SOILS IN URBAN / SUBURBAN LANDSCAPES

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What is “Urban Soil”?
Is This Soil?
Is This Soil?

active gravel pit

pavement and buildings

vegetated roadside areas
Is This Soil?
Is This Soil?
Some examples of the functions of soils in an urban/suburban landscape.
Functions of Soil in an Urban/Suburban Landscape

Storm Water Runoff

Capture and Treatment
Functions of Soil in an Urban/Suburban Landscape

Recreation
Functions of Soil in an Urban/Suburban Landscape

Climate Control,

Greenspace
Functions of Soil in an Urban/Suburban Landscape

Waste Management
Soils formed in HTM overlying refuse

**Greatkills**
10 to 20 inch loamy cap over human refuse

**Freshkills**
20 to 40 inch loamy cap over human refuse
Functions of Soil in an Urban/Suburban Landscape

Food
Threats, challenges, .......
Challenges for Soils Urban and Suburban Landscapes

Contamination
Challenges for Soils Urban and Suburban Landscapes

Contamination
Challenges for Soils Urban and Suburban Landscapes

Disturbance

Compaction

Surface removal

Hydrologic disturbance
Challenges for Soils Urban and Suburban Landscapes

Heavy Use
Challenges for Soils Urban and Suburban Landscapes

Instability

Unknown conditions
Remediation and restoration of Urban Soils and Landscapes
Figure 3.4: Water movement on a natural landscape with a plant cover. This landscape is in a humid area. In the drier regions, the stream level is higher than the surrounding land.
Reduced function

Figure 3.5: Water movement on a disturbed urban landscape with limited vegetation and impervious surfaces. This landscape is in a humid area. In the drier regions, the stream level is higher than the surrounding land.
Soil Remediation, Restoration, .........
Contamination

Soil Remediation, Restoration, ........

 OCCUM PARK  
 NORWICH, CONNECTICUT  

<table>
<thead>
<tr>
<th>Project Timeline</th>
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<tr>
<td>1967-1986: Textile business in operation</td>
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<td>1986: Fire destroys mill complex</td>
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<td>1997: CT DEP begins testing for contaminants onsite</td>
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<td>1998: CT Governor announces $1.5 million to fund park redevelopment</td>
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<td>1999: EPA commits $75,000 in Targeted Brownfields Assessment funds</td>
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<td>2001: City acquires the property</td>
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<td>2002-2004: Cleanup activities conducted</td>
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<td>2004: Construction begins</td>
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<td>June 2005: Occum Park is completed and opened to the public</td>
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Soil Remediation, Restoration, ..........
Soil Remediation, Restoration, ...........

Harvard Yard Soil Restoration Project
Began Spring of 2008
Stopped applying synthetic fertilizers and pesticides
Over seeded turf with shade and drought tolerant fescue
Compost Tea applied
Aerated soil
Compost applied

Soil tests
Root Measurements
Control Plot

Soil Remediation, Restoration, ...........

- Visible improvement of turf and trees
- Root growth in test plot increased 3-5" over those in the control plot
- Irrigation reduced by over 30%
- Less excess nitrogen meant less mowing!

All took place between March and June of 2008
All of Harvard Yard converted in August 2008 (an estimated 2 million gallons of water saved annually)
Compost tea brewers and composting facility added at Arnold Arboretum
Soil Remediation, Restoration, 

Oak/Pine Planting in Kissena Corridor, Queens

Ecosystem restoration

Tree planting

Plant suitability Wildlife

Community gardens
Soil Remediation, Restoration, ........

