions to benefit the transportation community as a whole.

### Works Cited

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- Tabler, R.D. (2003). *Controlling blowing and drifting snow with snow fences and road design*. Niwot, Colorado: NCHRP.

# Appendix



Well-designed windbreaks and shelterbelts can boost crop yields on your farm.

## ***Break wind. Make money.***

We'll help you plan your windbreak project for maximum effectiveness, choose and source the right tree species, help you search out funding for your project, and put you in touch with other farmers who have completed similar projects. Call us today. We're ready to help.



Contact Conservation Ontario at **905-895-0716** or visit our web site at **[www.conservationontario.ca](http://www.conservationontario.ca)** to find out more about getting your tree project growing.



Print Ad Copy

Twenty-five years ago we planted windbreaks around the perimeter of some of our fields. We definitely see earlier germination of crops along the windbreak. Corn plants near the trees germinate 10 days ahead of corn planted further into the field. The pollination and tasseling is five to six days ahead too. The soils warm up faster.

**Bruce Whale**  
Dairy farmer  
Drayton, ON

Our windbreaks are 15 years old. They're laid out in such a way that they scoop the wind and deflect it up. This helps to minimize the barn odour effects for neighbours.

The four rows of windbreaks dramatically reduce wind and water erosion on the long gently sloping farm. As well, the crop yield advantage is very noticeable, extending 10 feet into the field for every foot of tree height. This has been documented through various research projects conducted on the farm.

**Steven Eastep**  
Poultry and swine farmer  
Elara, ON

## We can help get trees planted for your profitability.

Well-designed windbreaks and shelterbelts will boost revenue on your farm.

We'll help you plan your windbreak project for maximum effectiveness, choose and source the right tree species, help you search out funding for your project, put you in touch with other farmers who have completed similar projects, and walk with you through every step of the process.

*We hope we've planted the seed for a great project.*

Call us today. We're ready to help.

Contact Conservation Ontario at 905-895-0716 or visit our web site at [www.conservationontario.ca](http://www.conservationontario.ca) to find out more about getting your tree project growing.



## Break wind, make money.

*How a windbreak adds to your bottom line  
and how we can help get things growing.*



Brochure Outer Panel

## Money Trees

Plant a line of trees and you'll harness the power of multiple wind-buffering, air-cleaning, heat-shading powerplants. You'll change the environment in your fields forever... and for the better.

Here's a taste of the science-backed research that proves the return on investment from a windbreak. It only takes a thin strip of land to deliver a big payoff.

Once you see the benefits a windbreak can deliver to your farm, you'll want to get planting right away. And we're here to help. See the back of the brochure for contact information and get in touch today.

## Research proves it... money does grow on trees

### Higher yields

Soybean yields in Southwestern Ontario were 25 per cent higher and corn yields were six to eight per cent higher in areas sheltered by windbreaks. Hay yields of mixed grasses and legumes in sheltered areas were 20 per cent higher than in open areas during 14 years of comparisons in Nebraska.

### Better crops

Evidence in Ontario shows that windbreaks protect high-value crops, such as strawberries and tree fruits, from sandblasting and bruising.

### Improved spray applications

Cornell University research shows better results where crop protection products are applied in fields sheltered by trees. Shelter-belts located downwind stop drifting crop protection sprays from leaving the field.

### Better crop pollination

Reduced wind speeds allow bees and other pollinating insects to do their yield-enhancing work.

### Earlier planting, faster emergence

Nebraska researchers say average soil temperatures in sheltered areas are slightly warmer than in unprotected areas.

### Later frost in field and forage crops

Research from New Zealand shows that higher humidity levels protect the crop from radiative heat losses, reducing the potential of frost.

### Increased insect predation

Researchers in South Dakota estimate that birds consume about 260 pounds of insects per half-mile of windbreak each year.

### More biodiversity

Buffers invite more biodiversity. Researchers in Quebec found that wildlife only use windbreaks as a corridor between larger woodlots, not as a residence, thus minimizing any increase in crop damage.

### Livestock comfort

Research shows reduced feeding costs, higher survival rate and increased milk production when livestock are protected from wind.

### Lower barn costs

The Canadian Pork Council reports a 20 to 30 per cent reduction in energy consumption in a 600-sow farrow-to-finish hog barn when it's sheltered by a row of trees.

### Reduced soil erosion

The state extension forester in Utah writes that windbreaks prevent wind erosion for a distance of 10 to 20 times their height downwind.

### Better odour control

A well-planned windbreak can reduce odour by causing increased turbulence - which moves air and odour plumes up and away from the source.

### Safer roads

Windbreaks can significantly reduce blowing and drifting snow on roads when positioned 15 to 100 metres or more from the edge of the roadway.



