SOILS IN URBAN / SUBURBAN LANDSCAPES

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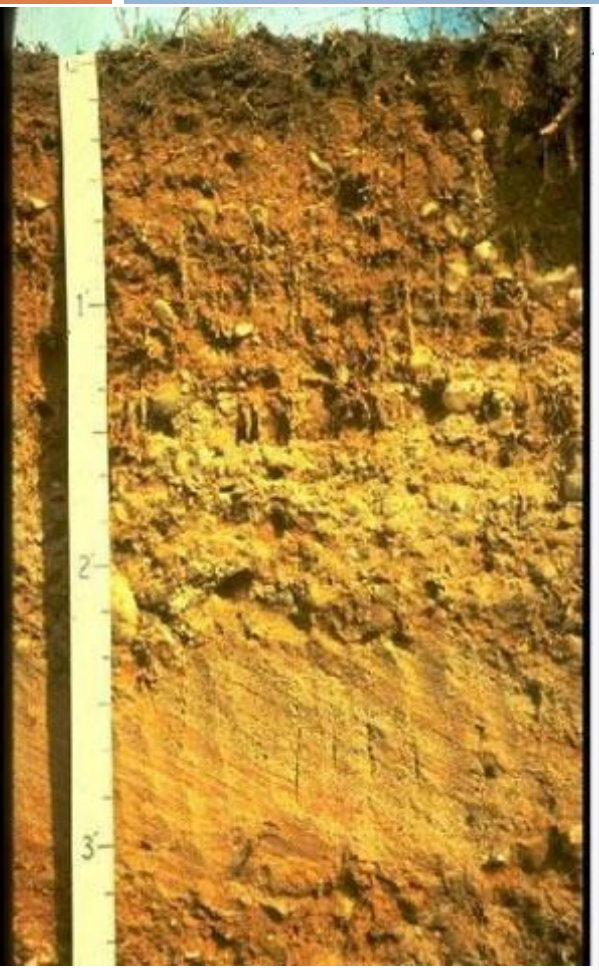
What is “Urban Soil”?



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

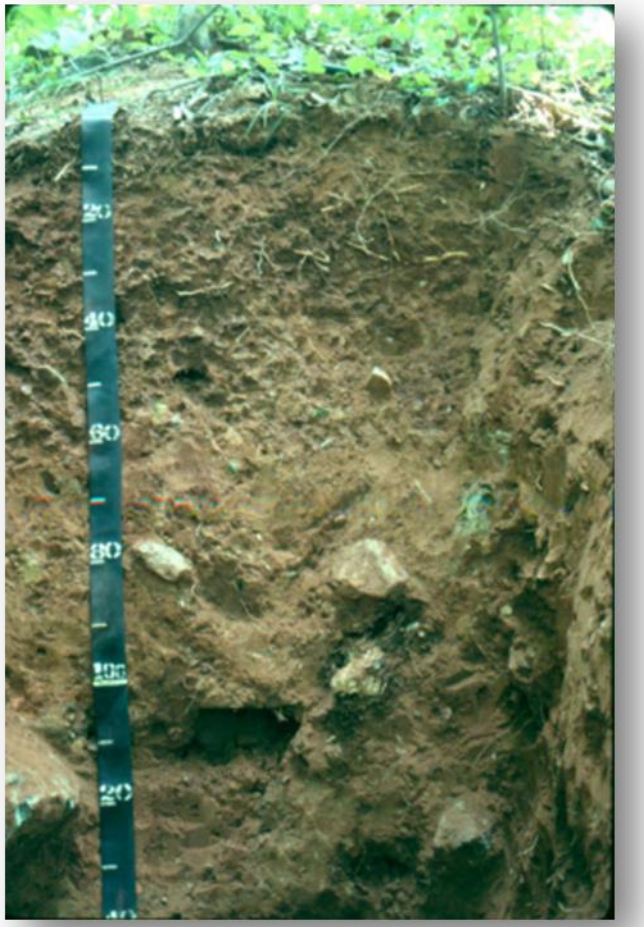
Threats , challenges, …….

