USDA United States Department of Agriculture

NYC Envirothon 2017
Soil Science Review

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USDA-NRCS

USDA United States Department of Agriculture

Introduction

Who Are We?

U.S. Department of Agriculture (1862)

Natural Resources Conservation Service (1935)

Dust Bowl
Stratford, TX, 1935

What Do We Do?

"Provide leadership in a partnership effort to help land owners & managers conserve, maintain, and improve their soil, water, and other natural resources."

USDA United States Department of Agriculture

NRCS Soil Science Division

National Cooperative Soil Survey

Helping People Understand Soils

soils.usda.gov

NJ & NYC Technical Soil Services

Provide modern soil information for the urban environment with soil maps, site inspections, training, & research.

What is Soil?

- mixture of mineral and organic materials
- forms on the surface of the earth
- changes in response to climate and organisms

Soil Components

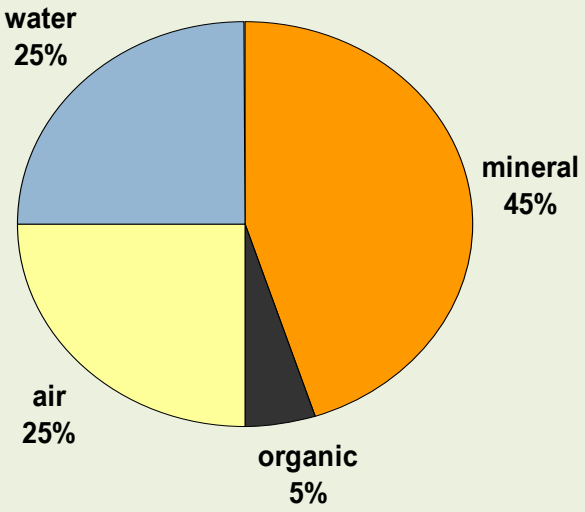
Solid space

- mineral material (from rocks)
  - sand, silt & clay sized particles
- organic material (from plants & animals)
  - various stages of decomposition