## **Plan the spring planting of a profit-producing windbreak now**

*Local Conservation Authorities can help landowners access trees, technical support and funding*

**Newmarket, Ontario – September 16, 2009** – Fall is a great time to start planning a new windbreak. And while you're considering the perfect spot, consider how much it will boost revenue on your farm.

Conservation Ontario, in partnership with the Ontario Soil and Crop Improvement Association and the Province of Ontario, has summarized the benefits of planting a windbreak in a brochure being distributed to Ontario farmers. A downloadable copy of the brochure is available at [www.conservationontario.ca](http://www.conservationontario.ca).

There are documented benefits to shelterbelts. Research shows that soybean yields in Southwestern Ontario were 25 per cent higher and corn yields were six to eight per cent higher in areas sheltered by windbreaks. Research has also shown, among other things, improved spray applications, better crop pollination, earlier planting, faster emergence and better odour control around barns – all things associated with properly positioned tree windbreaks.

“Twenty-five years ago we planted windbreaks around the perimeter of some of our fields,” says Bruce Whale, a dairy farmer at Drayton, ON. “We definitely see earlier germination of crops along the windbreak. Corn plants near the trees germinate 10 days ahead of corn planted further into the field. The pollination and tasseling is five to six days ahead too. The soils warm up faster.”

There is plenty of upside to planting a windbreak, not the least of which is safer winter driving. Even a windbreak planted as far away as 100 meters from the road may significantly reduce blowing and drifting snow.

“Producers should contact their local Conservation Authority this fall,” says Jo-Anne Rzakki, Coordinator, Watershed Stewardship at Conservation Ontario. “Experts across Ontario are meeting with producers this fall, providing technical support and advice. They're also booking orders now for trees to be planted next spring.”

Your local Conservation Authority will help you plan your tree project for maximum effectiveness, choose and source the right species of tree seedlings, and walk with you through every step of the process.

Conservation Authorities across Ontario can also provide direct access and links to various sources of funding. “Depending on your project, there may be funding available from a number of government and non-government organizations,” says Rzakki. “Contact your local Conservation Authority now. They'll know the best steps to take and what is available in your watershed area.”

Contact Conservation Ontario at **905-895-0716** or visit our web site at [www.conservationontario.ca](http://www.conservationontario.ca) for links to your local Conservation Authority and more about getting your tree project growing.

Press Release

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Ontario research shows yield gains for nearby crops, and they'll also help decrease barn odours

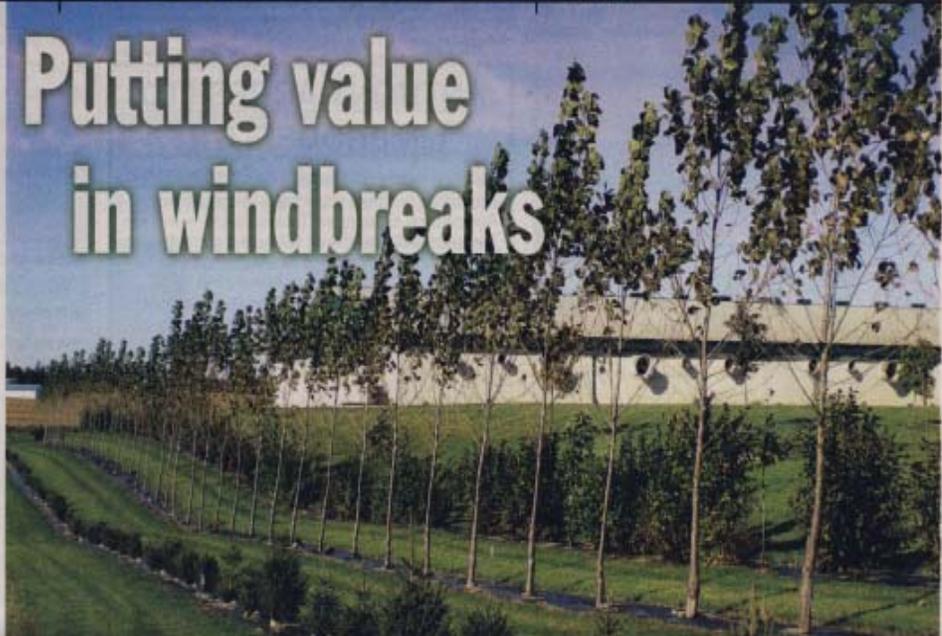
**BY HELEN LAMMERS-HELPS**  
*Ontario Farmer*

**F**arms can find economic advantages by planting windbreaks.

Yield increases are one of many known benefits of windbreaks. Research in Ontario shows yield increases of 25 per cent for corn and six to eight per cent for soybean in the area downwind of a windbreak. Ontario research has also shown that high value crops such as strawberries and tree fruits are protected from sand blasting and bruising by windbreaks.

The rule of thumb is that the area protected by the windbreak is at least

# Putting value in windbreaks



Feature Story Ontario Farmer Magazine