Challenges for Soils Urban and Suburban Landscapes

Contamination

Challenges for Soils Urban and Suburban Landscapes

Contamination



Challenges for Soils Urban and Suburban Landscapes

Disturbance

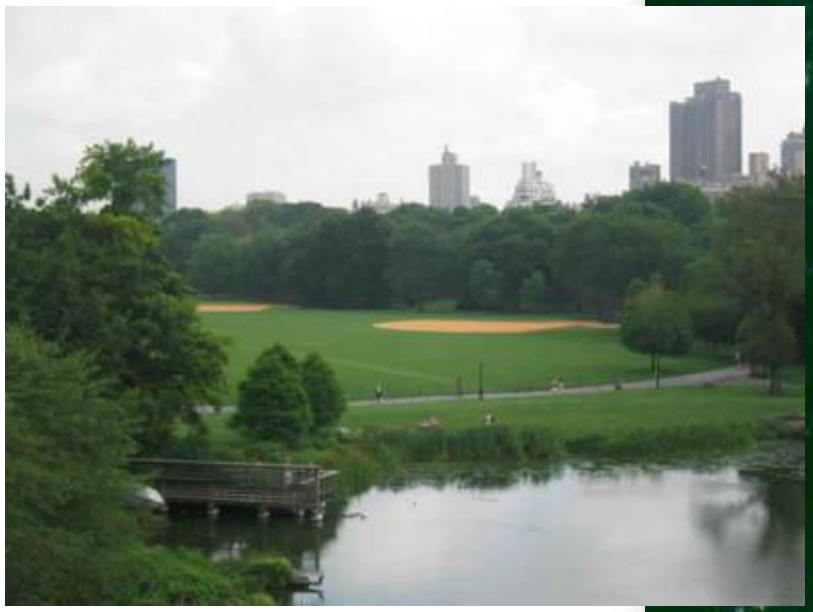
Compaction

Surface removal

Hydrologic disturbance

Challenges for Soils Urban and Suburban Landscapes

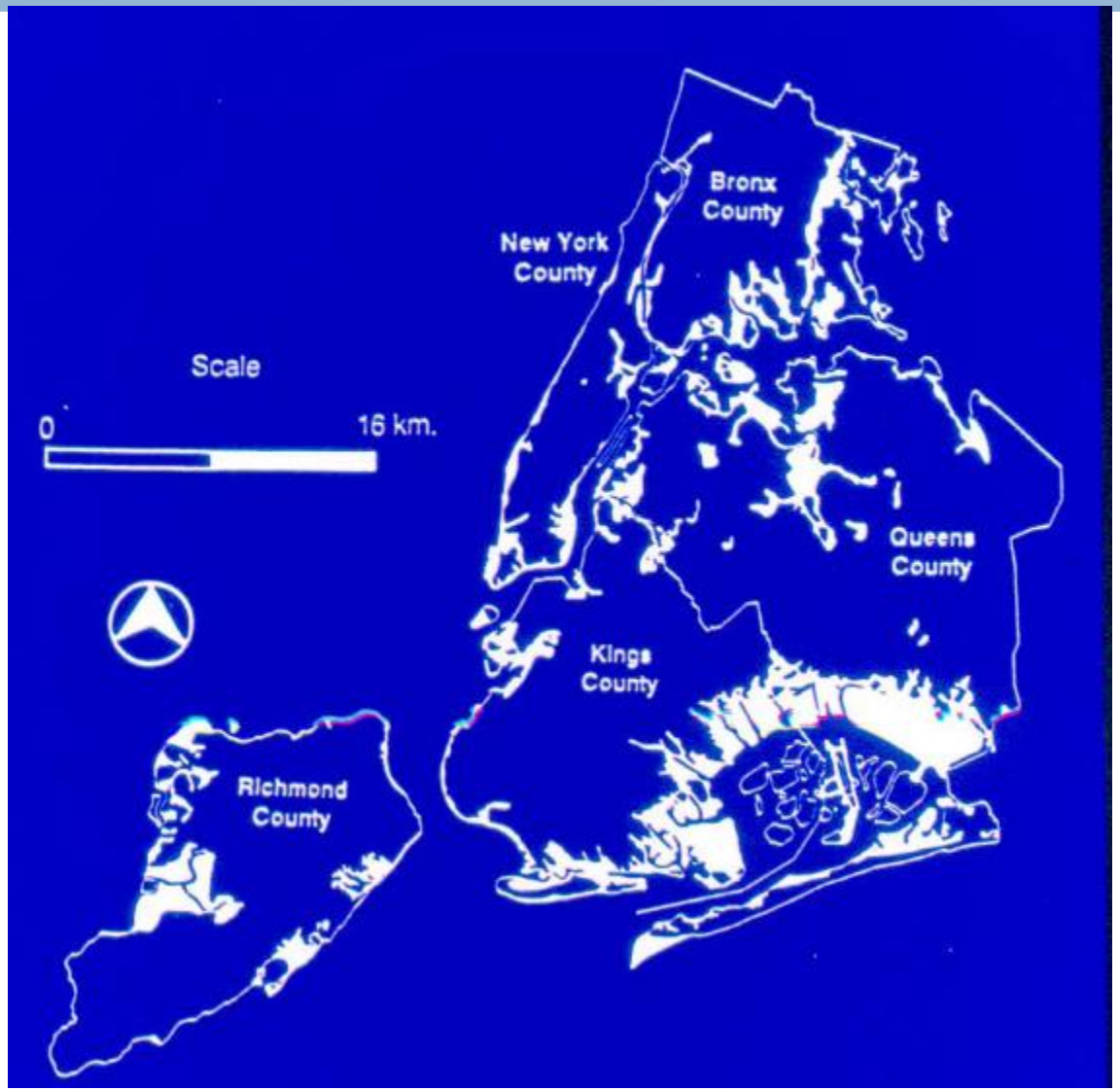
Heavy Use



Challenges for Soils Urban and Suburban Landscapes

Instability

Unknown conditions



Remediation and restoration of Urban Soils and Landscapes

Soil Remediation, Restoration, …….

Healthy Soil

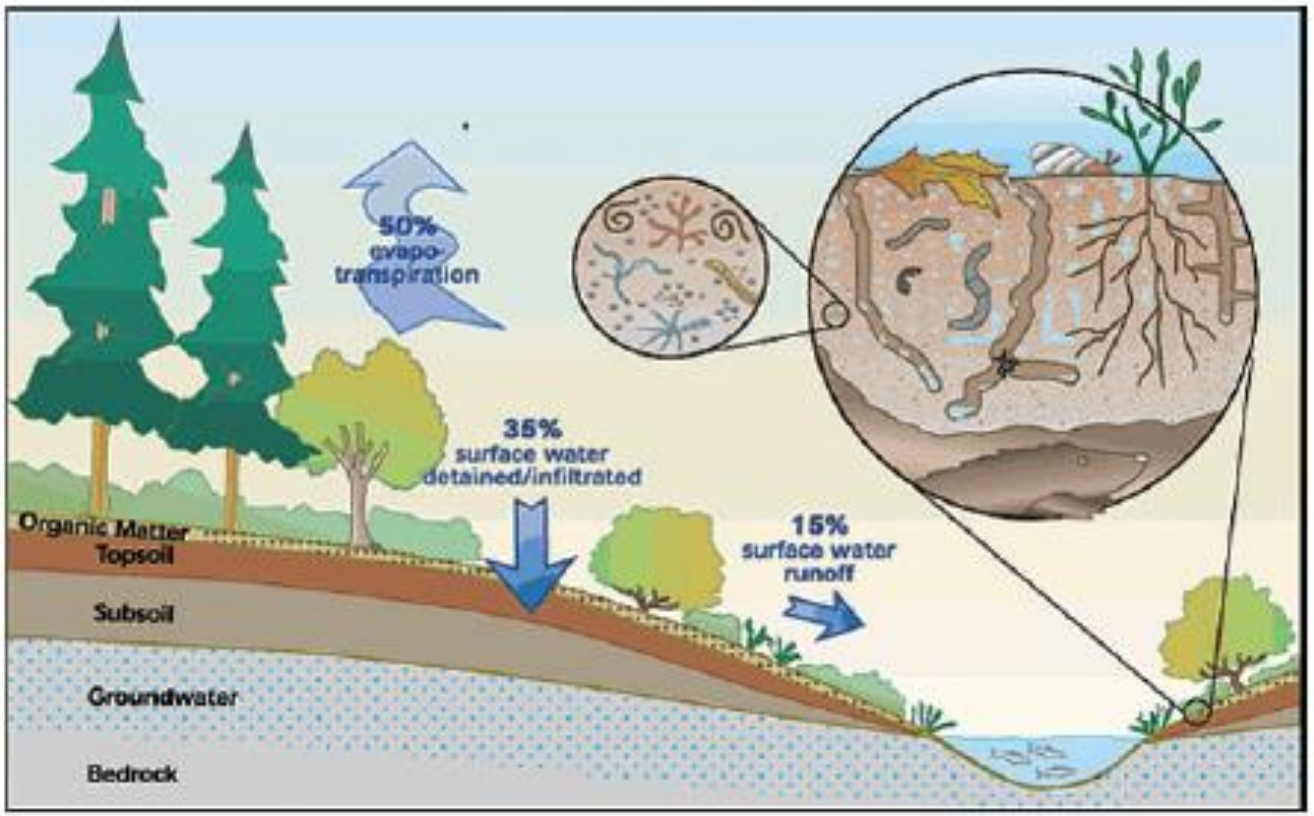


Figure 3.4: Water movement on a natural landscape with a plant cover. This landscape is in a humid area. In the drier regions, the stream level is higher than the surrounding land.

Soil Remediation, Restoration, …….

Reduced function

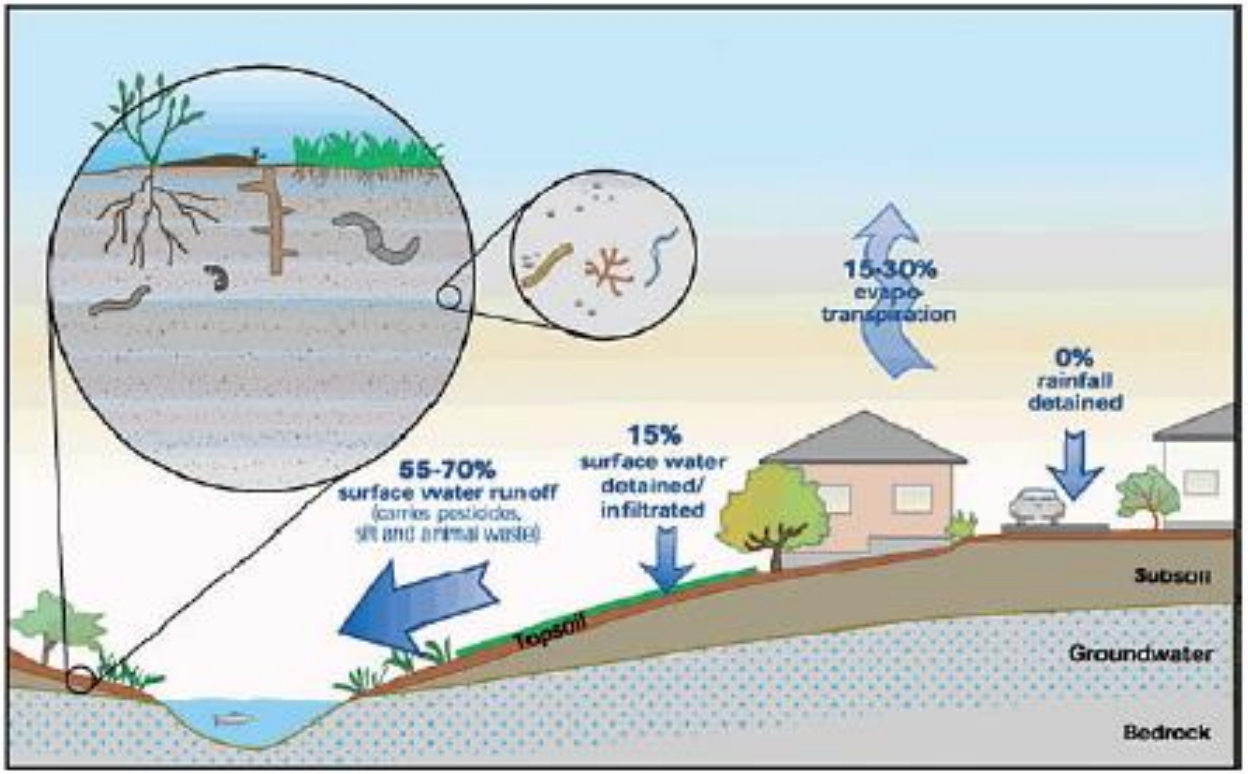


Figure 3.5: Water movement on a disturbed urban landscape with limited vegetation and impervious surfaces. This landscape is in a humid area. In the drier regions, the stream level is higher than the surrounding land.