Pore space

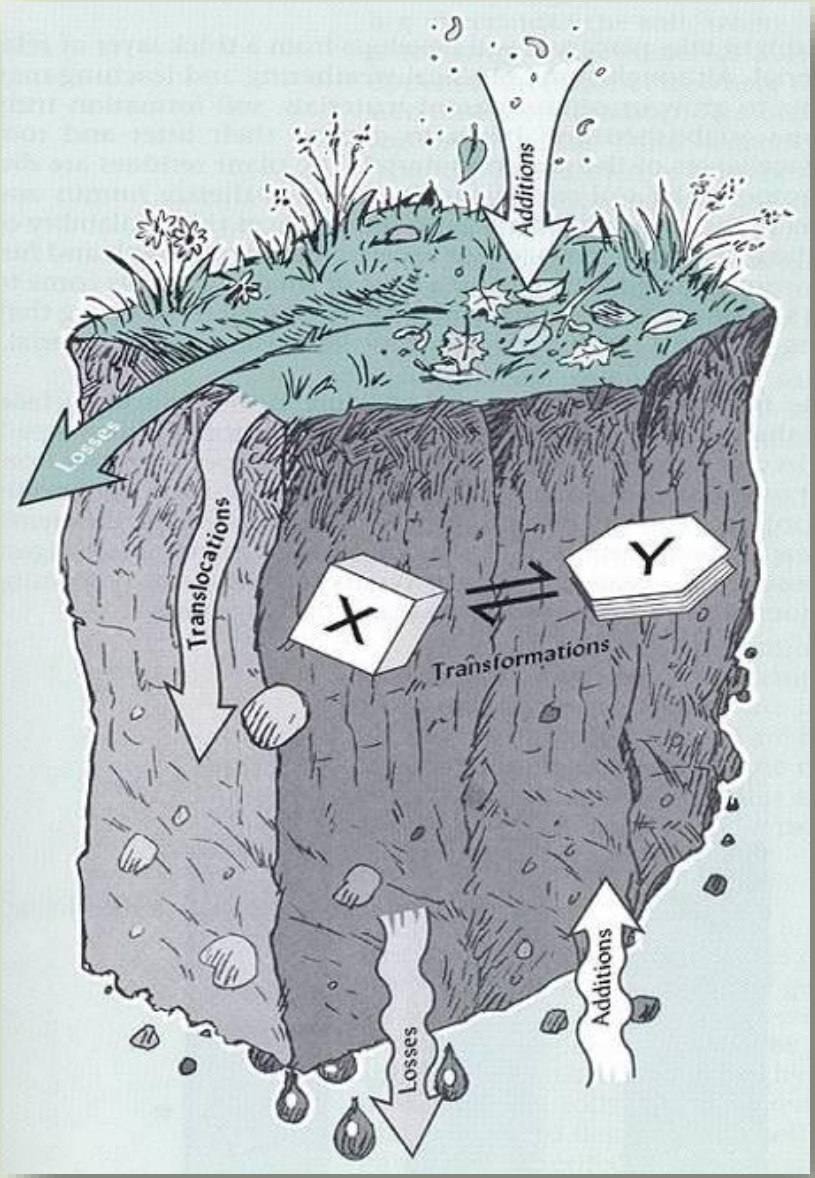
- air
- water

An ideal agricultural soil
50% pore space
50% solid space

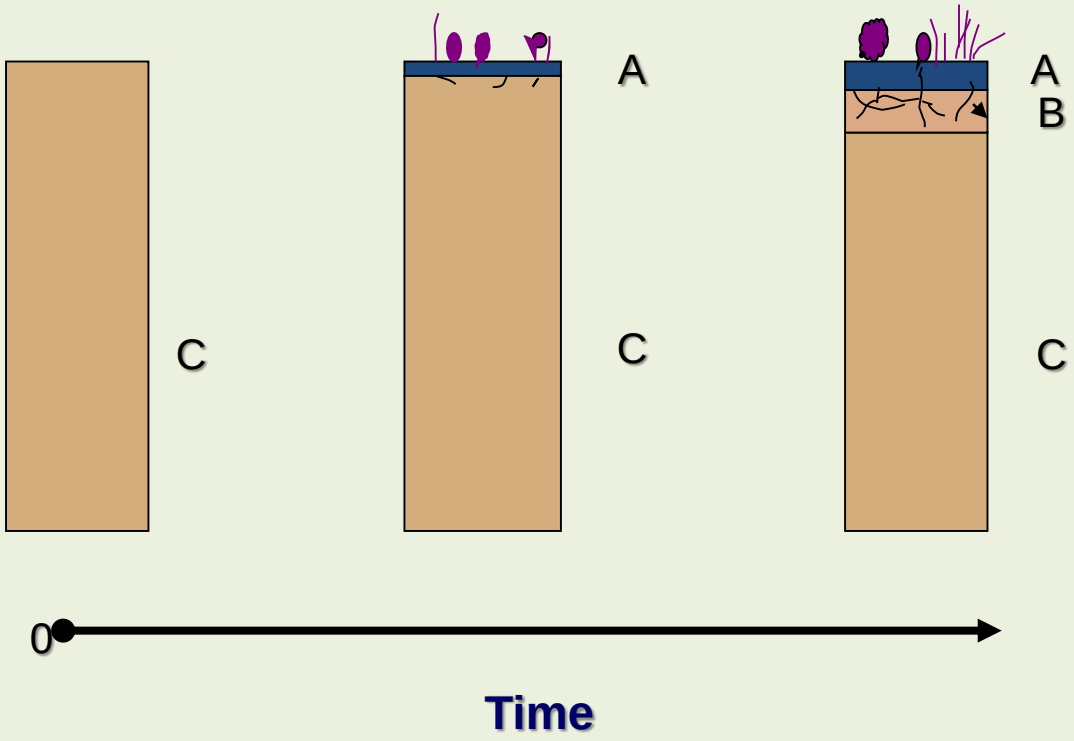


Soil Forming Processes

- Additions
- Losses
- Translocations
- Transformations



Formation of Soil Horizons



Why are Soils Different?
5 Soil Forming Factors

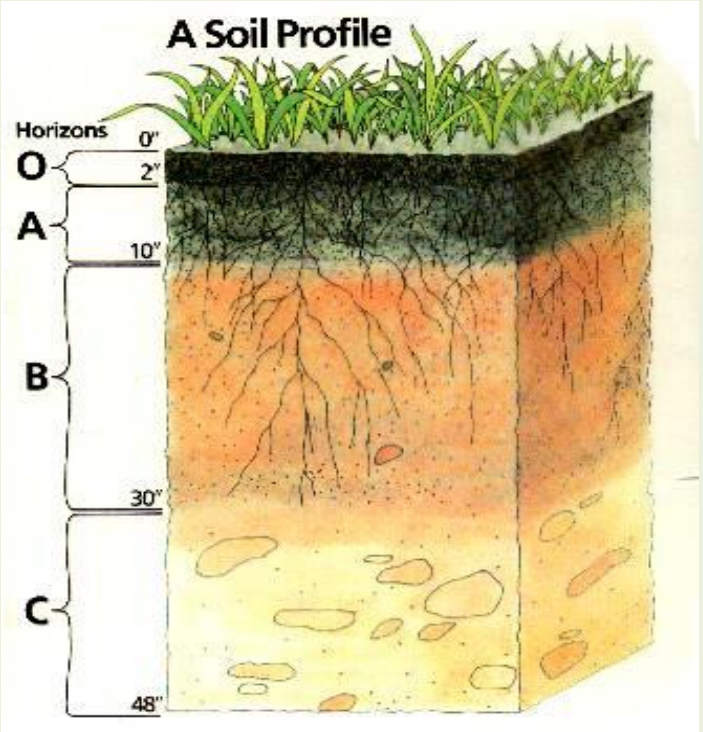
1) Climate
2) Organisms
3) Relief or topography
4) Parent material
5) Time

