Case Study

Greening Canada's roadways

Trees are often planted alongside roads or in urban areas to beautify the landscape and provide natural habitats. Many struggle to survive and rarely reach full maturity. That's because soils are often compacted with low organic matter, trees are exposed to salt and pollution, there is no after-planting care, and not every species can grow in this setting.

Did you know...
the typical lifespan of a tree along a major roadside is only five to 10 years[1]?

Research trials conducted throughout Ontario and Alberta by Vineland scientists over several years have focused on how to build an ecological environment that can withstand lack of water and care, tolerate pollution and weed competition. This led to the development of species selection guidelines and best management practices for soil remediation that dramatically improves tree survival.

[1] Nowak et al. 2004

Impact at a glance

- Extraordinary tree survival rates of almost 100 per cent compared to standard plantings with a 45 per cent survival rate
- 66 per cent higher carbon sequestration levels, equal to taking four times as many cars off the road as standard plantings
- Four times more storm water runoff intercepted than standard plantings
- Three times more water available per acre than standard plantings due to higher soil organic matter


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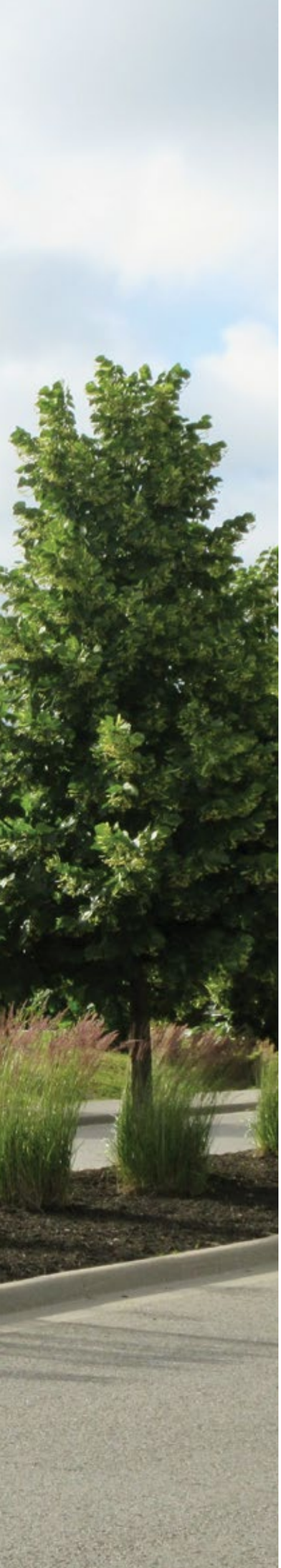


Giving urban plantings in high stress areas a chance

Several years of research has culminated in two unique online tools – a soil remediation calculator and a tree species selector – to help transportation planners, municipalities, conservation authorities and landscape contractors make the best decisions based on specific soil and site conditions for greener, more resilient landscapes.

The Vineland method for best tree growth success:

- Bed-style site preparation
- Deep-ripped soil to break up compaction
- Compost to boost soil organic matter

Vineland's soil remediation method is significantly less expensive than standard cost estimates for roadside tree planting in Ontario, costing approximately $95,000 to plant 1,000 trees compared to $200,000 (dependent upon contractor's business model and pricing).

Vineland's contribution:

Developed a "how-to" manual for trees and shrubs to thrive in challenging urban and suburban environments and a more cost-effective method for soil remediation.

Online tools for more successful plantings

- **Soil remediation calculator:** Assess and improve the soil specific to each planting project
- **Tree species selector:** Pick the species best suited to a planting project's unique needs

Highway of Heroes Living Tribute

Vineland's method has been successfully put to the test in a high profile partnership with the Highway of Heroes Living Tribute project.

Four years ago, the Highway of Heroes Living Tribute was established with the goal of planting a tree for each of Canada's war dead alongside the stretch of Highway 401 in Ontario known as the Highway of Heroes. This living memorial will include 117,000 trees representing every Canadian war casualty dating back to 1812.