Soil Remediation, Restoration, …….

No function

Soil Remediation, Restoration, …….

Contamination

OCCUM PARK
NORWICH, CONNECTICUT

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

- 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

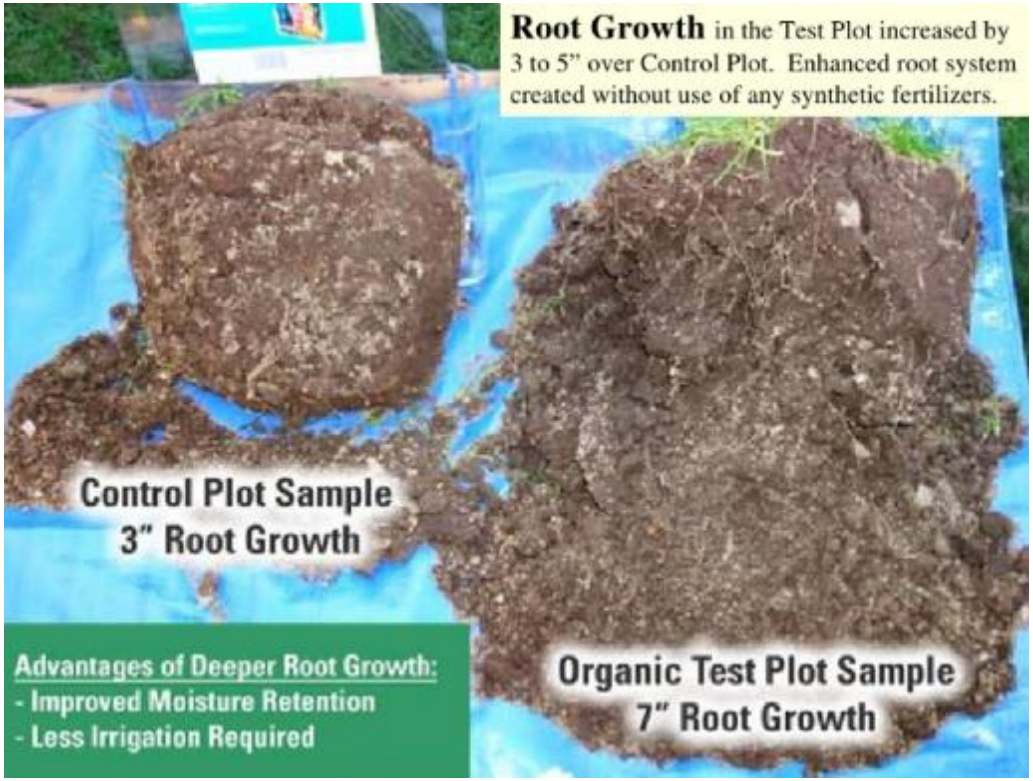
Root Measurements

Control Plot

http://www.slideshare.net/harvard_uos/harvard-yard-soils-restoration-project-summary-report-22509-4936446

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

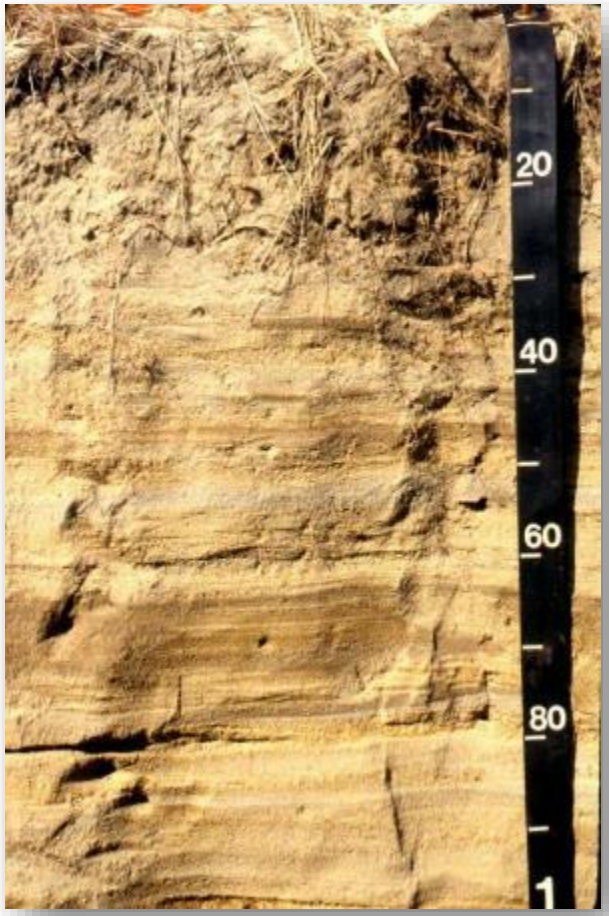
Soil Remediation, Restoration, ……..

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

JORDAN COVE WATERSHED PROJECT

SECTION 319

Mapping urban and suburban soils

Soil Survey in Urban / Suburban Landscapes
Mapping in Urban Areas / Getting Around

1899

1999

Soil Survey in Urban / Suburban Landscapes
Mapping in Urban Areas / Finding Holes

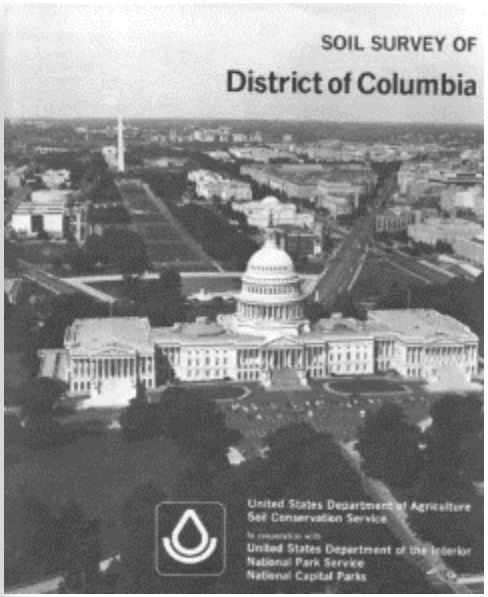
Soil Survey in Urban / Suburban Landscapes Mapping in Urban Areas / HTM

HTM - a new type of parent material - use your nitrile gloves

Ground Penetrating Radar

X-ray fluorescence analyzer (XRF)

History of Urban Soil Mapping



SUITMA 5

SEPTEMBER 20-25, 2009 NEW YORK CITY

http://www.soilandwater.nyc/urban-soils.html

NYC Soil Surveys

NYC Detailed Soil Survey via Web Soil Survey

The 1:12,000 scale soil map covers 235,945 acres and has a minimum size delineation of 1.5 Acres. New York City has approximately 27 percent open space and this is where the majority of the field investigations were conducted. 70 soil series were identified in the survey; 32 of which were developed in human transported materials (HTM) and 38 in naturally occurring parent materials (glacial till,

Useful Links

NYC Urban Soils Institute

NRCS Soils Home Page

NYC Clean Soil Bank

Web Soil Survey Portal

Bronx River Watershed Soil Survey and Map

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.

