Time to Change the Conversation Around Turfgrass

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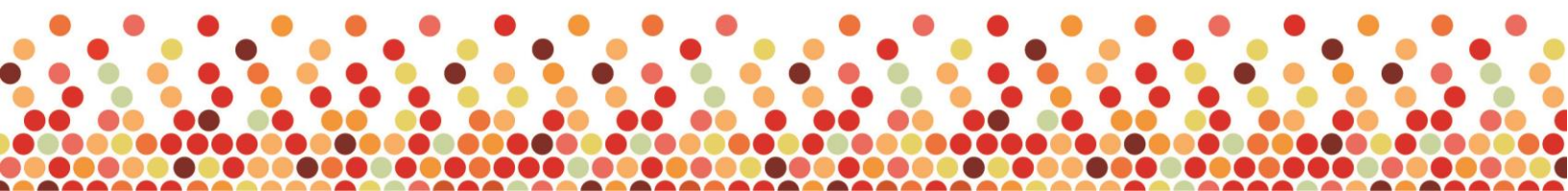
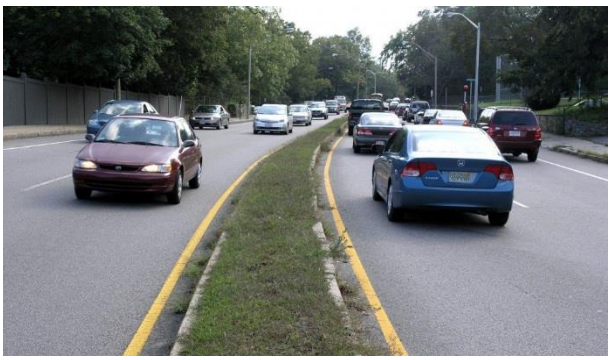


Often regarded as an environmental foe, grass is actually an environmental ally. It really depends on how you look at it.

The basics

Let's start with a fundamental question, what is grass? The first answer that might spring to mind for many people would be some form of turfgrass in a park, sports field or lawn. In reality, the grass family – Gramineae - contains more than 9,000 species. It is an incredibly diverse group including many species which are of economic importance as sources of food, fodder and fuel. Many staple foods are derived from grasses (wheat, maize, rice) and grasses are a major component of the Earth's vegetation, nowhere more so than in natural grasslands such as the Prairies, which cover an estimated 40.5 per cent of Earth's land surface. Grasses play an important role in nature and agriculture, and in our built environments, where cultivated grasses are used in lawns, parks and other green spaces.

Grasses have the amazing ability to grow in extremely challenging environments. Surviving through floods, heat and drought (brown grass is not necessarily dead grass, it just goes dormant with high heat and lack of water); each year we bear witness to its remarkable resilience and durability.



It doesn't get much more challenging than this - yet grasses survive. (Photo credit: Peter Del Tredici, "The Flora of the Future", Places Journal, April 2014. https://doi.org/10.22269/140417)

Every square foot of grassed area contains hundreds of individual plants, each providing similar ecosystem benefits to trees, on a smaller scale.

What would our environment be like without access to green spaces in cities and homes, without green medians along our highways? Grass is an essential part of the living landscape and frequently is considered to be environmentally costly because of the inputs associated with maintenance. The reality is, there are numerous benefits that accrue from having optimally-maintained green space.

Severe drought conditions in the last several years have caused state and local governments in California to put in place an incentive program to encourage homeowners to remove lawns and replace them with inert materials. While enacted in an effort to conserve water by stopping people from watering their lawns, the overall outcome of this initiative had exactly the opposite effect. By removing the living landscape, when rain events did occur, the soil could no longer capture and filter rainwater, or hold it on-site where it would be slowly released for trees and other plants to use. Instead, water was lost through rapid runoff, and in the end, the denuded landscape was the least effective water-saving measure. It would have been preferable to encourage planting of drought-tolerant grasses and other plants. 'Deadening' the landscape removes ecological, social and health benefits that everyday green spaces provide.

The situation

In an integrated green space, healthy grass will:

- Filter and capture runoff, prevent soil erosion
- Reduce heat
- Improve air quality
- Absorb noise
- Absorb CO_2
- Support biodiversity (both plant and animal life)
- Provide a great place to relax and play
- Make people healthier, happier

As a component of an integrated and diverse landscape (which includes trees, shrubs and turfgrass working together), turfgrass has many functional qualities that improve our environment and help mitigate the effects of climate change. These benefits, however, will be observed only if the grass is healthy and maintained.

Grasses, like other plants in the landscape, are affected by biotic factors such as pests, diseases and weeds, which consume, infect or compete with them. They also have to deal with abiotic (or environmental) stresses including light, temperature (too high, too low), drought, rain (too much, too little) and soil conditions which are often compromised in residential and roadside settings through compaction and general poor quality.

To create and maintain healthy turfgrass, we need to do a better job of selecting and installing grasses that are well-suited to our built environment. Selections will vary by location and desired function and we need to consider the climate of the future when making these choices. Various cultural practices, including fertilizing, watering, aerating, over-seeding and top dressing, will also help keep turfgrass in top condition.

Grass options

What about grass selection? There are several turfgrass varieties available that have been selected based on environmental performance. For example, the Turfgrass Water Conservation Alliance (TWCA) evaluates turfgrasses based on their capacity to withstand drought conditions. Grasses are given the TWCA seal of approval only if they "… provide clear water conservation benefits and can survive under reduced or limited water while still maintaining overall plant health" (http://www.tgwca.org/).

