



Transportation Agency Tool to Analyze Benefits of Living Snow Fences

Tool Team

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UNIVERSITY OF MINNESOTA
EXTENSION



**Center for Integrated Natural Resources
& Agricultural Management**

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

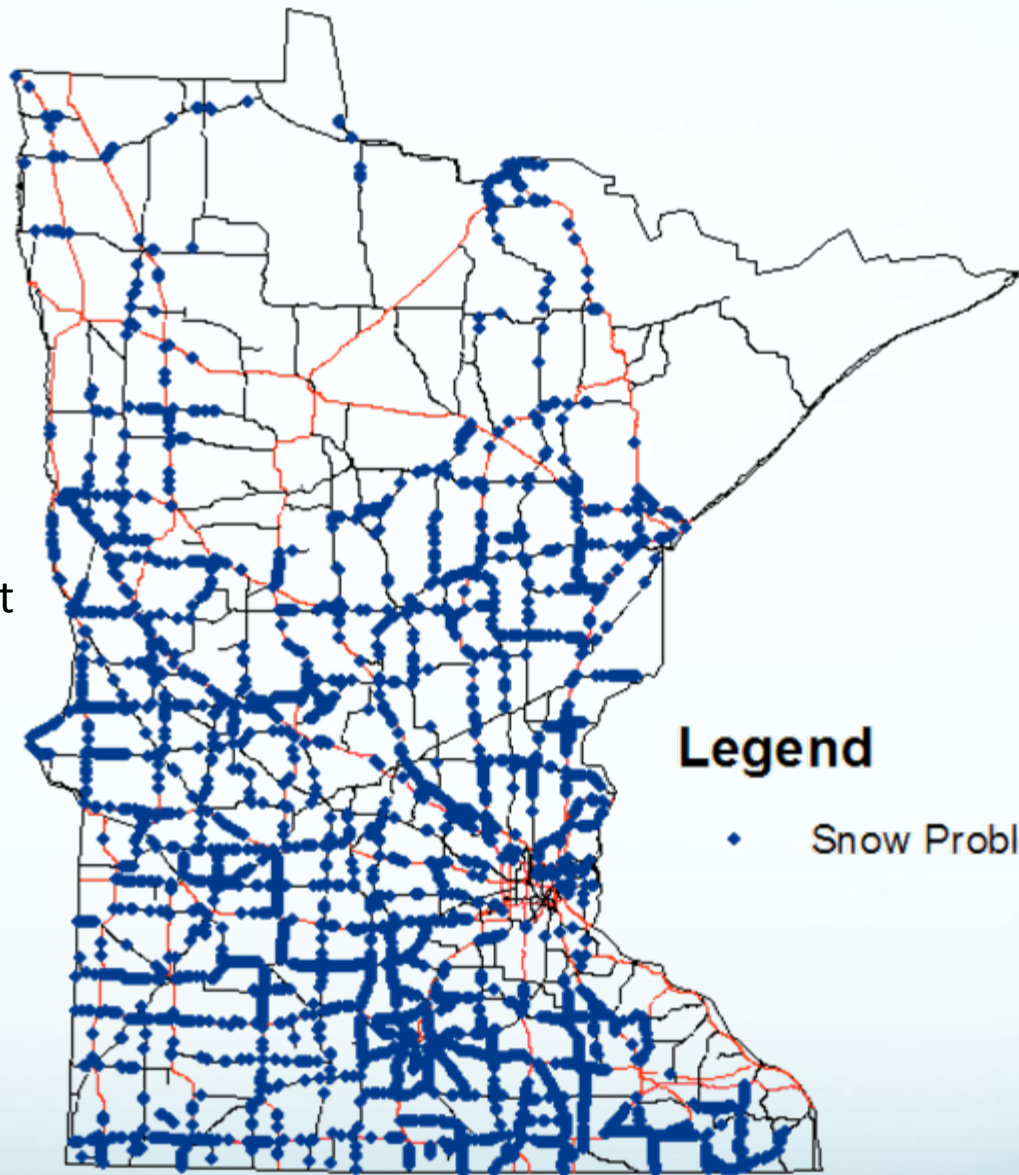
08/09/2013