Big Egg Marsh restoration Project on Jamaica Bay, Queens
Soils formed in Dredge Material

**Bigapple**

>40” dredge

**Marinepark**

14-24” loamy fill over dredge
Soils formed in Dredge Material
Mapping urban and suburban soils
Soil Survey in Urban / Suburban Landscapes
Mapping in Urban Areas / Finding Holes
Soil Survey in Urban / Suburban Landscapes
Mapping in Urban Areas / HTM

HTM - a new type of parent material - use your nitrile gloves
Ground Penetrating Radar
X-ray fluorescence analyzer (XRF)
History of Urban Soil Mapping

New York City

Hudson County, New Jersey
The report provides the descriptions of soil map units and soils of the Bronx River Watershed, including the nature of the watershed, the infiltration study, and comprehensive soil physical and chemical property data. The map with legend is composed of 89 soil map units, comprised of 9 anthropogenic and 15 natural soil series. The maps scale is 1:6,000, and the minimum size delineation is 0.15 acres.

http://www.soilandwater.nyc/urban-soils.html
Recent Urban Soil Survey Activity

- NYC
- Chicago
- Los Angeles
- Detroit
Traditionally areas heavily influenced by humans were mapped as one or a combination of:

- **udorthents**: Cut and fill, dumps, pits, recreational land, transportation areas, etc.
- **urban land**: Mostly (usually 80% or more) impervious surfaces like pavement and roofs.
- **associated soil series**: Natural soil areas too closely intermingled on the landscape to separate on the map.
**Not Rated** — All Urban land units and many Udorthents are not rated for most interpretations because they have characteristics that show extreme variability from one location to another. It’s not possible, using existing data, to offer general planning information in these areas.
Report — Map Unit Description

District of Columbia

U1—Udorthents

Map Unit Composition

Udorthents and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects within the map unit.

Description of Udorthents

Properties and qualities

Slope: 0 to 10 percent
Depth to restrictive feature: 10 inches to
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

<table>
<thead>
<tr>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
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<tbody>
<tr>
<td>Urban-Urban land complex, 0 to 8 percent slopes</td>
<td>11.2</td>
<td>0.6%</td>
</tr>
<tr>
<td>Soil-Urban land complex, 0 to 8 percent slopes</td>
<td>3.8</td>
<td>0.2%</td>
</tr>
<tr>
<td>Silt loam</td>
<td>24.9</td>
<td>1.3%</td>
</tr>
<tr>
<td>Shallow and duff soils</td>
<td>606.8</td>
<td>31.5%</td>
</tr>
<tr>
<td>Clay land</td>
<td>1,142.2</td>
<td>59.3%</td>
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<tr>
<td>Clay land-Chillum complex, 8 to 15 percent slopes</td>
<td>14.0</td>
<td>0.7%</td>
</tr>
<tr>
<td>Total</td>
<td>1,925.6</td>
<td>100.0%</td>
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More descriptive map units

- 1. Pavement & buildings, postglacial substratum, 0 to 5 percent slopes - 512 acres
- 2. Pavement & buildings, till substratum, 0 to 5 percent slopes - 24303 acres
- 3. Pavement & buildings, outwash substratum, 0 to 5 percent slopes - 8123 acres
- 4. Pavement & buildings, wet substratum, 0 to 5 percent slopes - 5026 acres
Urban Soil Mapping on Web Soil Survey

Live Web Soil Survey Demo
Urban Soil Mapping on Web Soil Survey
Classifying Urban Soils
Soil Survey in Urban / Suburban Landscapes
Classification

We call Urban Soils **Anthropogenic Soils**

They are made up of **Human Transported Material (HTM)**
Some Criteria for Classifying Anthropogenic Soils

- Anthropogeomorphic process
- Kind of Anthrotransported material
- Thickness of Anthrotransported material
- Amount of human artifacts (%)

- Chemical and Physical properties
- Diagnostic horizons (below anthropoturbation)
“u”: presence of human-manufactured materials (artifacts). Artifacts are something created or modified by humans usually for a practical purpose.

“^”: indicates mineral or organic layers formed in human transported materials.
**M layers:** root-limiting subsoil layers consisting of nearly continuous, horizontally orientated, human-manufactured materials. Ex. Asphalt, concrete, rubber, and plastic.