What about other functional traits? As their name implies, salt grasses are salt-tolerant and have the innate capacity to survive in harsh environments; they remain green during extended periods of drought and spread through rhizomes penetrating compacted soils. Does this sound at all familiar? Think roadsides.

In a trial carried out by the City of Calgary, salt grass plugs were installed in a road median. Twelve months later, they had established into a (more or less) contiguous green sward. The grass was able to establish in spite of the challenging environment and compacted soil. While this approach needs to be fine-tuned to make it more utilitarian, there is a potential in using these types of 'pioneer' grasses in this setting. Apart from thriving in a roadside environment, their roots can promote better soil structure over time, creating more

favourable conditions for other plants including shrubs and trees which can then be integrated into a once inhospitable setting. Selection of turfgrasses which are salt-tolerant is another way of improving their functionality in roadside plantings and increased attention should be focused on the evaluation of cultivars for this purpose.

For residential use, various creeping tall fescues and ryegrasses are available with excellent aesthetic qualities. Many have lower maintenance requirements and more importantly, are hardy under drought conditions recovering quickly when rain begins again. Several also exhibit improved insect resistance, a great trait when sowing or over-seeding a lawn.

Plants have evolved complex and mutually-beneficial relationships with microorganisms such as bacteria and fungi. Microbes can help plants access soil nutrients and promote resilience in the face of biotic and abiotic stress. There is considerable interest in microbes which associate with roots (rhizo-competent organisms) and those surviving inside grasses (endophytes).

Salt grass-planted medians in Calgary, AB. Top: at planting; Bottom: 12 months later. (Images courtesy of David Misfeldt, City of Calgary).

The use of biostimulants and biofertilizers in lawn care can enhance conditions for beneficial microbes on and around grass roots. Rhizobacteria such as *Bacillus pumilus* and *B. amyloliquefaciens* promote root formation and enhance nutrient uptake while also stimulating plant defences against diseases. Such bacteria are now used to coat grass seeds, colonizing young roots as the seeds germinate and providing benefits that can improve turfgrass establishment.

Vineland research findings

High endophyte grasses possess many qualities that position them well for use in urban settings. Vineland Research and Innovation Centre (Vineland)'s researchers established test plots containing creeping tall fescue, creeping ryegrass, high endophyte tall fescue and high endophyte ryegrass in 2015. For comparison, a standard Kentucky bluegrass blend was also included. The plots received no maintenance other than mowing. In spite of severe drought conditions during the summer of 2016 and a very wet summer in 2017, the high endophyte cultivars and the creeping tall fescue performed exceptionally well. After two and a half years, these grasses still covered more than 80 per cent of the test area with approximately

15 per cent of the space occupied by broadleaf weeds. In comparison, Kentucky bluegrass dwindled to less than 30 per cent coverage over the same period.

These grasses were also tested on sod farms in Ontario. After 18 months, the high endophyte and creeping grasses covered more than 98 per cent of the plot area. The grass was so dense that it prevented weed ingress. In contrast, the Kentucky blue blend covered less than 60 per cent of the plots, with at least five per cent of the area covered by broadleaf weeds. The high endophyte grasses also showed some resistance to chinch bugs.

High endophyte fescue (HEF) and Kentucky bluegrass (KB) plots 18 months after seeding.

The endophyte (an *Epichloë* species) in the grasses contributes to their enhanced performance and insect tolerance. One year after sowing, the fungus was detected in more than 90 per cent of the ryegrass samples and around 30 per cent of the tall fescue samples. Levels were still high enough to provide protection against pests and the proportion of grasses containing the endophyte could be enhanced through over-seeding. They appeared to be durable, low maintenance options for residential use.

Taking these observations as a whole, it is clear that a number of new grasses have properties well-suited for use in urban areas. This is a better option than sowing traditional varieties in environments where they will fail. However, the only way to see these benefits is to ensure the turfgrass is healthy.

Other research findings

Colleagues at the Université Laval have conducted a long-term study to assess the impact of fertilization practices on turfgrass performance and provide empirical evidence on nutrient losses through runoff and leaching under different regimes.

Researcher Guillaume Grégoire's findings from the study include:

1. Runoff was greater in unfertilized plots compared to fertilized plots. The grass canopy was also thicker in fertilized plots which intercepts water and it is likely that denser root growth allows it to permeate into the soil
2. The level of phosphate losses were higher in runoff from unfertilized (including compost-treated) versus fertilized plots

3. There were slightly higher levels of nitrogen in runoff and leachate from fertilized plots. This is to be expected given fertilizer was applied to the plots and that nitrogen is extremely water-soluble and mobile in the soil. The losses can probably be reduced or prevented through the use of slow release fertilizers where nutrients are not so easily solubilized during rain events.
4. Losses were reduced when the fertilizer application was split (compared to a one-time application).

These are important findings, as some municipalities have adopted by-laws to limit (or ban) turfgrass fertilization. Results clearly indicate that a correctly fertilized lawn will retain more water and nutrients than a poorly maintained area, leading to improved functionality. Overall, good lawn maintenance practices deliver value through improved turf quality and resilience, and provide economic, environmental and social benefits.

Well-maintained and healthy turfgrass is an essential component of a living landscape, contributing to a better environment, better living space and a happier and healthier lifestyle.

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