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
- Future of Tool



Snow Problem Areas
3,700
Median Length 955 Feet

Legend

• Snow Problem

Blowing Snow Problems



Blow-Ice

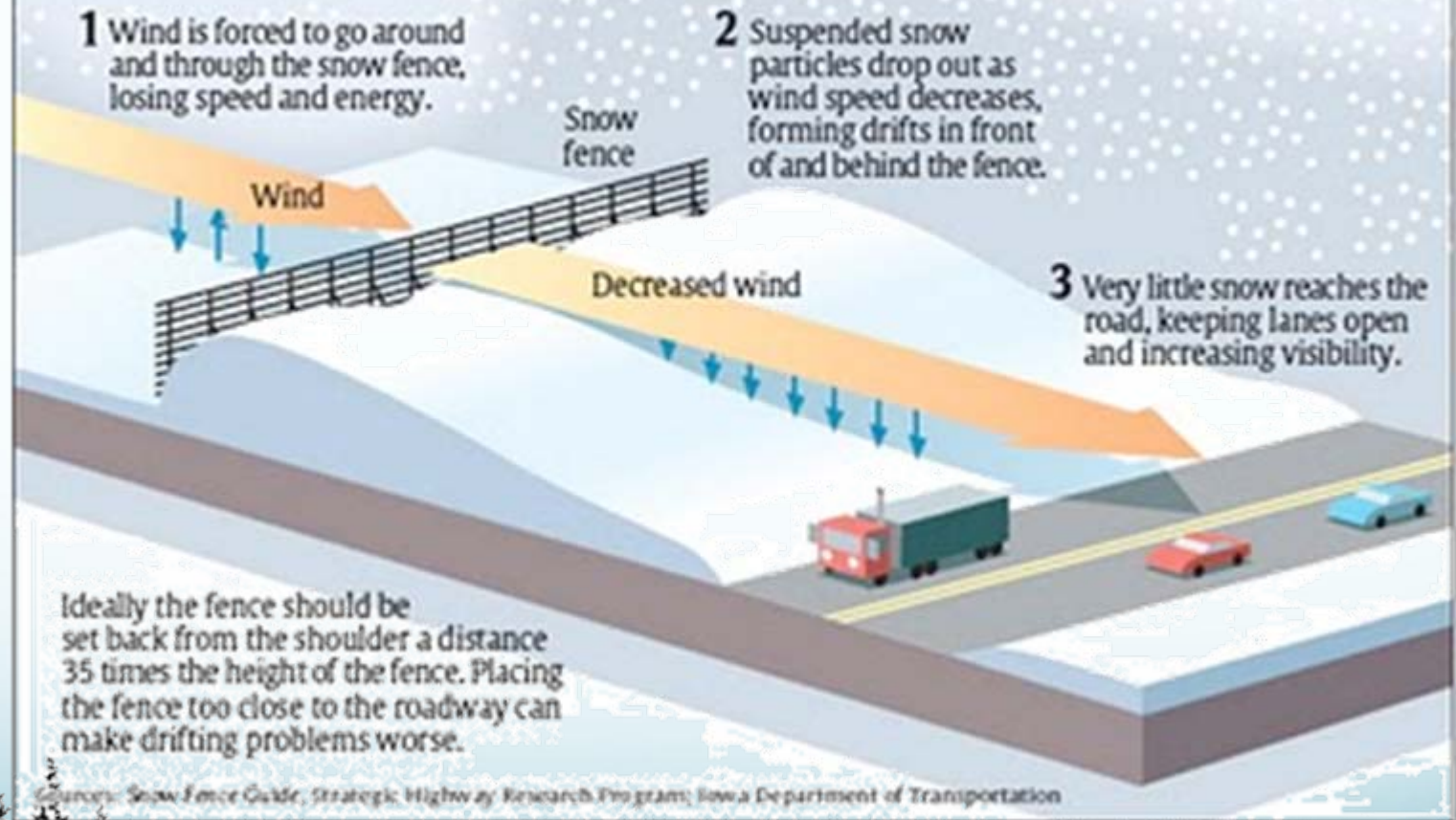
Drifting Snow



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.



by Bob Swanson, Jeff Dorese and Sam Ward, USA TODAY

Do they work?