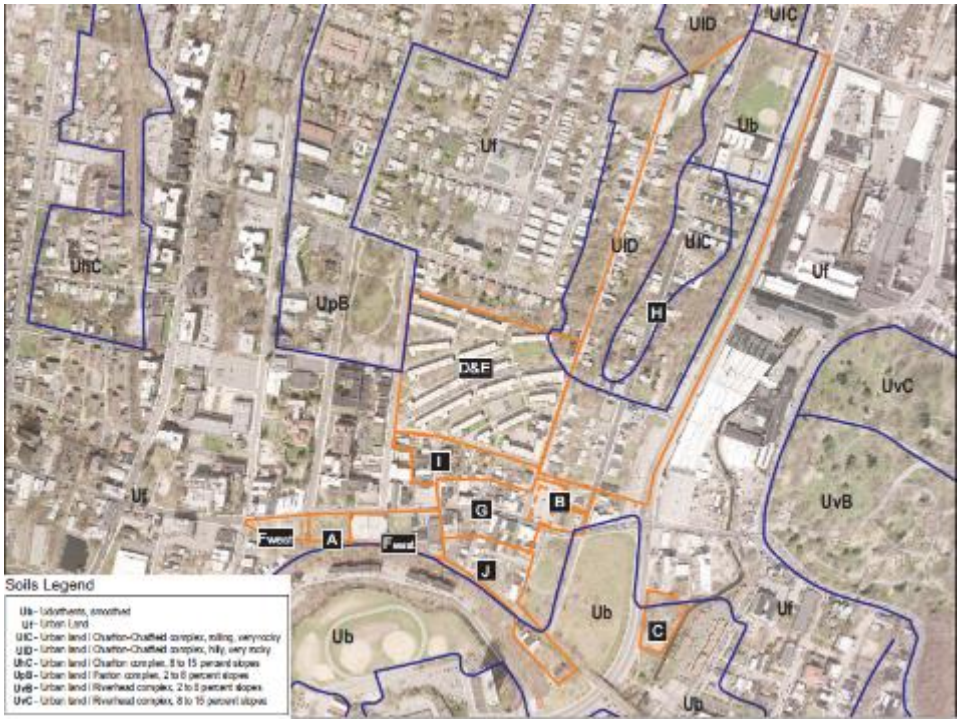
Recent Urban Soil Survey Activity

- NYC
- Chicago
- Los Angeles
- Detroit

Soil Survey in Urban / Suburban Landscapes

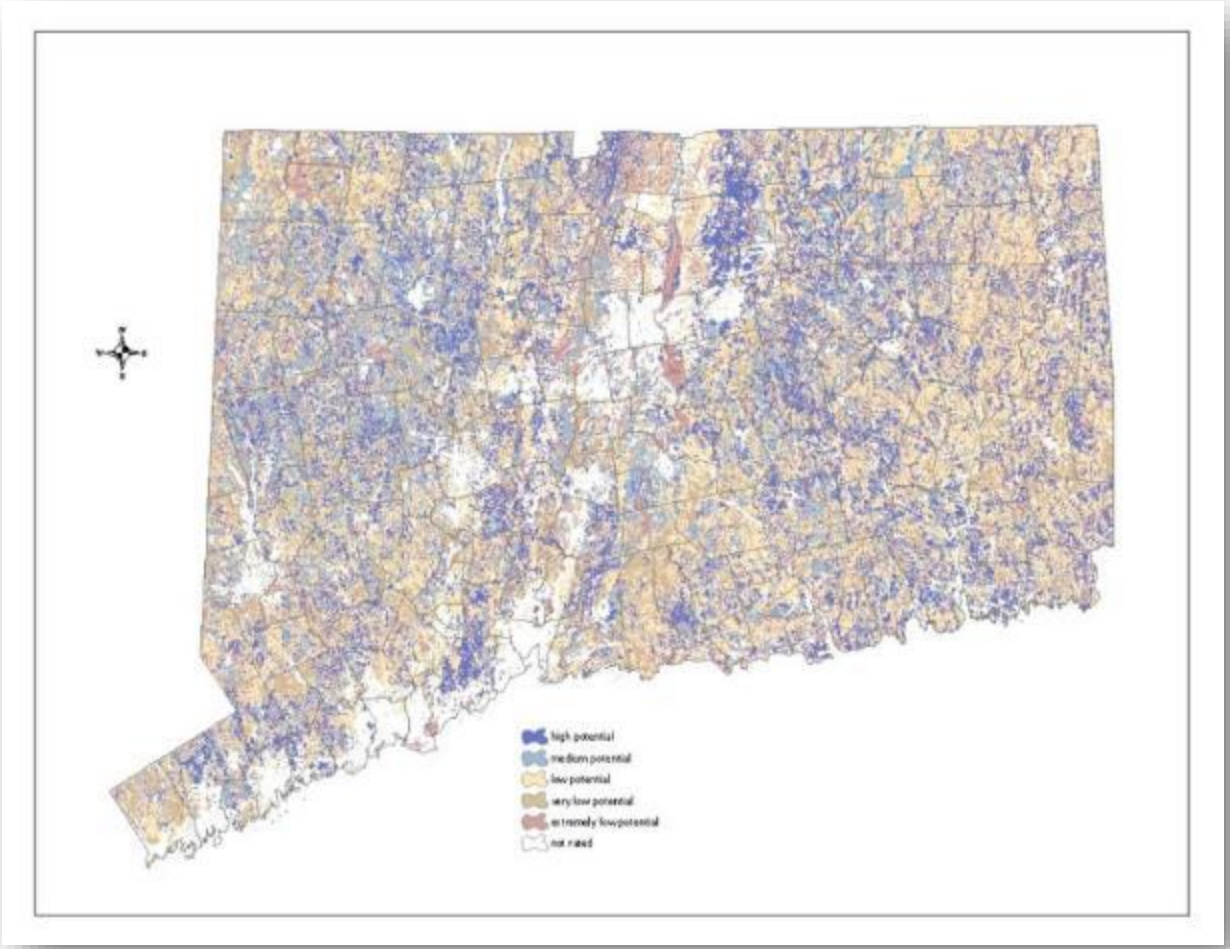
Traditionally areas heavily influenced by humans were mapped as one or a combination of:

- 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.



Soil Survey in Urban / Suburban Landscapes

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.



end

lumbia (DC001)

Map Unit Name	Acres in AOI	Percer of AO
ville-Urban land lex, 0 to 8 percent s	11.2	0.6
m-Urban land lex, 0 to 8 percent s	3.8	0.2
de loam	24.9	1.3
hents	606.8	31.5
land	1,142.2	59.3
land-Chillum lex, 8 to 15 percent s	14.0	0.7
	122.8	6.4
of Interest	1,925.6	100.0%

Map Unit Description

Printa

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 transe mapunit.

