

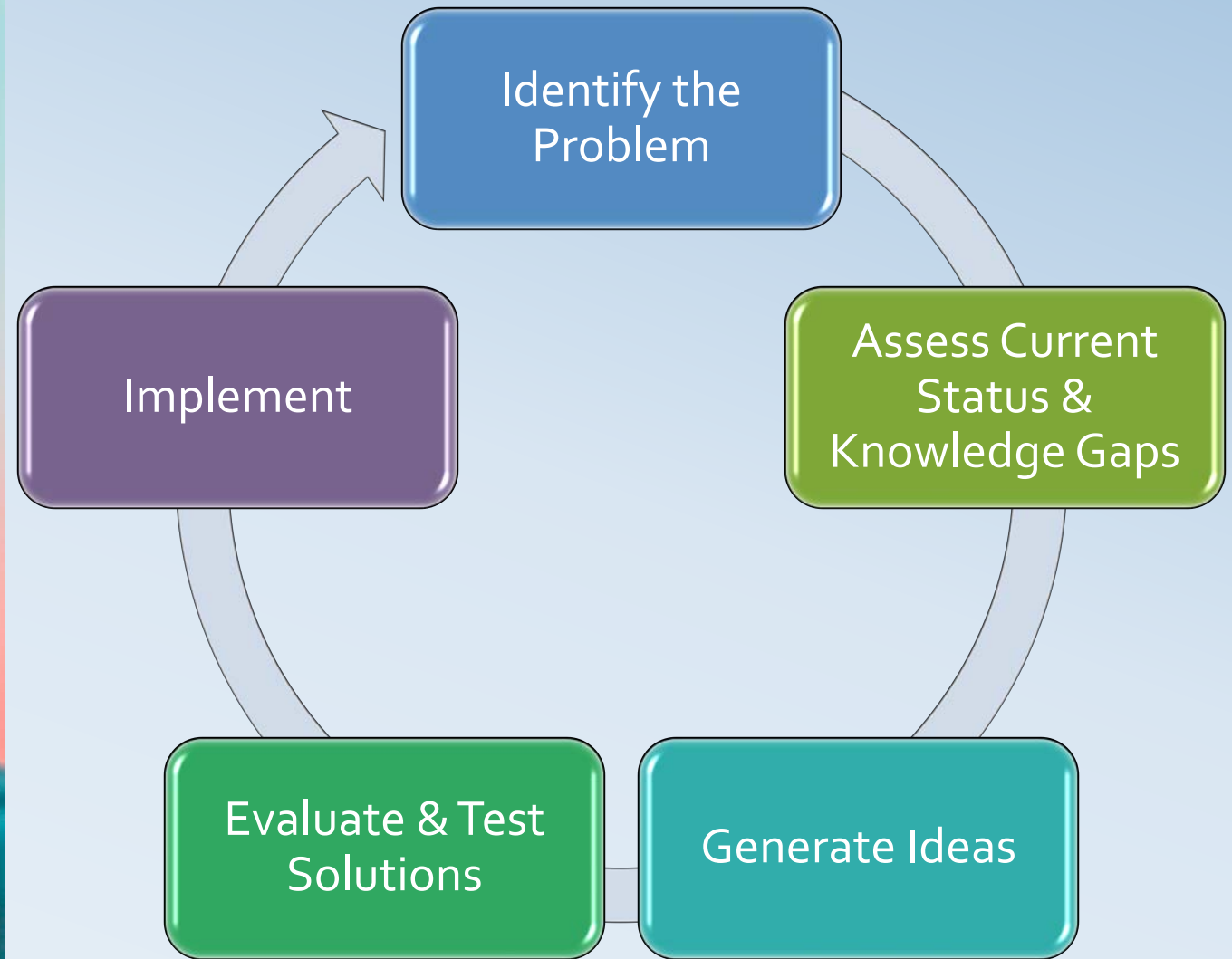
# Getting Back Healthy Soils in the City—An Asset Management Problem?

Photo by Luca Micheli



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# Assess Current Status & Knowledge Gaps



A woman with dark, curly hair, wearing a grey cardigan over a dark top and tan pants, stands in a hallway. She is holding a white rectangular sign with a blue border. The sign contains the text 'Urban and Degraded' in a bold, blue, sans-serif font. The hallway has wood-paneled doors and a patterned carpet. A coat rack is visible in the background.