Standing Corn Rows



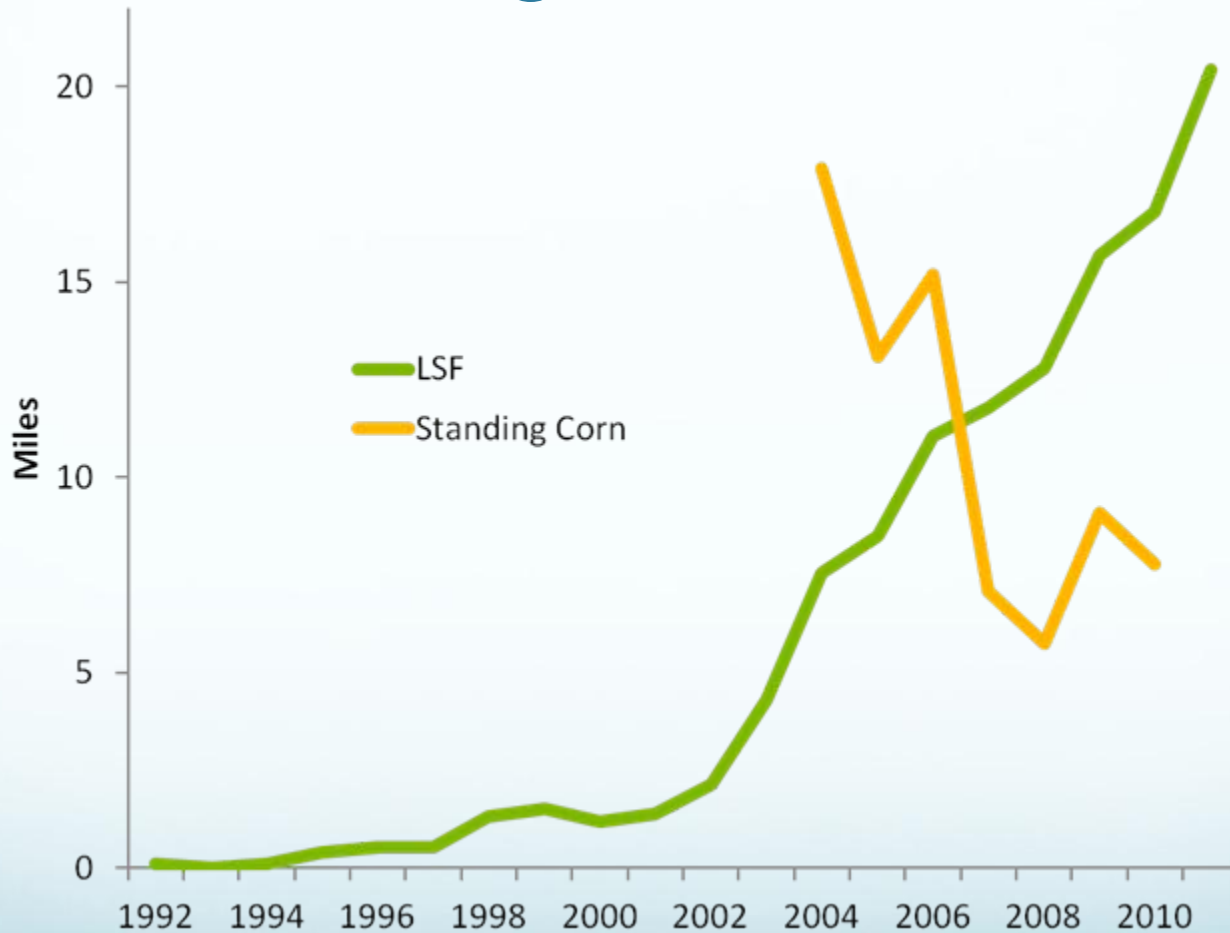
This Honeysuckle single row protects MN-Hwy 30



8 ft.