Description of Udorthents

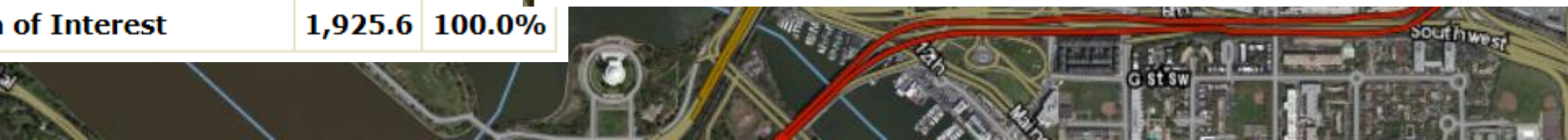
Properties and qualities

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

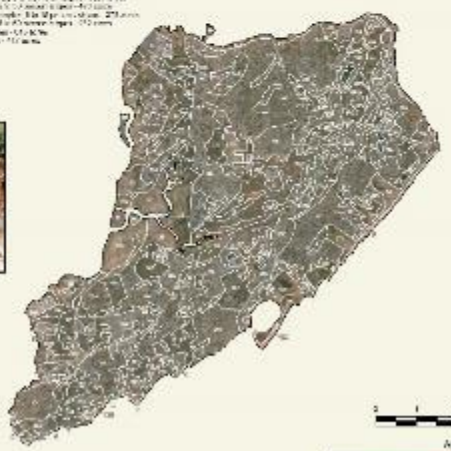
Interpretive groups

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

Description — Map Unit Description



New York City Reconnaissance Soil Survey



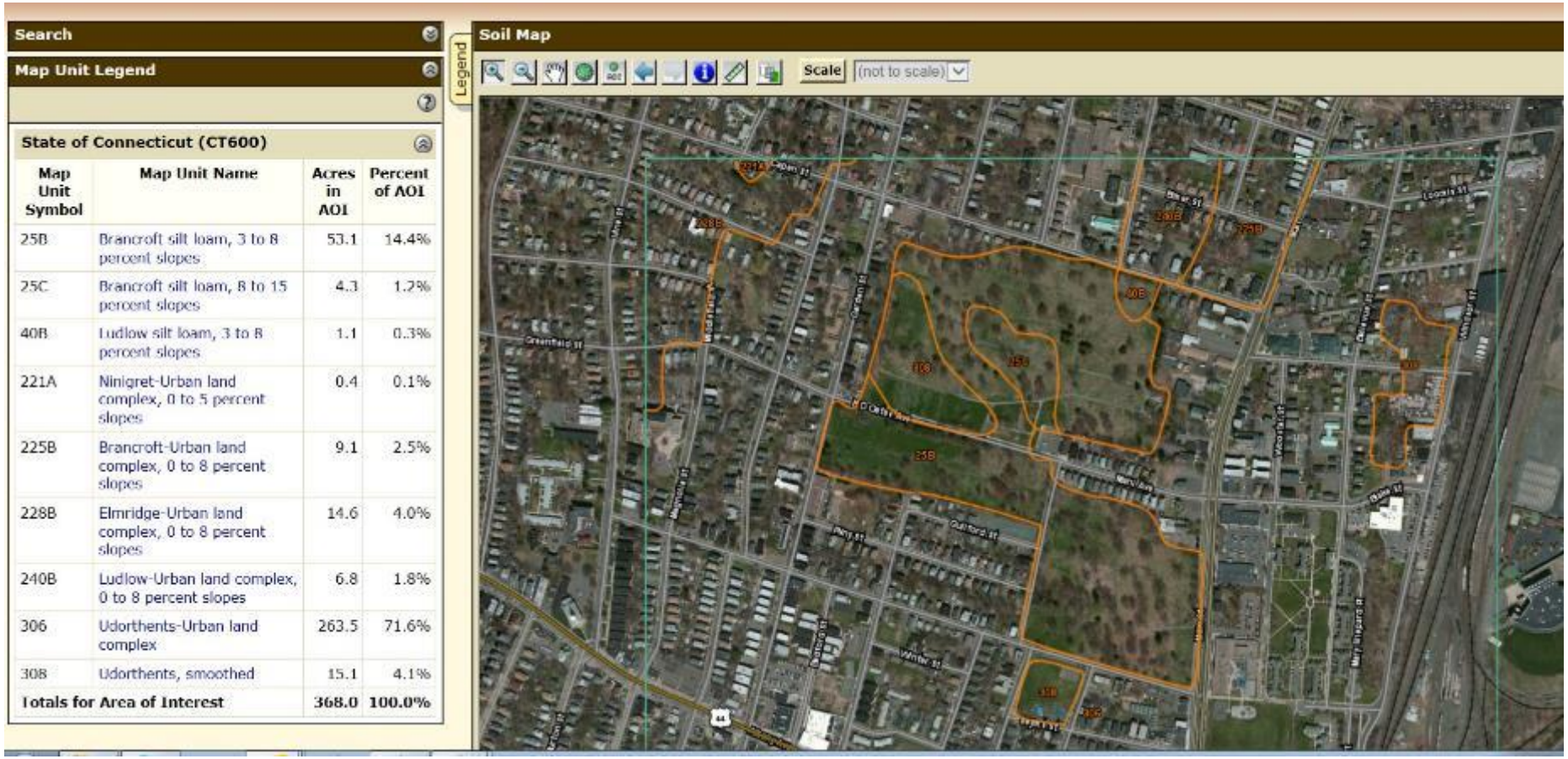
More descriptive map units

- 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

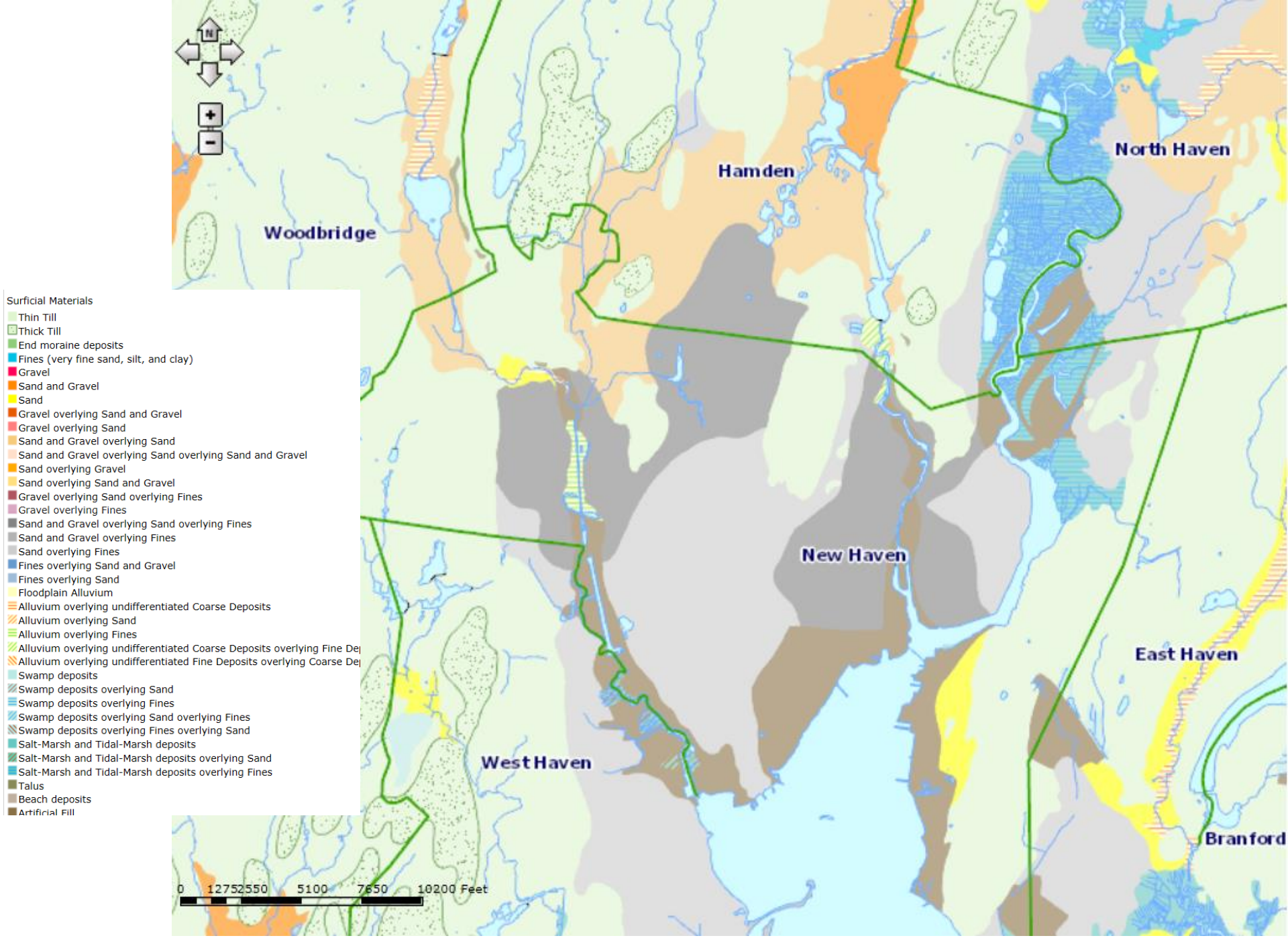
Live Web Soil Survey Demo

Urban Soil Mapping on Web Soil Survey



State of Connecticut (CT600)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
25B	Brancroft silt loam, 3 to 8 percent slopes	53.1	14.4%
25C	Brancroft silt loam, 8 to 15 percent slopes	4.3	1.2%
40B	Ludlow silt loam, 3 to 8 percent slopes	1.1	0.3%
221A	Ninigret-Urban land complex, 0 to 5 percent slopes	0.4	0.1%
225B	Brancroft-Urban land complex, 0 to 8 percent slopes	9.1	2.5%
228B	Elmridge-Urban land complex, 0 to 8 percent slopes	14.6	4.0%
240B	Ludlow-Urban land complex, 0 to 8 percent slopes	6.8	1.8%
306	Udorthents-Urban land complex	263.5	71.6%
308	Udorthents, smoothed	15.1	4.1%
Totals for Area of Interest		368.0	100.0%


Surficial Materials
Thin Till
Thick Till
End moraine deposits
Fines (very fine sand, silt, and clay)
Gravel
Sand and Gravel
Sand
Gravel overlying Sand and Gravel
Gravel overlying Sand
Sand and Gravel overlying Sand
Sand and Gravel overlying Sand overlying Sand and Gravel
Sand overlying Gravel
Sand overlying Sand and Gravel
Gravel overlying Sand overlying Fines
Gravel overlying Fines
Sand and Gravel overlying Sand overlying Fines
Sand and Gravel overlying Fines
Sand overlying Fines
Fines overlying Sand and Gravel
Fines overlying Sand
Floodplain Alluvium
Alluvium overlying undifferentiated Coarse Deposits
Alluvium overlying Sand
Alluvium overlying Fines
Alluvium overlying undifferentiated Coarse Deposits overlying Fine De
Alluvium overlying undifferentiated Fine Deposits overlying Coarse De
Swamp deposits
Swamp deposits overlying Sand
Swamp deposits overlying Fines
Swamp deposits overlying Sand overlying Fines
Swamp deposits overlying Fines overlying Sand
Salt-Marsh and Tidal-Marsh deposits
Salt-Marsh and Tidal-Marsh deposits overlying Sand
Salt-Marsh and Tidal-Marsh deposits overlying Fines
Talus
Beach deposits
Artificial Fill
Woodbridge
Hamden
North Haven
New Haven
East Haven
West Haven
Branford
0 12752550 5100 7650 10200 Feet

