Transportation Agency Tool to Analyze Benefits of Living Snow Fences

**Tool Team**
Gary Wyatt, Extension Educator
Dean Current, CINRAM Program Director
Diomy Zamora, Extension Educator
Dan Gullickson, MN/DOT Forester
David Smith, Research Assistant

**Other Team Members**
Steve Taff, Extension Economist
Sierra Schroeder, Research Assistant
Dinesh Paudel, Research Assistant
Joe Knight, Asst. Professor
Don Kilberg, Researcher
Economic and Environmental Costs and Benefits of Living Snow Fences: Safety, Mobility, & Transportation Authority Benefits, Farmer Costs, & Carbon Impacts

- Focus Groups and Surveys of Landowners and Agency Staff
- Costs of LSF and Standing Corn to Landowners
- Carbon Emissions and Sequestration
- MnDOT’s Cost Savings and Accident Reduction with LSF and Standing Corn
- Transportation Agency Tool
Presentation Overview

- Blowing Snow Problems
- Snow Fences
- Transportation Agency Tool
- Selected Recommendations
- Future Research
Transportation Agency Tool to Analyze Benefits of Living Snow Fences
Blowing Snow Problems

Blow-Ice

Drifting Snow

MnDOT

Transportation Agency Tool to Analyze Benefits of Living Snow Fences
Snow Fences

Snow fences reduce drifting, increase visibility for drivers

Travelers through the Rockies and much of the interior West will face blowing and drifting snow today. Danger to drivers will be reduced in areas where properly built and located snow fences are installed.

1. Wind is forced to go around and through the snow fence, losing speed and energy.

2. Suspended snow particles drop out as wind speed decreases, forming drifts in front of and behind the fence.

3. Very little snow reaches the road, keeping lanes open and increasing visibility.

Ideally, the fence should be set back from the shoulder a distance 35 times the height of the fence. Placing the fence too close to the roadway can make drifting problems worse.
Living Snow Fences

Transportation Agency Tool to Analyze Benefits of Living Snow Fences

MnDOT
Do they work?
Standing Corn Rows
This Honeysuckle single row protects MN-Hwy 30

8 ft.

Snow catch area, south of planting

Transportation Agency Tool to Analyze Benefits of Living Snow Fences
Miles Protected from LSF and Standing Corn Rows

Transportation Agency Tool to Analyze Benefits of Living Snow Fences
## Potential Benefits

### MnDot
- Net benefits $1.3 million
- Expand the program to 40% of snow problem areas (from 2%)
- Use tool for detailed analysis

### Economic
- Net benefits $14 million
- Expand the program to 65% of snow problem areas

### Other Transportation Agencies
- Implement LSF program and analyze snow problem areas
- Coordinate with conservation agencies

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*Living snow fences
Economic, transportation & environmental benefits*
Standing Corn Row and Living Snow Fence
Transportation Agency Tool
Objectives

- Cost/Benefit Analysis
- Estimate Payment Ranges
- Integrate MnDOT Snow Problem Database
- Functional beyond MnDOT
- Useable
Tool

- Excel Based (VBA Macros)
- Single File
- Beta Tested
- Version 1.0 release soon
MnDOT Snow Problem Database

Transportation Agency Tool to Analyze Benefits of Living Snow Fences
Design LSF & SC

Transportation Agency Tool to Analyze Benefits of Living Snow Fences
## Traffic & Crashes

### 6. Traffic

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Average Daily Traffic (AADT) (vehicle/day)</td>
<td>460</td>
<td>460 Seg ID</td>
</tr>
<tr>
<td>AADT Growth rate (annual %)</td>
<td>0%</td>
<td>0% Seg ID</td>
</tr>
<tr>
<td>Heavy Commercial Average Daily (HCAADT) (vehicle/day)</td>
<td>105</td>
<td>105 Seg ID</td>
</tr>
<tr>
<td>HCAADT Growth Rate (annual %)</td>
<td>0%</td>
<td>0% Seg ID</td>
</tr>
<tr>
<td>Time to Regain Bare-Lane (hours)</td>
<td>2.0</td>
<td>22.5</td>
</tr>
<tr>
<td>Traffic Speed (mph)</td>
<td>55</td>
<td>55 Road Type</td>
</tr>
<tr>
<td>Traffic Speed Reduction (mph)</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