Snow catch area, south of planting

Miles Protected from LSF and Standing Corn Rows



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

Standing Corn Row and Living Snow Fence Transportation Agency Tool

<http://z.umn.edu/lstcal>



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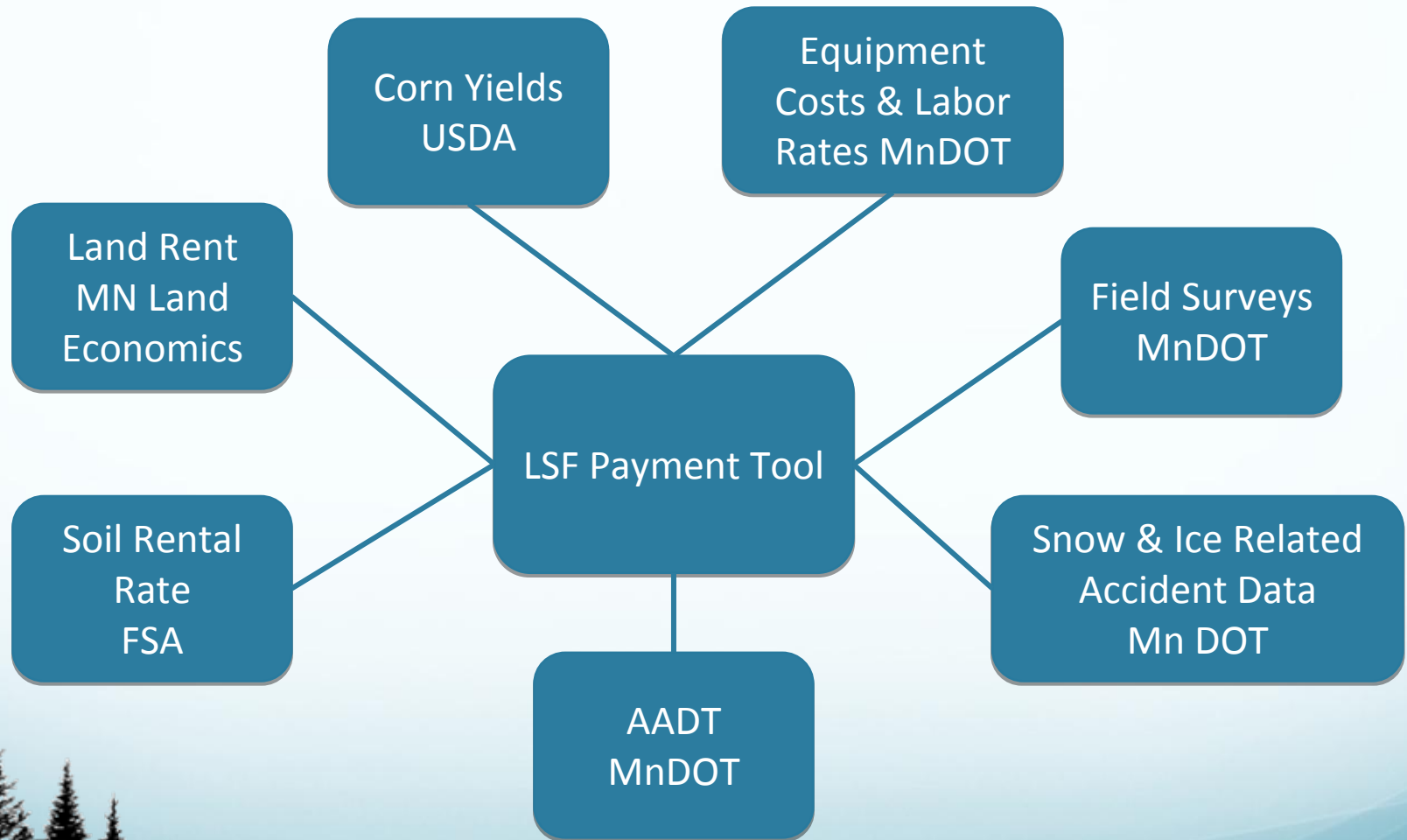
08/09/2013