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

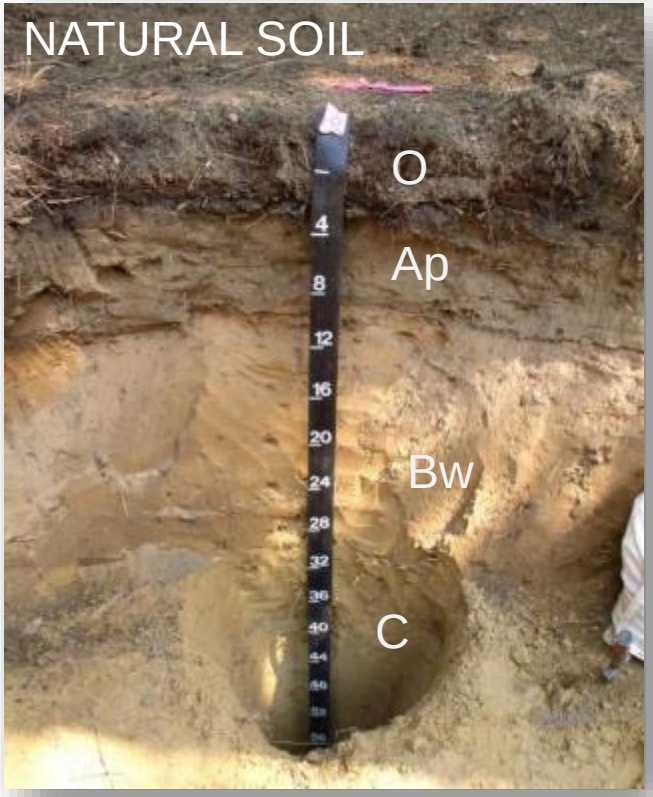
- Anthropogeomorphic process
- Kind of Anthrotransported material
- Thickness of Anthrotransported material
- Amount of human artifacts (%)

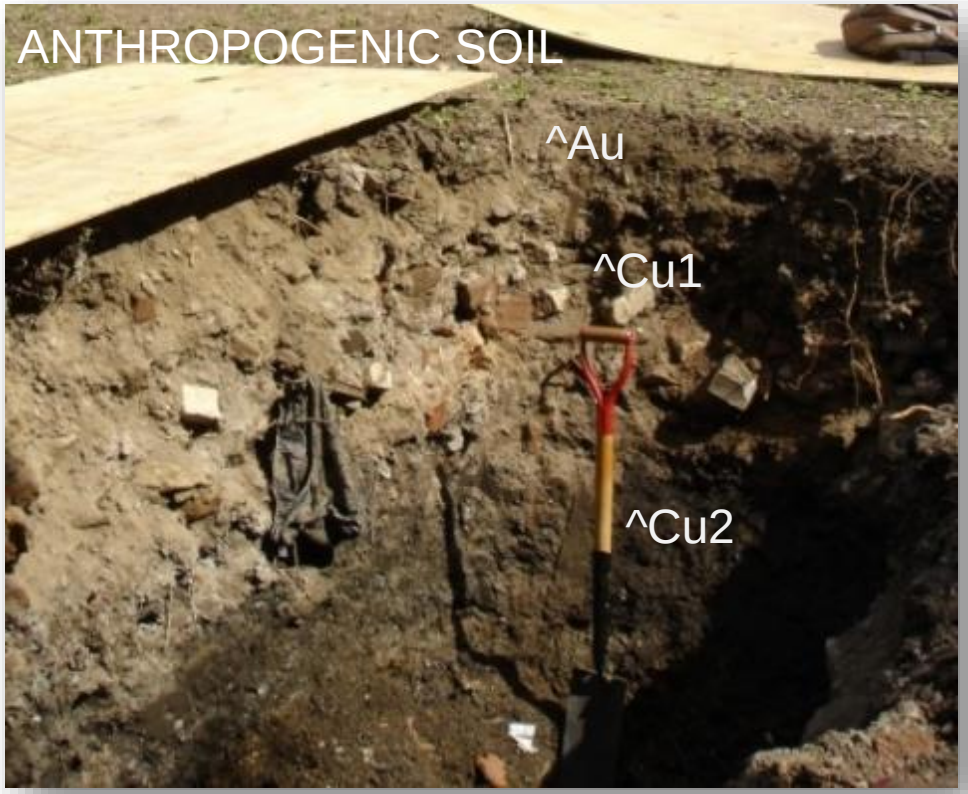
- Chemical and Physical properties
- Diagnostic horizons (below anthropoturbation)