Living Tribute partnered with Vineland to follow their tree selection recommendations relative to soil conditions, salt spray, wind exposure, and established planting protocols.

"Maximizing the survival rate of trees is very important to us – if we are taking money from individual Canadians, businesses and government, we want to plant trees that won't die. Partnering with Vineland was a natural fit – and as a result, the survival rate of our first highway planting is extraordinary."

-Mark Cullen, Highway of Heroes Living Tribute co-founder

Vineland's contribution:

Worked closely with Highway of Heroes Living Tribute to recommend the best tree species and planting practices for this living memorial.

Impact and outcomes

In addition to greening the Canadian landscape, better tree survival and growth significantly impact our air, water and soil – as well as economic benefits to the Canadian nursery landscape sector, municipalities and organizations undertaking the plantings.

Tree growth and survival rate

Trees planted using Vineland's approach had an almost 100 per cent survival rate five years after planting compared to only 45 per cent survival when standard planting methods were used. The trees are also larger (as measured using height and trunk cross sectional area).

- The typical tree lifespan along major roadsides is five to 10 years – but trees planted using Vineland's method had an almost 100 per cent survival rate five years after planting.

Carbon sequestration

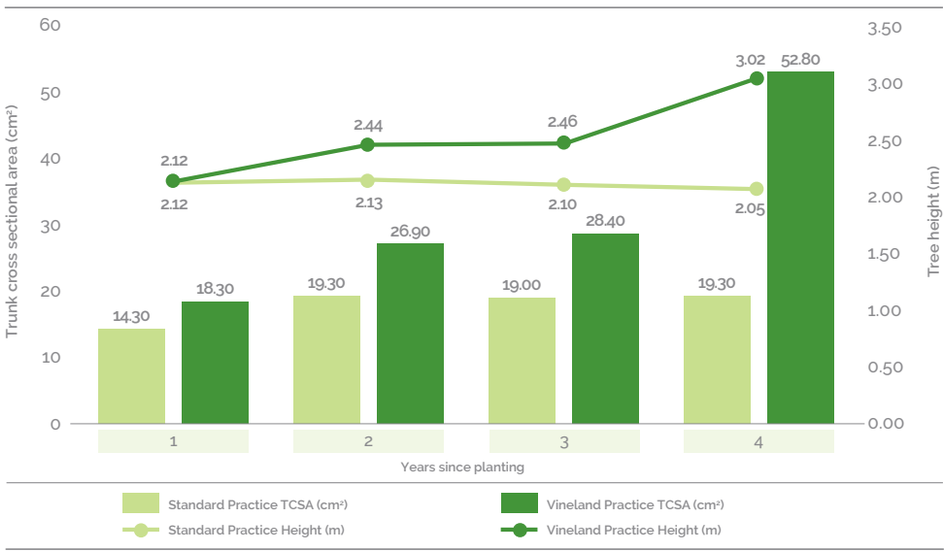
Trees "lock up" or sequester carbon in their leaves, branches and trunks as they grow, removing it from the atmosphere.

Using the Highway of Heroes Living Tribute project as an example, by year five, the average size of a Living Tribute tree planted using the Vineland method is estimated to be 66 per cent larger than the standard.

This means each Living Tribute tree will sequester 66 per cent or two-thirds more carbon from the atmosphere per year than standard planting trees. Including all Living Tribute trees, that's equivalent to taking almost 1,600 cars off the road per year – or almost four times as many as the standard planting method[2].

- Living Tribute trees planted using the Vineland approach remove 66 per cent more carbon from the atmosphere – equal to taking almost four times as many cars off the road as the standard planting method.

Average tree growth responses to planting methods



[2] Based on a mid-sized sedan that generates 4,989 kg (11,000 pounds) of CO2 per year, and average annual driving distance of 19,312 km (12,000 miles) (http://www.treebenefits.com/calculator/ReturnValues.cfm?climatezone=Northeast)

Soil remediation

Soil on an estimated 180 acres of land will be prepared for the 117,000 Living Tribute trees being planted. The Vineland method adds on average nine per cent soil organic matter content compared to only three per cent using the standard method – that's because higher organic matter content means healthier soil that can absorb more water[3].