**Urban and  
Degraded**

## CHAPTER 5

# SITE DESIGN: SOILS

► Nina Bassuk and Susan Day

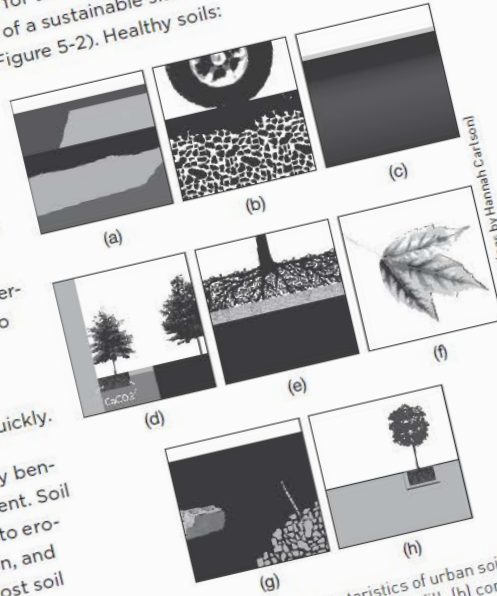
**SOIL IS THE FOUNDATION OF LIFE ON EARTH.** It is made up of mineral solids, water, air, and organic matter. It supports vegetation that we rely upon for the air we breathe and the food we eat. Sustaining soil itself is an important component of a sustainable site. However, soils play a much broader role in the health of ecosystems (Figure 5-2). Healthy soils:

- Protect water quality and supplies. They filter and retain water, helping to clean contaminated water and reduce runoff, erosion, sedimentation, and flooding.
- Store carbon and support a healthy population of microorganisms.
- Can reduce inputs (irrigation, pesticides, fertilizers) that might otherwise be needed to sustain plants and landscapes.
- Produce healthy plants.
- Help trees achieve desired size more quickly.

Soil, however, is slow to form and its many benefits can be easily lost during site development. Soil structure and quality can be damaged due to erosion, compaction, relocation, contamination, and overfertilization. In urban environments most soil has been modified or imported (Figure 5-1).

Thus the twin goals of soils management for a sustainable site are:

- Protect existing soil with desirable traits.
- Improve soils with undesirable traits.



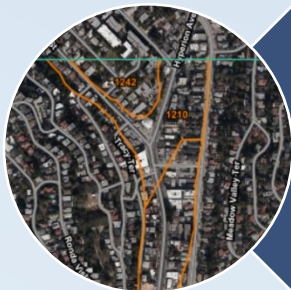
**FIGURE 5-1:** Common characteristics of urban soils include (a) grade changes caused by cut and fill, (b) compaction and loss of aggregate stability, (c) impervious crust, (d) altered soil pH, (e) poor drainage caused by compaction, (f) nutrient deficiencies, (g) anthropeic materials (buried rubble and debris), and (h) small soil volumes inadequate for plant growth (Craul 1985). These characteristics are detrimental not only to plant growth, but they reduce other natural soil values and benefits as well.

Adapted by John Wiley & Sons from drawings by Hannah Carlson

Calkins, M. (2011). The Sustainable Sites Handbook : A Complete Guide to the Principles, Strategies, and Best Practices for Sustainable Landscapes