soil = f (cl, o, r, p, t)

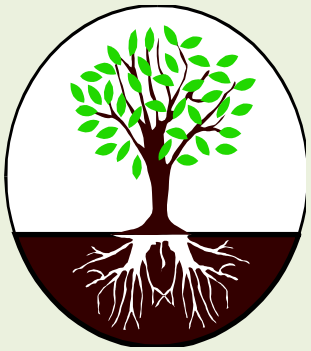
How do soils differ?

Important Soil Properties

- Horizonation
- Color
- Texture (particle size)
- Structure (aggregation)
- Consistence (firmness)
- pH and chemical properties
- Depth to water table (wetness)



Why are Soils Important?



- Sustain biological activity, diversity, & productivity
- Regulate and partition water and solute flow
- Filter, buffer, degrade, immobilize, and detoxify organic and inorganic materials
- Cycle nutrients
- Provide support and materials

http://soilquality.org/functions.html

NYC - Geomorphic Setting

- **3 Physiographic Provinces**
  - New England Upland (NW)
  - Triassic Lowland (SW)
  - Atlantic Coastal Plain (SE)
- **Glacial deposits**
  - terminal moraine
  - shallow & deep till
  - meltwater deposits
- **Anthropogenic disturbance**

  (human activity)

Soils in Urban Areas
Potential Problems

- Greater variability
- Presence of artifacts
- Modified soil pH
- Modified soil temperatures
- High potential for compaction
- Generally elevated levels of contaminants

Laguardia sandy loam, Bronx

High Rock Park: Aerial Photography

2004

1:12,000 scale (1" = 1000 ft)

High Rock Park: Topography

USGS topographic map
1:24,000 scale (1”=2000 ft)

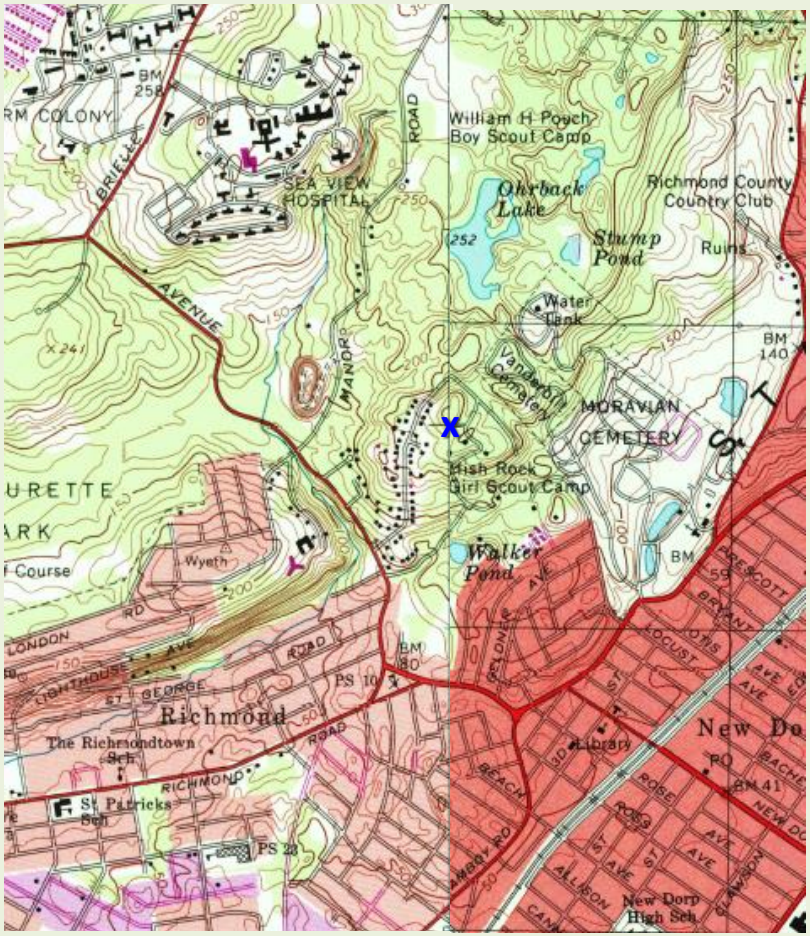
Map of relief or surface elevation using contour lines