For the Living Tribute planting, that translates into an estimated 920,000 litres of available water per acre for plantings using the Vineland method, compared to only 306,000 litres for standard plantings. That means the newly planted trees and shrubs using Vineland's approach will have access to almost three times more water than conventional plantings.

- Vineland's approach boosts soil organic matter, making three times more water available for newly planted trees and shrubs that don't have access to irrigation.

Storm water management

Storm water runoff washes oil, salts, gasoline, litter and other substances from roads and parking lots into streams, wetlands, rivers, and oceans. Trees help reduce runoff by holding moisture on leaves, branches and bark, and filtering and storing rainwater in their root systems.

By year five, each Living Tribute tree is expected to intercept almost 6,200 litres of storm water runoff per year. That's compared to approximately 4,100 litres per tree planted using the standard method. As a whole, Living Tribute trees will intercept approximately 725 million litres of storm water runoff annually.

- By using Vineland's approach, the Living Tribute trees will help intercept almost four times as much storm water runoff every year compared to the standard planting method.

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[3] "Every 1% increase in organic matter results in as much as 102,000 litres (27,000 gallons) of available soil water per acre" (https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1082147.pdf)

Economics and cost savings

Tree replacement costs fall on the landscaper or landowner including municipalities and trees are not always replaced. Improving tree survival and longevity reduce the need for tree replacement, lower costs for municipalities and improve revenues for landscaping companies thanks to fewer warranty claims.

- For every 1,000 trees planted using Vineland's method, the increase in tree survival saves municipalities $575,000[4] and landscaping companies $615,000 in replacement costs.
- Vineland's soil remediation method costs less than half the standard Ontario estimate for roadside tree planting – $95,000 to plant 1,000 trees compared to $200,000 (dependent upon contractor's business model/pricing).
- Estimated cost savings related to the Highway of Heroes project for soil remediation are $11.1 million using the Vineland approach vs. $23.4 million using standard estimates – less than half the cost (dependent upon contractor's business model/pricing).

Expected success of the Vineland method on the Highway of Heroes Living Tribute

To date, 25,000 Living Tribute trees have been planted and the oldest are now two years old. By the time all trees are planted and are five years old, they are expected to make a significant positive impact on the air, water and soil thanks to Vineland's proven approach for tree survival and growth.

Using the Vineland method and demonstrating its application via the Living Tribute project, trees boast:

- Extraordinary tree survival rates of almost 100 per cent compared to standard plantings with a 45 per cent survival rate
- 66 per cent higher carbon sequestration levels, equal to taking four times as many cars off the road as standard plantings
- Four times more storm water runoff intercepted than standard plantings
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[4] Vineland analysis

