



Establishing Post-Construction Roadside Vegetation Growth

Roadside vegetation is essential for managing stormwater and mitigating soil erosion. Using organic and proprietary amendments to improve the topsoil after road construction projects are completed may help reestablish vegetation more quickly and provide better outcomes.

What Was the Need?

Roadside vegetation is necessary for managing stormwater, limiting erosion and improving soil stability. When road construction projects are completed, roadsides are often devoid of vegetation, which leads to soil compaction, low fertility and poor structure. To remedy this condition, MnDOT and local transportation agency engineers sought alternative approaches to establish roadside vegetation more quickly and cost-effectively. Organic and proprietary soil amendments are potential alternatives that have demonstrated enhanced soil fertility, microbial activity and water infiltration.

The purpose of this study was to compare the effectiveness of organic and proprietary amendments to that of conventional topsoil and fertilizers for establishing and improving vegetation growth on post-construction roadsides. The evaluation also assessed the benefits of nutrients for vegetation growth with the potential negative impacts on water quality that nutrients such as phosphorus can cause if they are overapplied.

What Did We Do?

A literature review examined published research about the effectiveness of organic and proprietary amendments to improve the growth of roadside vegetation by improving soil quality.

In the laboratory, soil health analyses of topsoil samples from four locations and of organic and proprietary amendments determined their corresponding physical, chemical and biological properties.

Greenhouse studies evaluated these properties in organic amendments, such as compost and biochar, and proprietary amendments, along with plant biomass and coverage to determine combinations and blends that provide the nutrients and organic matter needed for rapid vegetation establishment.

An additional greenhouse study replicated outside rainfall conditions with slope simulations to mimic road embankments. Researchers then evaluated the use

“The results of this project provide very useful guidance for effectively improving topsoil quality and establishing post-construction roadside vegetation growth sooner to prevent erosion, enhance stormwater management and protect water quality.”

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STORMWATER MANAGEMENT

of compost and proprietary soil amendments to increase the rate of plant growth and reduce nitrogen and phosphorus leaching. While nitrogen and phosphorus in compost and other soil amendments can improve vegetation growth and quality, they can also negatively impact water quality during the early plant establishment period.

In the field, the performance of the two top-performing soil amendments from the previous greenhouse evaluations was assessed on nine experimental plots.

What Was the Result?

The literature indicated that organic and proprietary amendments can increase nutrient availability and moisture content, resulting in improved vegetation growth. But because chemical and physical properties of soil and amendments vary, extensive laboratory, greenhouse and field testing is necessary to develop effective amendment selection and application rates guidance.

The soil health analyses and greenhouse study results showed that organic compost significantly improved soil stability, water retention and organic matter content. While the untreated soil had low aggregate stability that is susceptible to runoff and erosion, the soil with

organic material showed improved structural integrity and better water infiltration. Further, soils treated with compost showed higher water retention capacity and macronutrient availability, both valuable in establishing vegetation growth.

The proprietary soil amendments also performed well, demonstrating a strong, nutrient-rich composition that provides support for immediate and long-term growth. Biochar demonstrated limited nutrient availability, indicating that if used, it should be coupled with compost or other soil amendments to facilitate sufficient plant growth. These results also highlighted the impact of amendment rates, with higher application rates generally resulting in enhanced growth and plant biomass accumulation both in the roots and above ground growth.

Results from the greenhouse study that simulated a roadside embankment demonstrated that compost amendments increased the presence of phosphorus, suggesting the need for a strategy to balance growth outcomes with water quality considerations. These results further showed the importance of amendment selection and application rates to promote growth while also protecting water quality.

Findings from the field study validated the laboratory testing results in real-world conditions. Areas treated with organic compost showed improved plant biomass and root density while the proprietary amendment also demonstrated enhanced vegetation coverage and biomass but to a lesser degree than compost.

What's Next?

These project results provide valuable guidance for incorporating organic and proprietary amendments into post-construction roadside vegetation growth efforts. By enhancing growth, the vegetation can better mitigate the negative impacts of erosion and improve stormwater management. The recommended amendment application rates balance vegetation growth with water quality considerations and will be incorporated into guidelines to promote cost-effective implementation.

About This Project

REPORT 2025-22

“Comparison of Compost and Proprietary Soil Amendments for Vegetation Establishment.”

Find it at mdl.mndot.gov.

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PROJECT COST

\$260,000

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