



TECHNICAL SUMMARY

Questions?

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LRRB PROJECT COST:

\$467,139



Turfgrass management can impact soil temperature, an important factor in good coverage.



Exploring Region-Specific Roadside Turfgrass Varieties

What Was the Need?

Nearly 250,000 acres of vegetation along Minnesota roadsides stabilize the roadways, prevent erosion and filter stormwater runoff before it reaches bodies of water. Sustaining appropriate vegetation along roadways in colder climates, however, can be challenging. In winter, freezing temperatures, deicing salt and damage from snowplows present challenges. In summer, heat and drought, planting the wrong species at the wrong time of year and insufficient ongoing maintenance also prevent vegetation from thriving. Reestablishing turfgrass with seed or sod can be a costly use of public transportation funds.

MnDOT currently recommends turfgrass seed mixes on a state-wide basis. Seed mixture performance, however, is impacted by weather, climate conditions and other local variables. [Previous research](#) explored the performance of currently used turfgrass varieties. The question remained whether some mixtures may be better suited to specific regions within the state. Additionally, the costs of establishing roadside vegetation vary due to seed mixture costs and the level of effort needed to establish it.

The Local Road Research Board wanted to identify the most successful seed mixes for different areas around the state and the costs associated with establishing the mixtures. Additionally, MnDOT wanted to ensure its turfgrass seed mixture recommendations are optimal for maintaining roadside coverage in the context of the current and predicted future climate.

What Was Our Goal?

In this second phase of ongoing turfgrass research, the goal was to determine if seed mixtures could be regionally tailored based on geography or other characteristics and to estimate installation costs.

What Did We Do?

Investigators identified 14 sites, representing a broad range of climatic conditions across the state, to test different seed mixtures and understand specific growing environments. After denuding the existing vegetation at each site and analyzing the soil for water content and other factors impacting plant growth, they characterized the weed seed bank—existing seeds in the soil—to understand how it impacts the performance of seeded turfgrass mixtures. Soil was collected from the field and used in a greenhouse to quantify and analyze the seedlings that emerged.

Forty different seed mixes were planted at the roadside sites to explore the effects of species and cultivar richness on the performance of turfgrass. The plots were maintained, including mowing and removal of tree leaves and other debris. Data collected over two growing seasons provided insights into turfgrass coverage, weeds and areas of bare soil. Turfgrass coverage, soil characteristics and weather variables were also statistically analyzed.

Finally, data from industry experts and roadside turfgrass managers supported the development of cost prediction models for vegetation establishment projects.

Maintaining roadside turfgrass, which is necessary for stabilizing the roadway and other purposes, can be challenging in Minnesota's harsh climate. Analyzing the performance of grass seed mixtures and planting costs led researchers to recommend region-specific mixes and a cost estimation tool for local agencies to be confident in their roadside vegetation choices.

“Establishing these test plots with seed mixes that vary by region was an important step in finding the most effective and climate-resistant roadside turfgrass.”

—**Dwayne Stenlund**,
Erosion Control Specialist,
MnDOT Erosion Control
and Stormwater
Management

“In addition to clearly illustrating that planting a single statewide turfgrass mixture is not the most effective strategy, we found that multiple species within a single seed mix optimize roadside turfgrass performance.”

—**Eric Watkins**,
Professor, University of
Minnesota Department
of Horticultural Science

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Each research site had three blocks of 40 plots each. Plots were seeded by hand, fertilized once and provided temporary irrigation to establish the plantings.

What Did We Learn?

The research resulted in several findings and a tool to choose the optimal cost-effective turfgrass seed mixes. The analysis of the weed seed banks showed regional differences, but the abundance of weed seeds in the soil prior to seeding did not impact the amount of weed coverage in the established turf. Instead, the degree of weediness was correlated with the extent of turfgrass coverage.

Species richness of a grass seed mix improved the chances of successful turfgrass coverage over time, resulting in fewer weeds and less bare soil. With more grass species in a mix, a more consistent coverage can be achieved across a region’s subtle differences in sunlight, soil chemistry and microclimates.

Twelve key soil and weather variables that influence roadside turfgrass coverage helped to identify the most effective turfgrass mixes for three regions of the state. Two regions, the northern and central/southern areas, are based on climate factors, including temperature and precipitation. The third region is based on poor soil characteristics. High sand and low clay content, low organic matter and high bulk density—when soil compaction restricts root growth—are some conditions that may necessitate soil amendments or particular species and cultivars.

A spreadsheet budget tool was also developed to estimate roadside turfgrass seed or sod installation and establishment costs to inform grass seed mixture decisions for estimators and design professionals. The tool is based on three models, with an average prediction accuracy of 95.4%, for different scenarios.

What’s Next?

Agencies and researchers are continuing to observe the turfgrass test sites over time, collecting longer-term data to validate the initial findings in this study. The budget spreadsheet will be refined and augmented with new data, and a web-based tool will be developed to facilitate its use by local agencies and MnDOT.

Future turfgrass testing will need to consider climate change trends, focusing on seed mixtures tolerant of both current and future conditions.

This Technical Summary pertains to Report 2022-16, “Regional Optimization of Roadside Turfgrass Seed Mixtures Phase 2: Regional Field Trials and Economic Analysis,” published July 2022. More information is available at mndot.gov/research.