Greening the roadways – an opportunity ready to grow

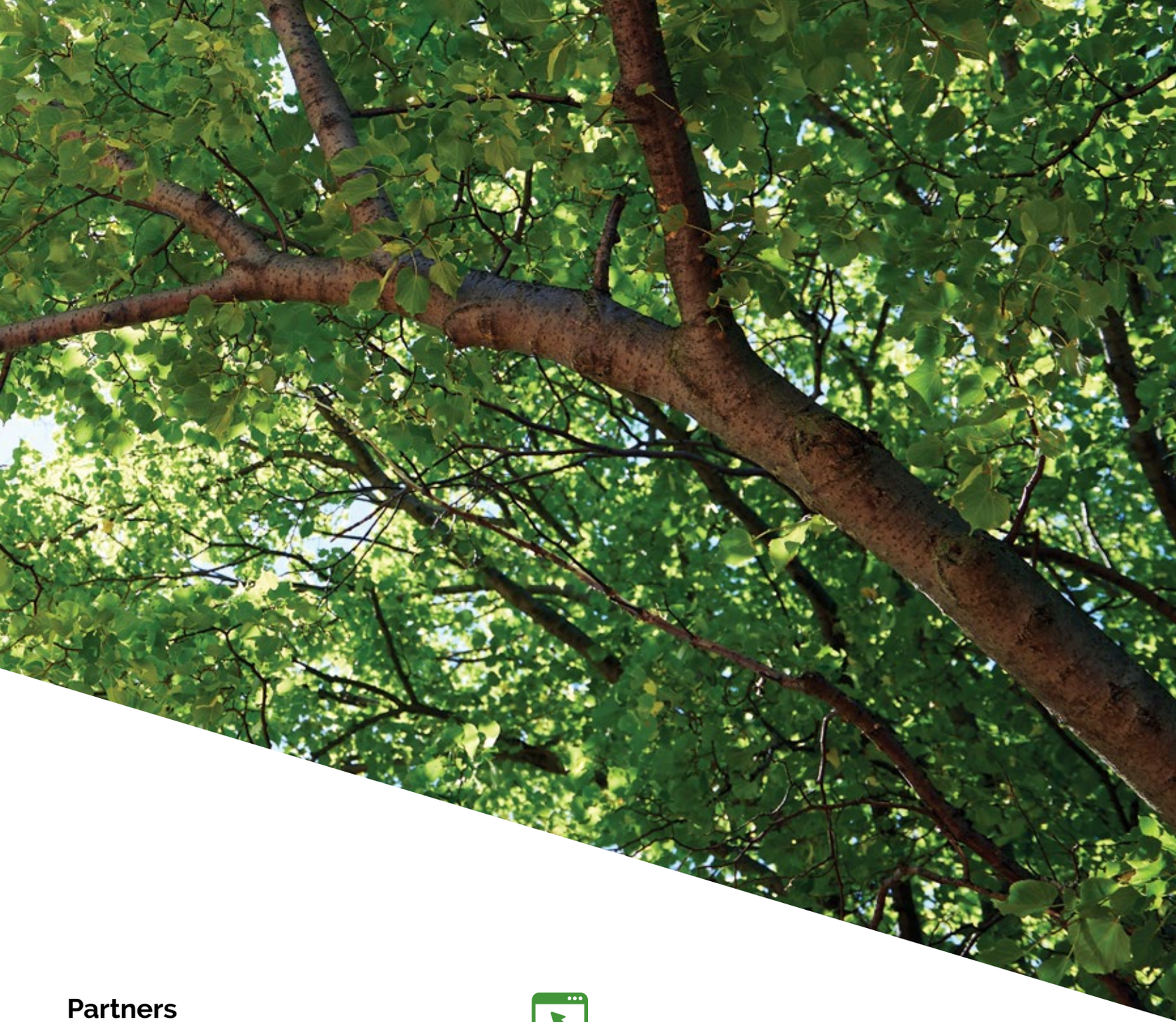
The Highway of Heroes Living Tribute is just one example of the Vineland method at work.

Vineland's practice-proven and research-based recommendations on improved tree survival and growth in challenging urban environments are available for use by those planning tree planting projects.

Tools include:

- Soil remediation calculator
- Tree species selector
- Best management practices for soil remediation and management
- Techniques proven in challenging urban environments

Vineland continues to work with a number of partners across Canada to test and improve tree establishment in challenging locations. Soil remediation and species selection trials in Ontario were conducted with the Ministry of Transportation. In Alberta, soil remediation trials in Airdrie, Calgary and Edmonton were done in partnership with Alberta Transportation, bringing benefits to these communities and increased sales to local nursery and landscape suppliers.



Partners

Funding for Vineland's Greening the Canadian Landscape program was provided by the Canadian Ornamental Horticulture Alliance research and innovation cluster, and through the *AgriInnovation program of Growing Forward 2*, a federal-provincial-territorial initiative.

www.greeningcanadianlandscape.ca