### 7. Snow & Ice Related Crashes

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatal Crash (K) per 11 years</td>
<td>0</td>
<td>0 Seg ID</td>
</tr>
<tr>
<td>Incapacitating Injury (A) per 11 years</td>
<td>0</td>
<td>0 Seg ID</td>
</tr>
<tr>
<td>Non-Incapacitating (B) per 11 years</td>
<td>1</td>
<td>0 Seg ID</td>
</tr>
<tr>
<td>Possible Injury (C) per 11 years</td>
<td>11</td>
<td>0 Seg ID</td>
</tr>
<tr>
<td>Property Damage Crash (N) per 11 years</td>
<td>1</td>
<td>1 Seg ID</td>
</tr>
</tbody>
</table>
**Blow Ice & Drifting Snow**

### 10. Blow Ice

<table>
<thead>
<tr>
<th>a) Blow Ice Events (#/year)</th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Plow Truck Class (Class)</td>
<td>330: Single Axle</td>
</tr>
<tr>
<td>c) Average Plow Truck Hours (hours/event)</td>
<td>2</td>
</tr>
<tr>
<td>d) Average Plow Truck Mileage (miles/event)</td>
<td>40</td>
</tr>
<tr>
<td>e) Treatments per event (#/event)</td>
<td>1</td>
</tr>
<tr>
<td>f) Application Rate (lbs/lane mile)</td>
<td>300</td>
</tr>
<tr>
<td>g) Sand (%)</td>
<td>0%</td>
</tr>
<tr>
<td>h) Salt (%)</td>
<td>100%</td>
</tr>
</tbody>
</table>

### 11. Drifting Snow

<table>
<thead>
<tr>
<th>Equipment Classification Codes</th>
<th>Events Using Equipment</th>
<th>Average # of Pieces of Equipment</th>
<th>Average Equipment Hours</th>
<th>Equipment Mileage</th>
<th>Attachments</th>
</tr>
</thead>
<tbody>
<tr>
<td>330: Single Axle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>344: V-Wane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Transportation Agency Tool to Analyze Benefits of Living Snow Fences* 5/31/12
Installation Costs

Transportation Agency Tool to Analyze Benefits of Living Snow Fences
Establishment & Maintenance Costs

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimate</th>
<th>Suggestion</th>
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</thead>
<tbody>
<tr>
<td>2012</td>
<td>$660</td>
<td>$609</td>
</tr>
<tr>
<td>2013</td>
<td>$660</td>
<td>$731</td>
</tr>
<tr>
<td>2014</td>
<td>$660</td>
<td>$819</td>
</tr>
<tr>
<td>2015+</td>
<td>$660</td>
<td>$798</td>
</tr>
</tbody>
</table>

Legend:
- User Input: Blank
- User Input: Value
- Calculated
- Suggested

Transportation Agency Tool to Analyze Benefits of Living Snow Fences
Selected Program
Recommendations
Contract Length/Rental Payment

**Issue**: When landowners sign up for an LSF contract they usually sign up for a fixed rental rate for the length of the contract.

**Recommendations**:  
- Adjust payments annually based publicly available land price index.
Maintenance Costs/ Uncertainty

**Issue:** In current contracts landowners are responsible for maintaining the LSF and making sure vegetation survives.

**Recommendations:**
- MnDOT should ensure that all potential maintenance activities required over the life of a contract are covered.
- Higher payments the first 3-4 years
- Cover the cost of tree removal at contract end.
Incentive/Payments

**Issue:** There was some discussion of how incentives might be provided to landowners. Some stretches of roadways would have priority and a greater value for MnDOT.

**Recommendations:**
- Increase over the minimum payment for priority snow problem area (e.g. super-elevated curves, high accident rates)
Future Research

- Translate Tool to Web
- Econometric Analysis of Installation Costs
- Willingness to Plant Living Snow Fences
Thank You

- Minnesota Department of Transportation for funding and supporting our project.
- Center for Transportation Studies for recognizing our research with the John S. Adams Award for Excellence in Transportation Research and Education.