Keys to Soil Taxonomy 10th edition

"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

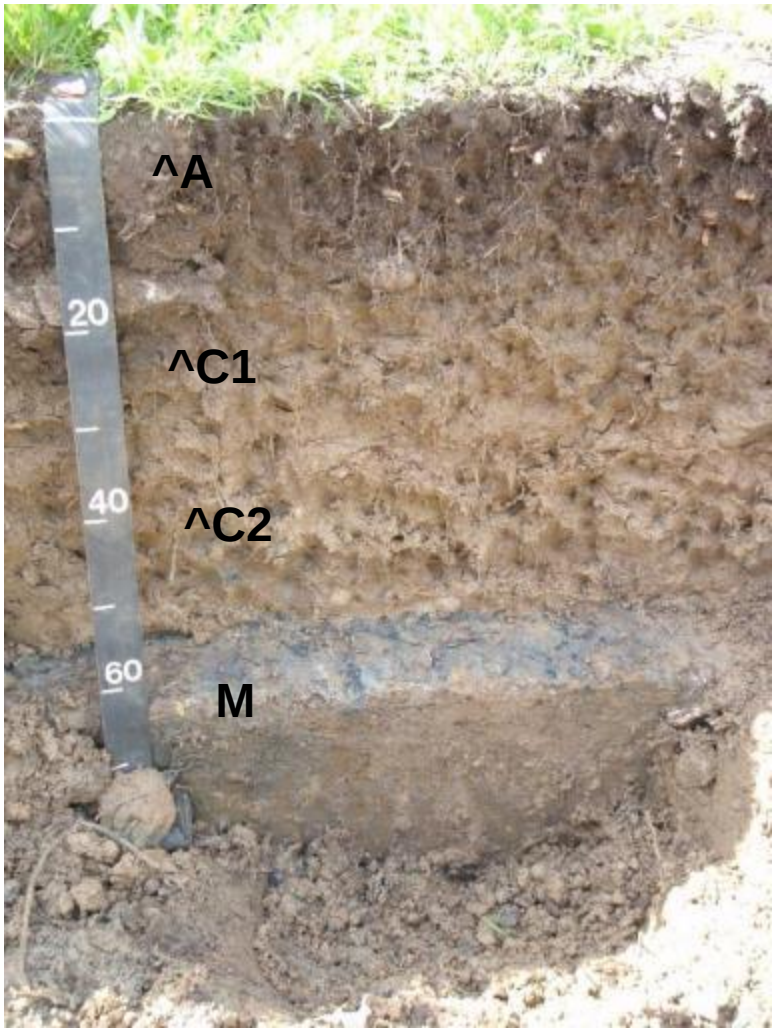




Keys to Soil Taxonomy 10th edition

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

Soil Survey: Soil Interpretations

Background Information

- 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

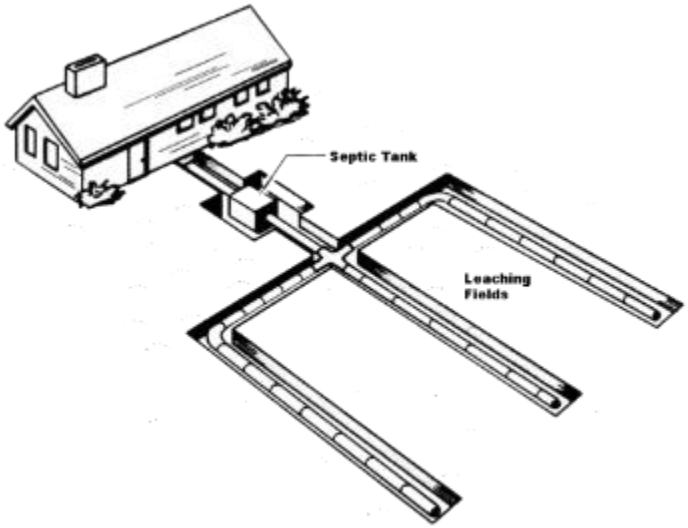
retrofitting

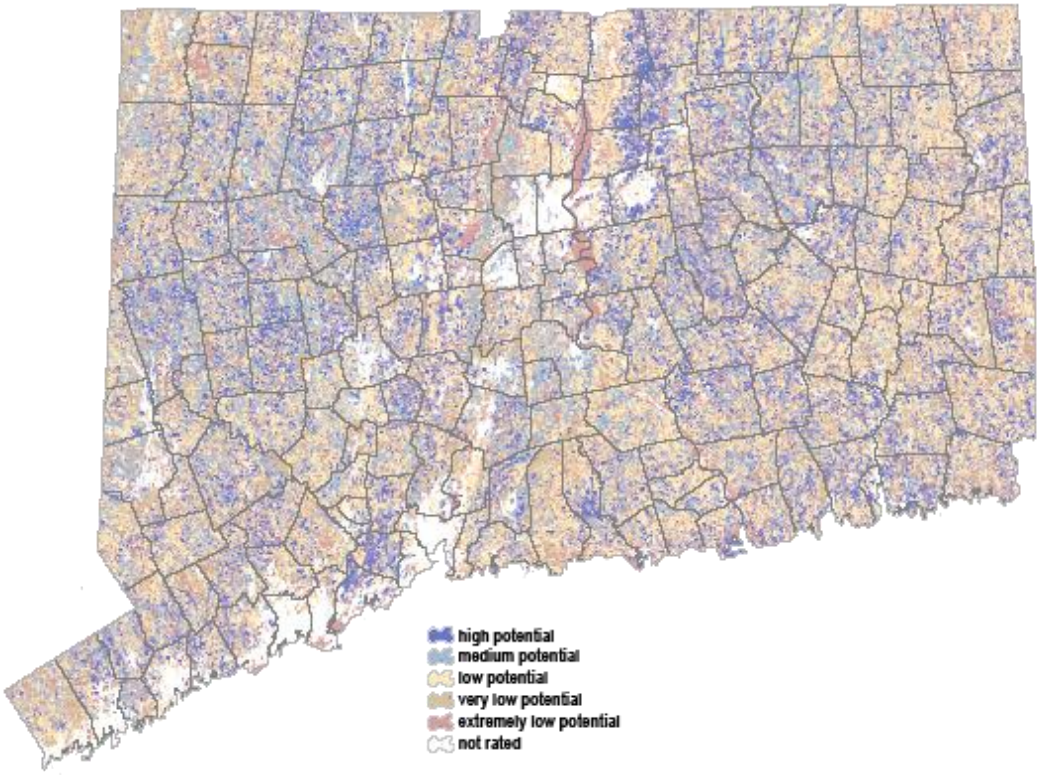
Soil Interpretations for Urban/Suburban Landscapes

Recreation

Soil Interpretations for Urban/Suburban Landscapes

Waste Management





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

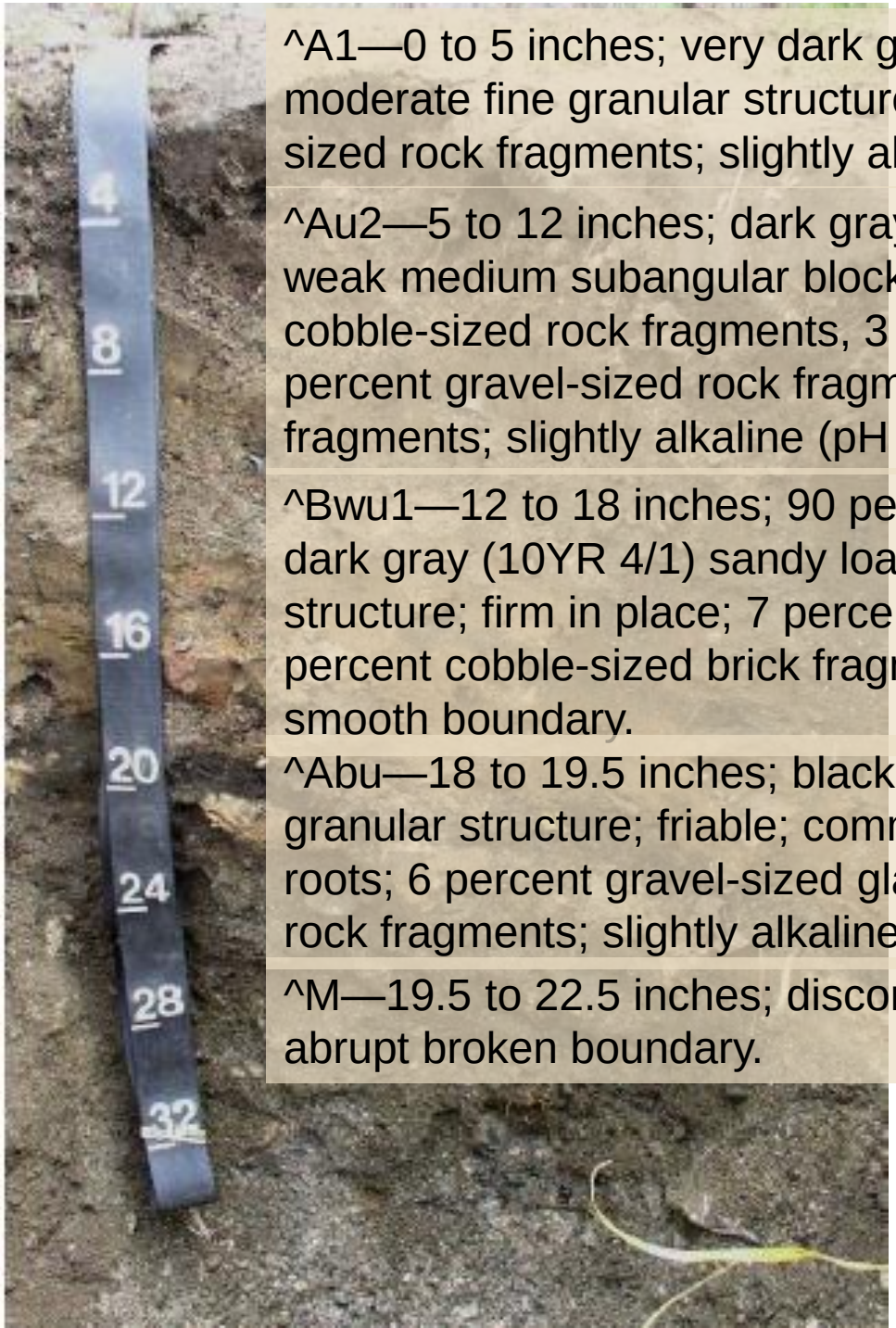
> 35% coarse fragments

Thank you!

Laguardia sandy loam

51A Laguardia sandy loam, 0 to 3 percent slopes, in Soundview Park in Bronx County, New York