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Objectives

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

Databases



Tool

- Excel Based (VBA Macros)
- Single File
- Beta Tested
- Version 1.0 release soon
- Web Version in future

Selected Features

Legend

User Input: Blank



User Input: Value



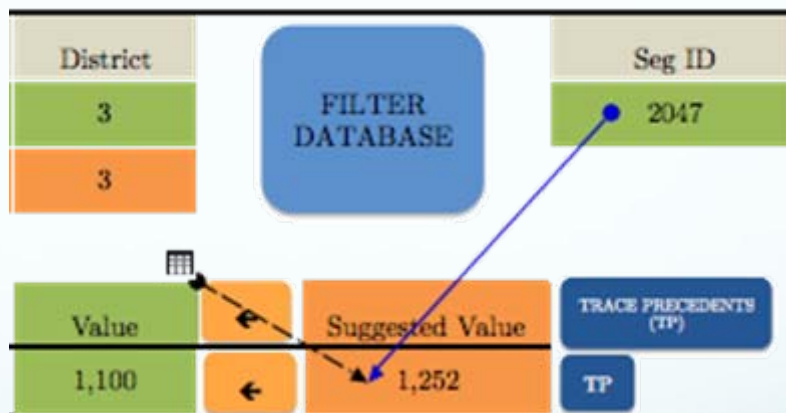
Calculated



Suggested



Value	←	Suggested Value
	←	1,252
Value	←	Suggested Value
1,252	←	1,252
Value	←	Suggested Value
1,100	←	1,252



MnDOT Snow Problem Database

Legend

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

1.) Filter List to locate Segment ID

County	Road Number	District
30		

FILTER DATABASE

Seg ID
2047

	K	L	M	N							
	TMA	TMZ	SUBAREAD	Plow Route							
9.642	39.465	39.635		I-90: Jct. MN 91 to Jct. US. 59							
9.292	39.175	39.285		I-90: Jct. MN 91 to Jct. US. 59							
8.698	38.591	38.689		I-90: Jct. MN 91 to Jct. US. 59							
7.648	37.579	37.641		I-90: Jct. MN 91 to Jct. US. 59							
7.291	36.916	37.284		I-90: Jct. MN 91 to Jct. US. 59							
0.739	50.251	50.729		I-90: US 59 to Jct. CSAH 9							
0.221	49.989	50.211		I-90: US 59 to Jct. CSAH 9							
8.741	48.434	48.726		I-90: US 59 to Jct. CSAH 9							
48.3	48.035	48.285		I-90: US 59 to Jct. CSAH 9							
7.303	47.037	47.283		I-90: US 59 to Jct. CSAH 9							
6.541	46.379	46.521		I-90: US 59 to Jct. CSAH 9							
6.308	45.932	46.288		I-90: US 59 to Jct. CSAH 9							
8.504	43.362	43.498		I-90: Jct. MN 91 to Jct. US. 59							
1.367	41.203	41.357		I-90: Jct. MN 91 to Jct. US. 59							
1.106	41.004	41.096		I-90: Jct. MN 91 to Jct. US. 59							
0.527	40.262	40.518		I-90: Jct. MN 91 to Jct. US. 59							
1.987	34.677	34.983		I-90: Jct. MN 91 to Jct. US. 59							
0.045	0	0.045		0							
8.584	33.216	33.584		I-90: Jct. MN 91 to Jct. US. 59							
8.522	32.178	32.522		I-90: Jct. MN 91 to Jct. US. 59							
0.887	30.538	30.882		I-90: Jct. MN 91 to Jct. US. 59							
0.392	30.193	30.387		I-90: Jct. MN 91 to Jct. US. 59							
				I-90: Jct. US 75 to Jct. MN 91							
948	948	70100000090663	24.1	0	Adrian	24.64	24.69	24.635	24.685		I-90: Jct. US 75 to Jct. MN 91
949	949	70100000090664	23.38	0	Adrian	23.067	24.402	23.803	24.397		I-90: Jct. US 75 to Jct. MN 91
1115	1115	72200000000809	3.6	0		23.063	23.705	23.059	23.701		I-90: Jct. US 75 to Jct. MN 91
3769						3.58	3.62	3.58	3.62		0