# Three Scales

Assess Current Status & Knowledge Gaps



Mapping



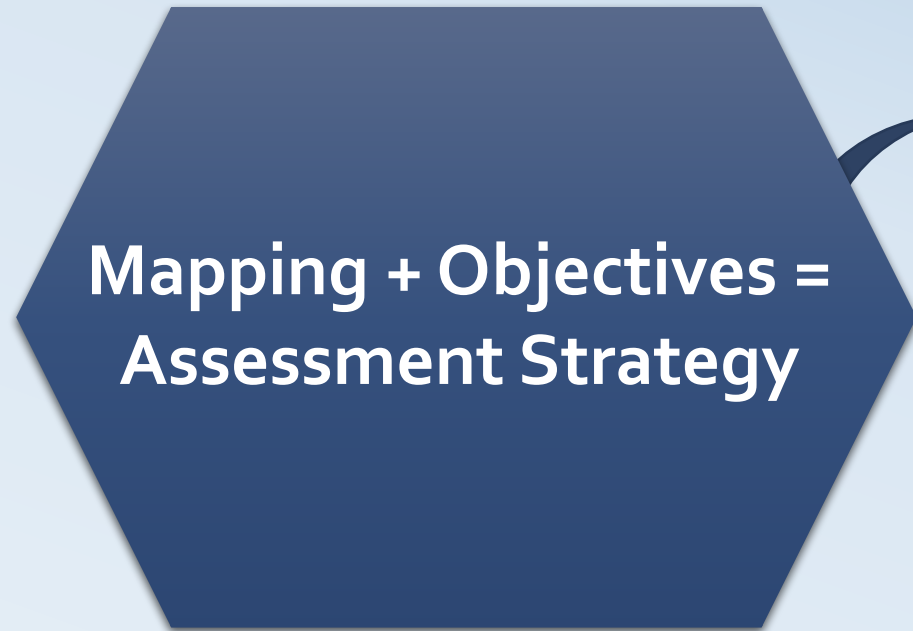
Parcel or Site Scale



Garden or Tree Level



Photo: Rachel M. Layman





Promote Well-being & Strong Communities



Allow Cities to Support the Global Ecosystem



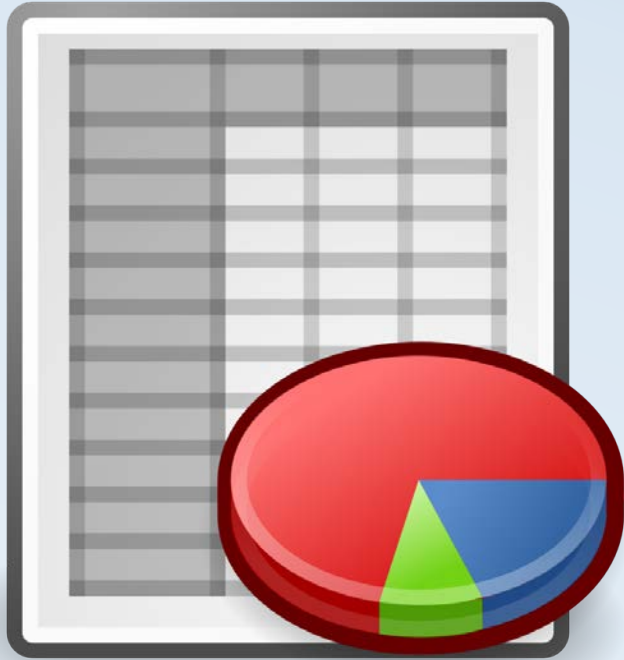
Avoid C emissions from fossil fuels



Protect Critical Life-Sustaining Resources

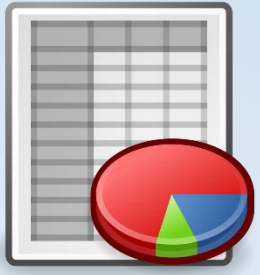
Better Data about Assets can  
translate into Better Decisions





- ❑ A business practice
- ❑ Common practice among municipalities for grey infrastructure
- ❑ Can track changes in asset value or condition over time (depreciation)
- ❑ Lets you know what you have, how long it will last, and how much it will cost to replace it

# Asset Management



- ❑ Natural Resources (trees, soils) can INCREASE in value
- ❑ Related resources such as compost?
- ❑ Puts “brown infrastructure” in the management mix
- ❑ Incorporates soil in a data inventory framework

## Asset Management

# ASSET MANAGEMENT

## Objectives

Minimize  
risk

Maximize  
performance

Minimize  
cost

## Facets

Inventory

Performance

Service Life

Life Cycle  
Cost

Risk/  
Criticality

## Process

Select  
Protocols

Itemize  
assets

Inspect  
assets

Rate assets

```
graph TD; A{{Mapping + Objectives = Assessment Strategy}} --> B[Collect & Analyse Data  
Soil Sampling & Testing]; B --> C([Make Management & Design Decisions]); C --> D[Soil Asset Management System]; D --> A;
```

**Mapping + Objectives =  
Assessment Strategy**

**Collect & Analyse Data  
Soil Sampling & Testing**

**Soil Asset  
Management System**

**Make Management &  
Design Decisions**





# ABOUT URBANCCD

Understanding the Rapidly Urbanizing World Through Computation and Data

## More Information



# Soil Profile Rebuilding

A technique for rehabilitating compacted urban soils in place.

DOWNLOAD THE SPECIFICATION

## Land development and soils

Urban development often results in stripped and compacted soils that cannot sustainably support trees and landscapes and provide little in terms of environmental benefits. Soil Profile Rebuilding is a cost-effective technique that can help rehabilitate these soils to provide documented increases in tree growth and ecosystem services such as carbon sequestration and stormwater management.



Where can soil profile rebuilding be used?