4
8
12
16
20
24
28
32



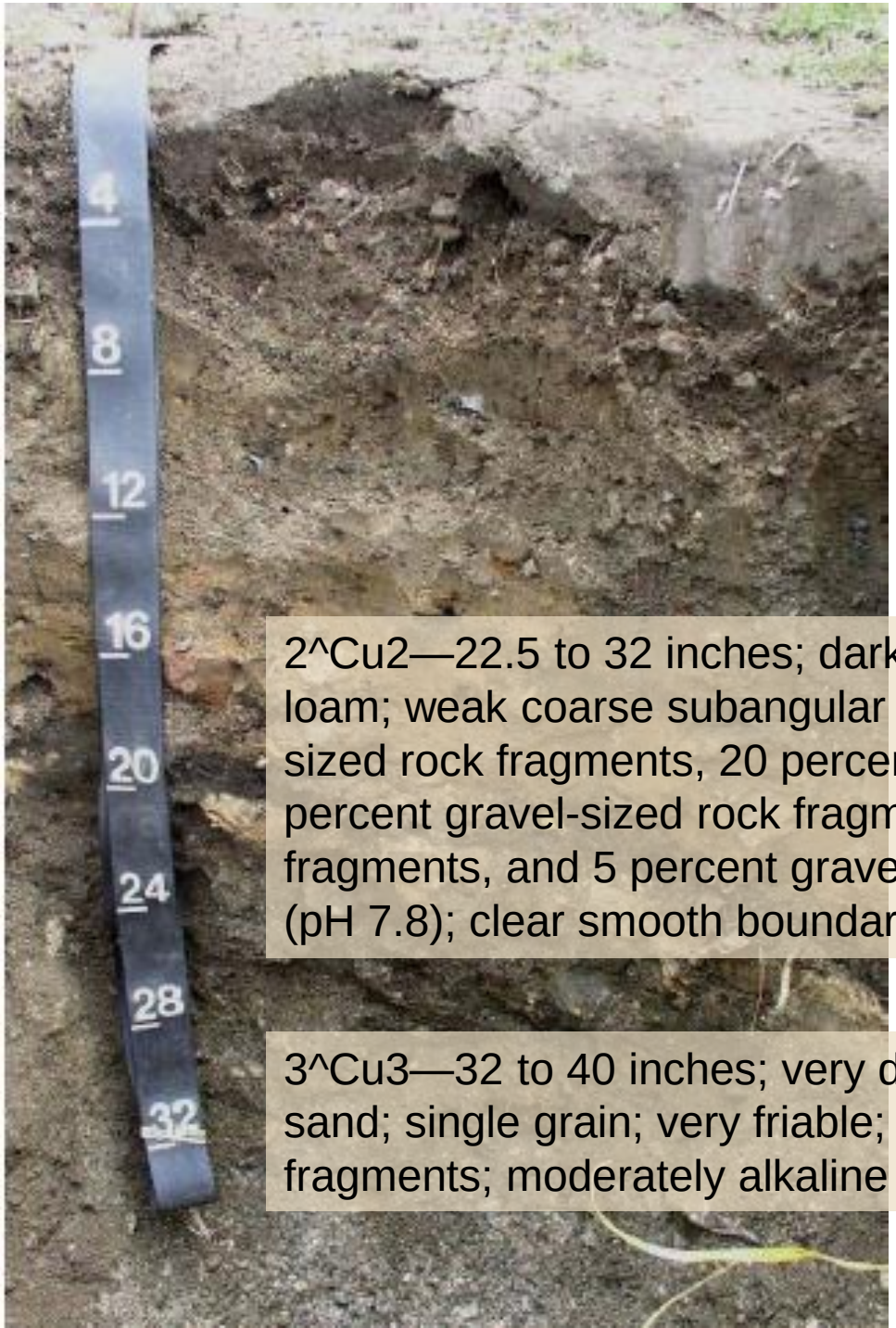
^A1—0 to 5 inches; very dark grayish brown (10YR 3/2) sandy loam; moderate fine granular structure; friable; few fine roots; 7 percent gravel-sized rock fragments; slightly alkaline (pH 7.4); clear smooth boundary.

^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).

extra

Soils formed in Human Constructed or Modified Landforms

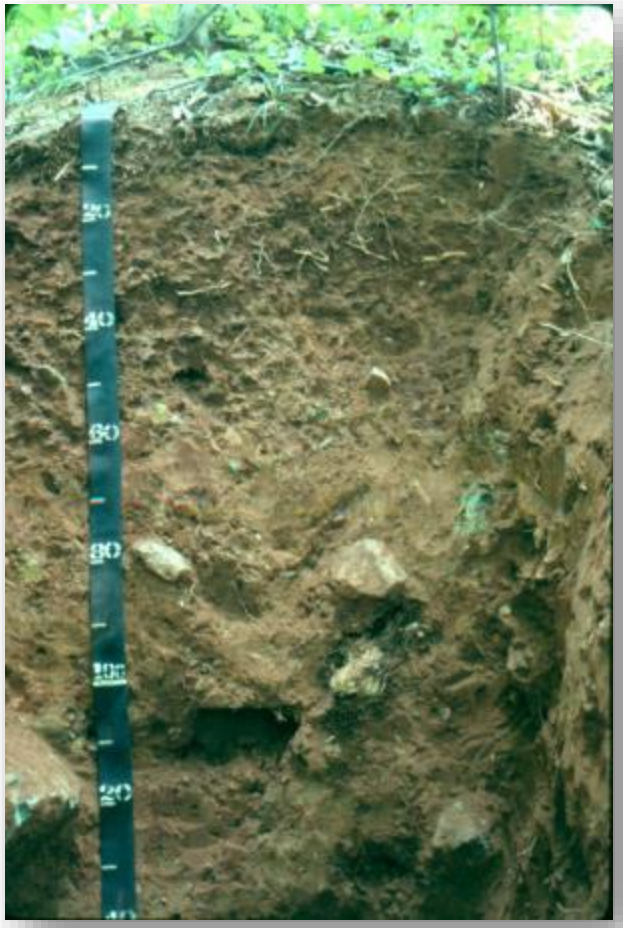
Verrazano

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

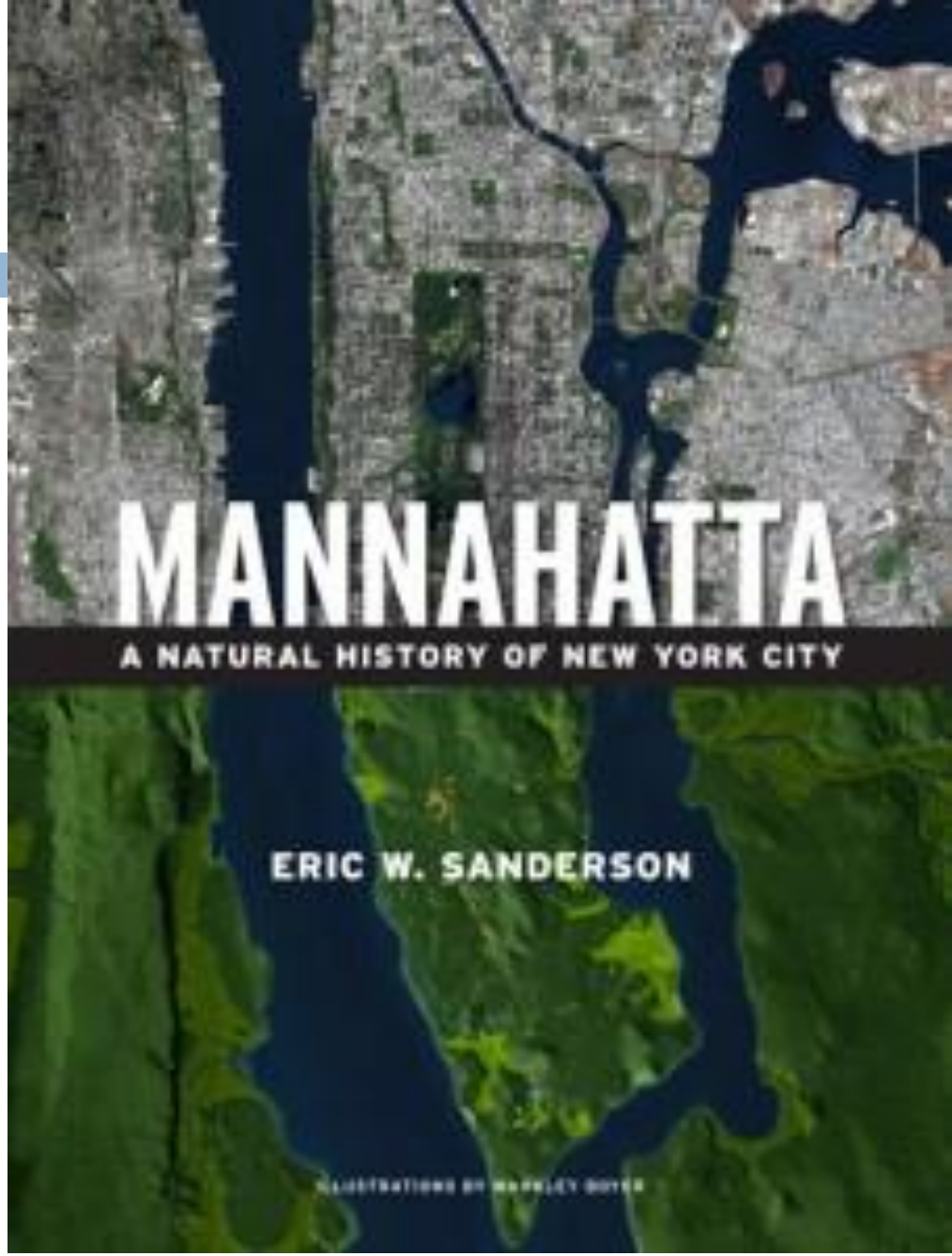
Inwood

> 40 inches fill; > 90% artifacts

Riker

> 40 inches of coal ash

Interesting stuff



http://themannahattaproject.org/home/