Design LSF & SC

Legend

User Input: Blank	Yellow
User Input: Value	Green
Calculated	Red
Suggested	Orange

2) Snow Problem Area		(unit)	Value	←	Suggested Value	TRACE PRECEDENTS (TP)
a) Snow Problem Length	(feet)	1,100	←	1,252	TP	
b) Road Type	(list)	MNTH	←	MNTH	TP	
c) Superelevated (SE) Curve	(Yes, No)	N	←	N	TP	
d) Land Value	(\$/acre)	\$1,384	←	\$1,384	TP	
e) Land Rental Rate	(\$/acre)	\$42	←	\$42	TP	
3) Snow Fence Design						
a) Fence Setback	(feet)	80	←	80	TP	
b) Snow Fence (SF) Length	(feet)	1,180	←	1,180	TP	
4) Living Snow Fence (LSF)						
a) LSF Width	(feet)	73	←	40	TP	
b) LSF Area	(acre)	1.8	←	2.0	TP	
c) Conservation Program	(CRP, EQIP, N)	EQIP				
d) FSA Soil Rental Rate (SRR)	(\$/acre)	\$19	←	\$71	TP	
e) Rows of Trees/Shrubs	(#)	2				
f) Snow Catch Enrolled in CRP	(Yes, No)	No				
g) Snow Catch CRP Area	(aces)	0.0				

Traffic & Crashes

Legend

User Input: Blank

User Input: Value

Calculated

Suggested

6) Traffic

a) Annual Average Daily Traffic (AADT) (vehicle/day)	460	←	460	TP
b) AADT Growth rate (annual %)	0%	←	0%	TP
c) Heavy Commercial Average Daily (HCAADT) (vehicle/day)	105	←	105	TP
d) HCAADT Growth Rate (annual %)	0%	←	0%	TP
e) Time to Regain Bare-Lane (hours)	2.0	←	22.5	TP
f) Traffic Speed (mph)	55	←	55	TP
g) Traffic Speed Reduction (mph)	20			

7) Snow & Ice Related Crashes

(a) Fatal Crash (K) (per 11 years)		←	0	TP
(b) Incapacitating Injury (A) (per 11 years)		←	0	TP
(c) Non-Incapacitating (B) (per 11 years)		←	0	TP
(d) Possible Injury (C) (per 11 years)		←	0	TP
(e) Property Damage Crash (N) (per 11 years)		←	0	TP

Legend

User Input: Blank	Yellow
User Input: Value	Green
Calculated	Red
Suggested	Orange

Blow Ice & Drifting Snow

10) Blow Ice		(unit)	
a) Blow Ice Events	(#/year)	21	Y
b) Truck Class	(class)	330: Single Axle	Blow Ice: When snow blowing over a roadway melts and refreezes creating a section of ice.
c) Truck Time	(hours/event)	2	
d) Truck Mileage	(miles/event)	40	
e) Treatments per event	(#/event)	1	
f) Application Rate	(lbs/lane mile)	300	
g) Sand	(%)	0%	
h) Salt	(%)	100%	

