



RESEARCH SERVICES

OFFICE OF POLICY ANALYSIS,
RESEARCH & INNOVATION

TECHNICAL SUMMARY

Technical Liaison:

Dan Gullickson, MnDOT
Daniel.Gullickson@state.mn.us

Project Coordinator:

Dan Warzala, MnDOT
Dan.Warzala@state.mn.us

Principal Investigator:

Gary Wyatt, University of
Minnesota Extension

PROJECT COST:

\$99,000



A snow fence can be as simple as two rows of corn that form a barrier to snow drifting onto roadways.

Evaluating the Costs and Benefits of Living Snow Fences

What Was the Need?

Blowing or drifting snow on roadways is a major transportation safety and efficiency concern, causing accidents and requiring expensive snow removal and other maintenance. This issue can be especially problematic near farmlands, where snow can drift onto roadways from harvested fields. To address this problem, MnDOT has operated a program that pays landowners in identified problem areas to plant living snow fences. LSFs consist of trees, shrubs or standing corn rows designed to serve as windbreaks to reduce the volume of snow that blows or drifts onto the roadways. MnDOT traffic safety data suggest that using LSFs can reduce snow- and ice-related accidents by 40 percent on roadways with super-elevated curves.

However, inducing landowners to participate in the LSF program has been difficult, and as of 2011 MnDOT had only used 12 percent of its LSF budget, obtaining contracts for just 2.3 percent of problem sites. The current level of payments offered to landowners may not be a sufficient incentive to establish and maintain LSFs, and research was needed to determine a payment structure that will increase adoption rates while remaining cost-effective.

What Was Our Goal?

The goal of this project was to develop a calculator for estimating optimal LSF program payments to landowners by identifying costs, benefits and obstacles to implementing the program.

What Did We Do?

Researchers began by conducting focus groups to get input from landowners about their costs for establishing and maintaining snow fences, and the constraints that limit landowner participation in the LSF program. Researchers also conducted an online survey of key staff at MnDOT and other agencies to get their perception of the value of LSFs, their familiarity with the LSF program, and whether they had sufficient resources and time to implement LSFs.

Researchers then conducted a detailed financial analysis to improve estimates of LSF costs to landowners by examining agency records, conducting interviews with agency representatives and conducting on-farm interviews with current LSF participants. They quantified the benefit of LSFs in terms of reduced greenhouse gas emissions from reduced use of snow removal equipment and carbon sequestration by vegetation as well as costs avoided due to the reduced number of crashes caused by blowing and drifting snow.

Using all of the data collected in this study on costs and benefits of LSFs, researchers developed the Living Snow Fence Payment Calculator, a software tool that allows users to calculate optimal LSF payments to landowners by analyzing per-acre cost-benefit ratios in terms of avoided road maintenance and safety costs and reduced carbon emissions.

By contracting 40 percent of sites with snow problems to the Living Snow Fences program, MnDOT could save \$1.3 million per year. LSFs improve driver visibility and road surface conditions, and have the potential to reduce accidents, snow removal costs and removal equipment emissions.

“Of about 3,800 possible LSF sites in Minnesota, not all have the same traffic, crash rates and snow problems. The tool developed in this project will allow personnel to prioritize LSF funding to target the most critical sites.”

—Dan Gullickson,
Living Snow Fence
Program Coordinator,
MnDOT Office of
Environmental
Stewardship

“The Living Snow Fence Payment Calculator will help agency staff work with local landowners to arrive at a realistic, economical and cost-effective payment for land practices protecting state and local highways.”

—Gary Wyatt,
Agroforestry Extension
Educator, University of
Minnesota Extension

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Minnesota Department
of Transportation Research Services
MS 330, First Floor
395 John Ireland Blvd.
St. Paul, MN 55155-1899
(651) 366-3780

www.research.dot.state.mn.us



Greg Menses, MnDOT District 8

Segments of roads with LSFs (right) have better driver visibility and road surface conditions than those without (left), leading to lower road maintenance costs and fewer accidents. LSFs can also benefit the atmosphere by storing carbon dioxide and reducing emissions from snow removal operations.

What Did We Learn?

Focus group participants discussed a variety of costs and constraints to landowner participation in the LSF program and most frequently mentioned life-cycle costs associated with the implementation, maintenance and removal of snow fences. Some participants said compensation was insufficient to cover all costs.

Agency survey results indicated great interest in LSF and a high confidence that it is effective. While agency staff has the technical competence needed to promote and implement the program, time and funding are limited, and 36 percent of agencies felt they were not equipped to conduct LSF plantings.

Based on agency and landowner feedback, researchers recommend improving the LSF program in the following ways:

- **Payments.** Create shorter and more flexible contracts with a flexible formula that accounts for varying maintenance costs, inflation of land values, crop yield, production costs, inconvenience factors, income or financial benefit received, and the price of corn. Consider increasing payments in the first three years to reflect greater maintenance costs, compensating for the removal of trees at the end of the agreement, paying for the entire area between the snow fence and right of way to reduce the difficulty of farming around it, and allowing a single strip of standing corn rather than the recommended two strips.
- **Prioritization.** Target landowners in problem areas by considering bonus payments for locations with high potential benefits, such as those with high accident rates.
- **Promotion.** Promote LSFs by improving education materials to give a clear and complete presentation of the program to landowners, showing concrete information about what is required of them and expected payments and benefits. Consider door-to-door visits to landowners, providing incentives and training to LSF participants to promote the program to other landowners, and establishing a dedicated LSF staff member in each agency office.

What's Next?

Researchers suggest that once MnDOT snowplows are fully equipped with GPS, resulting data should be used to quantify sand and salt applications to determine where snow fences are needed most and what impact they are having. Further research is also needed on the effectiveness of various plant species for use as LSFs.

This Technical Summary pertains to Report 2012-03, “Economic and Environmental Costs and Benefits of Living Snow Fences: Safety, Mobility, and Transportation Authority Benefits, Farmer Costs, and Carbon Impacts,” published February 2012. The full report can be accessed at <http://www.lrrb.org/PDF/201203.pdf>.