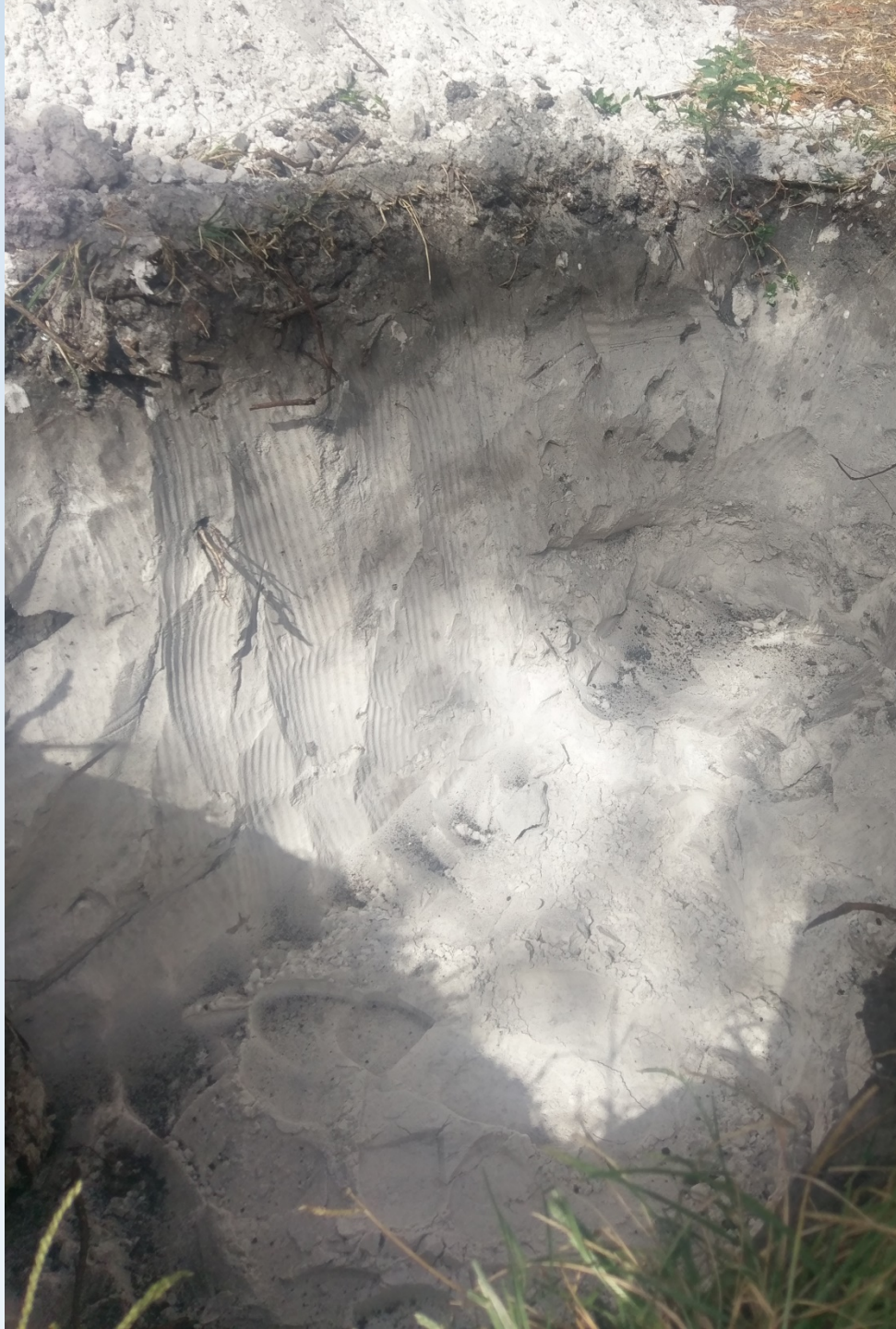
What benefits can soil profile rebuilding deliver?

- A technique for rehabilitating compacted urban soils developed at Virginia Tech
- Addresses subsurface compaction typical of building sites
- Simple and cost-effective
- Specifications are available for download and can be adapted as desired

Excerpt from Soil Profile Rebuilding website: <http://urbanforestry.frec.vt.edu/SRES>



Manufactured, Blended and  
Engineered Soils



The background of the slide is a close-up photograph of tree bark. The bark is dark brown and deeply textured with vertical ridges and grooves. It is heavily colonized by various types of moss and lichen. The mosses are in shades of green and grey, while the lichens are more varied, including some with blue-grey and white tones. The overall appearance is one of a healthy, old forest tree.

# Thank you

Shah, Tabinda. 2019. Breaking Ground: UBC Soil Asset Management Plan. Directed Study Project, University of British Columbia

UBC SEEDS Sustainability Program