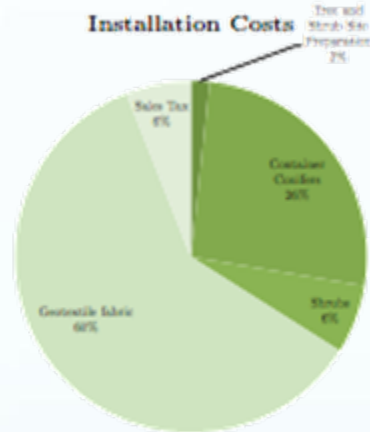
11) Drifting Snow						
	Equipment (class)	Events Using Equipment (#/year)	Equipment Quantity (#/event)	Equipment Time (hours/#/event)	Equipment Mileage (miles/#/event)	Attachments
a)	330: Single Axle	21	1	2	40	
b)						
c)						

Installation Costs

Legend

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

Installation Costs		RESET USER INPUTS
1. Tree and Shrub Site Preparation	875	
2. Bareroot Trees		
3. Container Conifers	\$1,140	
4. Shrubs	\$278	
5. Planting		
6. Weed or insect control		
7. Native Grass Site Preparation		
8. Native Grass Seed		
9. Geotextile fabric	\$2,640	
10. Sales Tax	\$204	← Suggested Value
11. Total Producer Costs	\$4,307	← \$3,718 TP



Farmer/Landowner Name: _____
 Address: _____
 City: _____
 State: _____
 Zip Code: _____ FSA Farm No.: _____
 Phone Number: _____ FSA Tract No.: _____

Trunk Highway _____ Control Section _____ Reference Post _____ to _____
 County _____ Township _____ Section _____

Insert eligible CRP costs from producer receipts/bills:

1. Tree and Shrub Site Preparation on _____ acres \$ _____
2. Number of Bareroot Trees is _____ at a cost of \$ _____
3. Number of Container Conifers is _____ at a cost of \$ _____
4. Number of Shrubs is _____ at a cost of \$ _____
5. Cost of planting line items 2, 3, 4 from above \$ _____
6. Cost of one weed or insect control within 24 months (Note:CRP C/S is only authorized if this component is needed for the cover establishment) \$ _____
7. Site Prep cost for Native Grasses on _____ acres \$ _____
8. Native Grass Seed cost for _____ acres (Note: seeding rate of 15 pounds per acre maximum) \$ _____
9. Geotextile fabric (plastic mulch) cost on _____ feet (FSA will only be providing CRP C/S for this component in areas of 25 inch or less rainfall according to 2-CRP (Rev 4) Part 20) \$ _____
10. Sales Tax \$ _____
11. Total producer costs for line items 1-10 \$ _____

Establishment & Maintenance Costs

Legend

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

RESET USER INPUTS									
Estimate					Suggestion				
	1	2	3	4+		1	2	3	4+
	2012	2013	2014	2015+		2012	2013	2014	2015+
<u>Mowing</u>									
<u>Weeding</u>									
<u>Watering</u>									
<u>Replanting</u>									
<u>Spot Spraying</u>									
<u>Other</u>	\$660	\$660	\$660	\$660					
Subtotal	\$660	\$660	\$660	\$660		\$691	\$731	\$191	\$79
					per acre	\$384	\$406	\$106	\$44
<u>Inconvenience cost</u>	\$59	\$59	\$59	\$59	←	\$54	\$54	\$54	\$54
					per acre	\$30	\$30	\$30	\$30
<u>Production Losses</u>	\$142	\$142	\$142	\$142	←	\$130	\$130	\$130	\$130
					per acre	\$72	\$72	\$72	\$72
Subtotal	\$184	\$184	\$184	\$184					
Total	\$844	\$844	\$844	\$844					

Segment ID: 2047
County: Aitkin
Road Num: 47
Milepost: 109.4

User: David Smith

Costs and Benefits of Living Snow Fence

A) Costs *15 year NPV*

Installation	-\$4,397	cost of installing living snow fence
Annual	-\$15,624	maintenance, inconvenience, rent
Total	-\$20,021	total costs of installation, maintenance, inconvenience, & rent

B) Cost Share & Annual Payments

Installation Cost Share	\$2,178	installation cost share from FSA (CRP) or NRCS (EQIP)
Soil Rental Rate Payment	\$0	soil rental rate payment from FSA
Total	\$2,178	total