“^” indicates mineral or organic layers formed in human transported materials.
Interpreting urban soils
A soil interpretation refers to the behavior of soils in response to human activities. Interpretations are a guide to use and management of soils in a survey area. Soils with similar responses to a particular use or treatment often are grouped together.

These interpretations are designed to be used with the National Cooperative Soil Survey of Connecticut. The mapping was done at the 1:12000 scale. The minimum delineation is about 3 acres.

Maps generated from these ratings are for planning purposes and do not replace an on-site evaluation for siting and design.
Interpretations for Cropland
Soil Interpretations for Urban/Suburban Landscapes

Stormwater management practices

retrofitting
Soil Interpretations for Urban/Suburban Landscapes

Recreation
Soil properties correspond to criteria identified in the CT State Health Code Regulations, as well as factors deemed significant by NRCS.
SOILS IN URBAN / SUBURBAN LANDSCAPES

Laguardia Series
> 40 inches fill; >10% artifacts
> 35% coarse fragments

Thank you!
Laguardia sandy loam

51A  Laguardia sandy loam, 0 to 3 percent slopes, in Soundview Park in Bronx County, New York
^A1—0 to 5 inches; very dark grayish brown (10YR 3/2) sandy loam; moderate fine granular structure; friable; few fine roots; 7 percent gravel-sized rock fragments; slightly alkaline (pH 7.4); clear smooth boundary.

^Au2—5 to 12 inches; dark grayish brown (10YR 4/2) gravelly sandy loam; weak medium subangular blocky structure; friable; few fine roots; 3 percent cobble-sized rock fragments, 3 percent cobble-sized brick fragments, 7 percent gravel-sized rock fragments, and 3 percent gravel-sized glass fragments; slightly alkaline (pH 7.6); clear smooth boundary.

^Bwu1—12 to 18 inches; 90 percent brown (10YR 4/3) and 10 percent dark gray (10YR 4/1) sandy loam; moderate coarse subangular blocky structure; firm in place; 7 percent cobble-sized rock fragments and 3 percent cobble-sized brick fragments; slightly alkaline (pH 7.8); clear smooth boundary.

^Abu—18 to 19.5 inches; black (2.5Y 2.5/1) loam; moderate medium granular structure; friable; common fine, common medium, and few coarse roots; 6 percent gravel-sized glass fragments and 4 percent gravel-sized rock fragments; slightly alkaline (pH 7.8); abrupt smooth boundary.

^M—19.5 to 22.5 inches; discontinuous partially-rotten concrete layer; abrupt broken boundary.
2^Cu2—22.5 to 32 inches; dark brown (10YR 3/3) extremely cobbly sandy loam; weak coarse subangular blocky structure; friable; 20 percent cobble-sized rock fragments, 20 percent cobble-sized concrete fragments, 10 percent gravel-sized rock fragments, 5 percent gravel-sized glass fragments, and 5 percent gravel-sized concrete fragments; slightly alkaline (pH 7.8); clear smooth boundary.

3^Cu3—32 to 40 inches; very dark gray (10YR 3/1) very gravelly loamy sand; single grain; very friable; 50 percent gravel-sized coal slag fragments; moderately alkaline (pH 8.0).
Soils formed in Human Constructed or Modified Landforms

**Verrazano**
10 to 39" loamy fill over sandy outwash/eolian; <10% artifacts

**Greenbelt Series**
> 40 inches fill
<10% artifacts
Soils formed in Human Constructed or Modified Landforms

**Centralpark**
- >40” loamy fill; <10% artifacts
- >35% coarse fragments

**Laguardia Series**
- >40 inches fill; >10% artifacts
- >35% coarse fragments
Soils formed in Human Constructed or Modified Landforms

**Inwood**
- > 40 inches fill; > 90% artifacts

**Riker**
- > 40 inches of coal ash
Interesting stuff

http://themannahattaprotect.org/home/