Green Infrastructure in Parking Lot Retrofits

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Introduction

The built environment poses significant risks to surrounding ecosystems. Impervious surfaces like roofs, roads, and parking lots do not allow rainwater to gradually filter into the soil. Instead, runoff often flows directly into storm drains and waterways —causing flooding, erosion and pollution.

One way to mitigate these negative impacts is the installation of **Green Infrastructure (GI)**, a variety of practices designed to infiltrate runoff into the soil, filter out pollutants, and provide habitat for native species.

Because of the way urban areas developed, most commercial parking lots lack GI. If a property owner wants to use their space to help protect local waterways, they often need to replace part of their parking lots with GI practices. This is known as a **retrofit**. The purpose of this project was to evaluate various retrofit options based on affordability and effectiveness and present this information in an accessible format for businessowners looking to install GI in their parking lots.

Methods

This project was conducted in two phases:

1. Collection and Evaluation of Data

Assessment of current literature with a focus on infiltration and pollutant reduction rates, costs, maintenance requirements, and performance in cold climates

Conversations with local businessowners, engineers and economists to gain practical knowledge about GI implementation

2. Creation of Accessible Tools

Design of a website and informational pamphlet to be shared on the PCS website and distributed to potential community partners, emphasizing ease of comprehension

Results

Four types of GI were found to be most suitable for parking lot retrofits in Michigan:

1. Permeable Pavers

Permeable pavers have quarter-inch gaps between them that filter water and let it infiltrate into the soil below. These gaps are small enough for wheelchair-users to move over comfortably (Fig. 1)

2. Rain Gardens

Rain gardens are bowl-shaped gardens designed to hold water that would otherwise go to a storm drain. They provide habitat for native species, improve water quality, and effectively infiltrate surface runoff (Fig. 2)

3. Tree Boxes

Tree Boxes are concrete boxes that filter pollutants and allow runoff to infiltrate through a drain at the bottom. They are planted with trees, which provide shade, sequester carbon, and act as a habitat for native species (Fig. 3)

4. Native Landscaping

In properties with limited space or clay soil, Native Landscaping provides curb appeal, habitat for native pollinators, and limited water quality improvement (Fig. 4)

Figure 1: Permeable Pavers in GR

Figure 2: Rain Garden planted by PCS June 2022

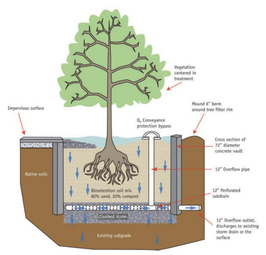
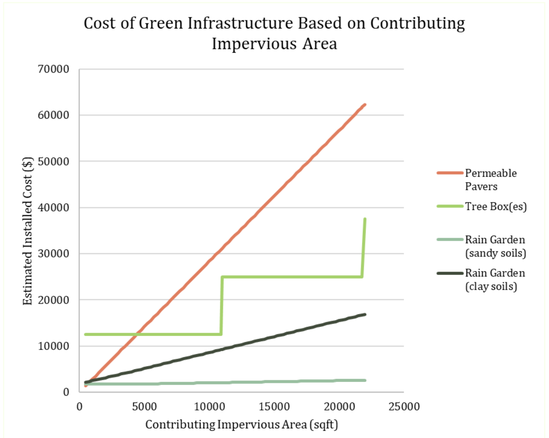
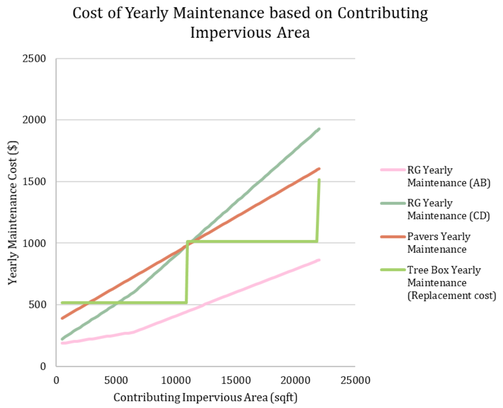
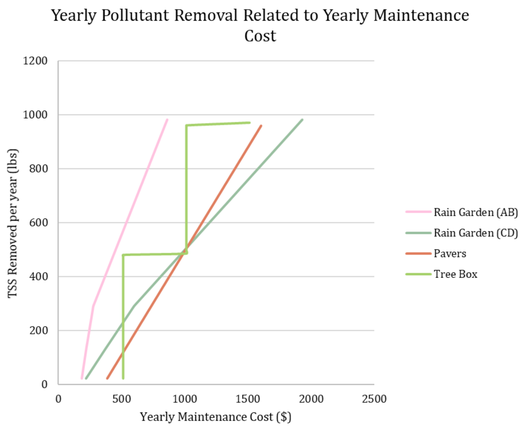


Figure 3: Diagram of a Tree Box

Figure 4: Native Plants in PCS Greenhouse







Conclusions

While there are many types of GI, Permeable Pavers, Rain Gardens, Tree Boxes, and Native Landscaping are the most practical for small businessowners in Grand Rapids. They can be scaled to fit smaller urban parking lots, survive well through Michigan winters, and are relatively affordable options.

Using the information gathered over the course of this project, engineering plans are underway for a parking lot retrofit in Grand Rapids that will incorporate three of the four options (Permeable Pavers, a Rain Garden, and Native Landscaping). The resources will also be shared with clients interested in installing GI, especially with new city programs that will potentially incentivize it.

References

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