C) Transportation Agency (MnDOT)

Blow Ice	\$67,608	equipment (capital, fuel, ...), trans. operator, sand/ salt
Drifting	\$58,462	equipment (capital, fuel, ...), trans. operator
Total	\$126,070	total savings from reduce blow ice and drifting snow problems
Net (Benefits - Costs)	\$108,228	savings minus costs (15 year)

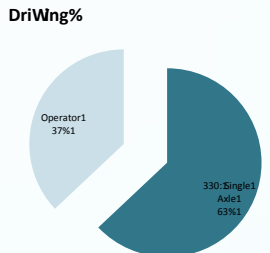
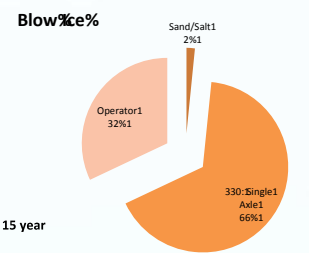
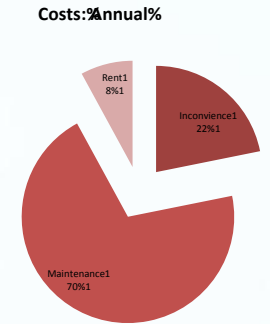
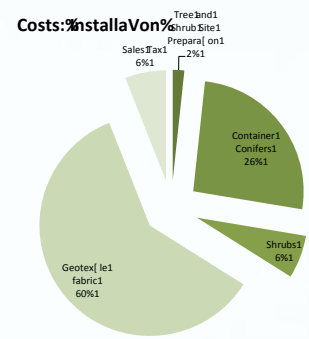
D) Benefits to Society

Avoided carbon emissions	\$5,831	reduced fuel use & carbon sequestration
Avoided travel time	\$402	reduced travel time including heavy commercial traffic
Avoided accidents	\$0	fatal, injuries, property damage
Transportation Agency	\$126,070	see C)
Total	\$132,304	total
Net (Benefits - Costs)	\$112,283	

E) Annual Payments *per acre*

Annual payment	Min	Max	
		MN DOT	Society
	\$510	\$5,362	\$5,911
Land value	\$1,384	\$178,746	\$197,022

average annual payment range
equivalent purchase price range



15 year Crashes

Fatal (K)	Incapacitating Injury (A)	Incapacitating (B)	Possible Injury (C)	Damage Crash (N)	Total
#	#	#	#	#	#
0.00	0.00	0.11	1.20	0.11	1.42

Travel Time

Car Drivers (hours)	heavy Commerical (hours)
28.24	5.97

Fuel/Sand/Salt

Avoided Fuel (gallons)	Avoided Sand (lbs)	Avoided Salt (lbs)
5,261	0	39,375

Snow & Ice Removal Equipment

Equipment (Hours)	Equipment (miles)	rans. Operator (hours)
630	25200	1260

Carbon

Avoided (ton CO2)	Sequestered (ton CO2)	Total Carbon (ton CO2)
58	108	166



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Future

- Translate Tool to Web
 - Non-state specific
 - Transportation Agency Database Management



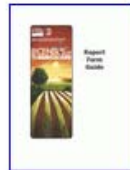
Also See

- > Report Forms and Instructions
- > Search Tips
- > Frequently Asked Questions
- > Site Map

2012 Census Report Forms and Instructions

The following are samples of the report forms and the report form guide for the 2012 Census of Agriculture.

Report Form Guide



[2012 Census Report Form Guide](#)

Instruction Sheets

[Regions 1 - 6 Instruction Sheets](#)

[Hawaii, Region 7, Instruction Sheet](#)

Report Forms

To view a sample of the report form for your state, select your region from the list below.



Thank You

- Minnesota Department of Transportation for funding and supporting our project.
- Dan Gullickson, MnDOT Forester

Web Sites

<http://z.umn.edu/lsfcal>

<http://z.umn.edu/lsf>

Questions....

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