Contour lines join points of equal elevation

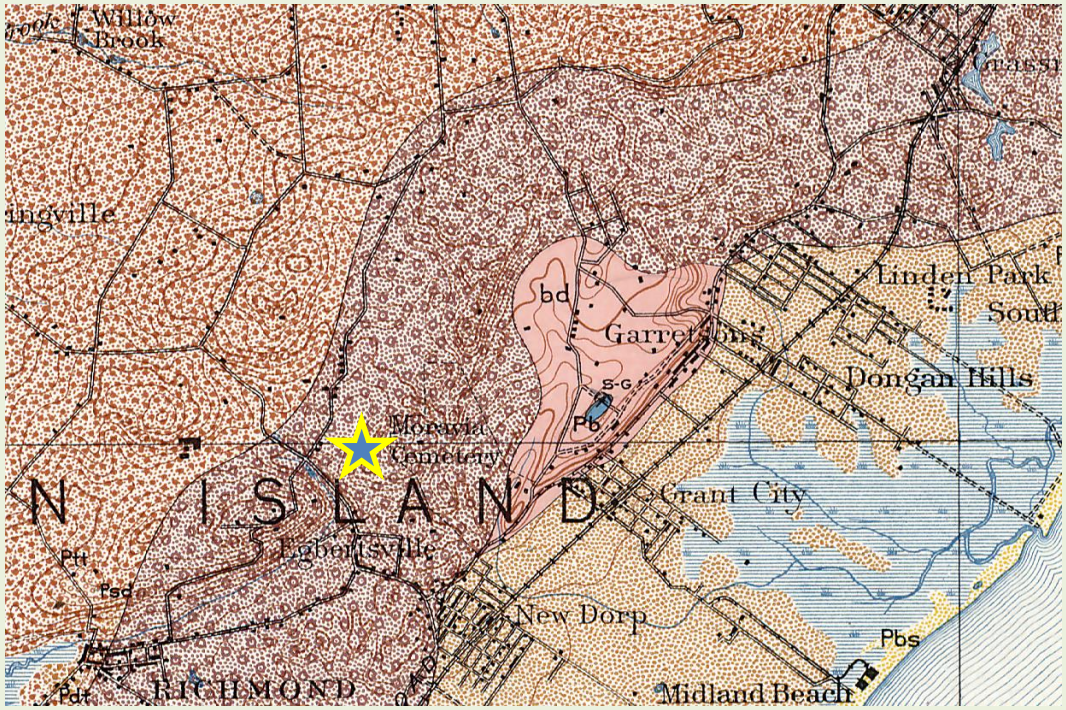
Contour interval here = 10 feet

Where lines are close together, greater change in elevation (steep)

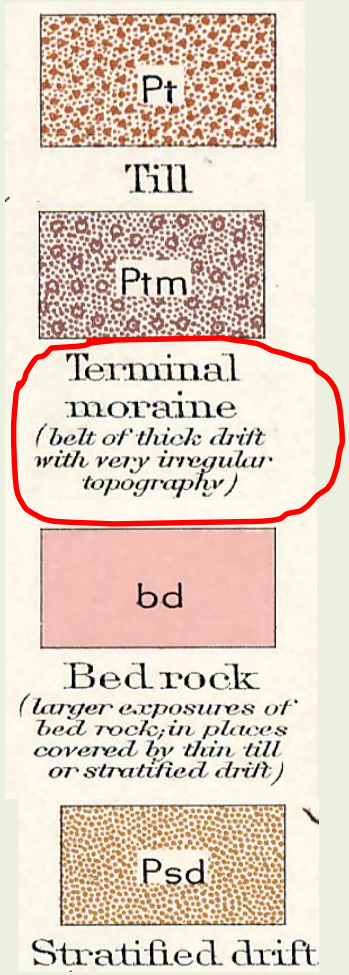
Hydrology & land use included:
Green = woodland or heavily vegetated
White = cleared of trees
Pink = built up area
Purple = elevation revised since last publication



High Rock Park: Surficial Geology



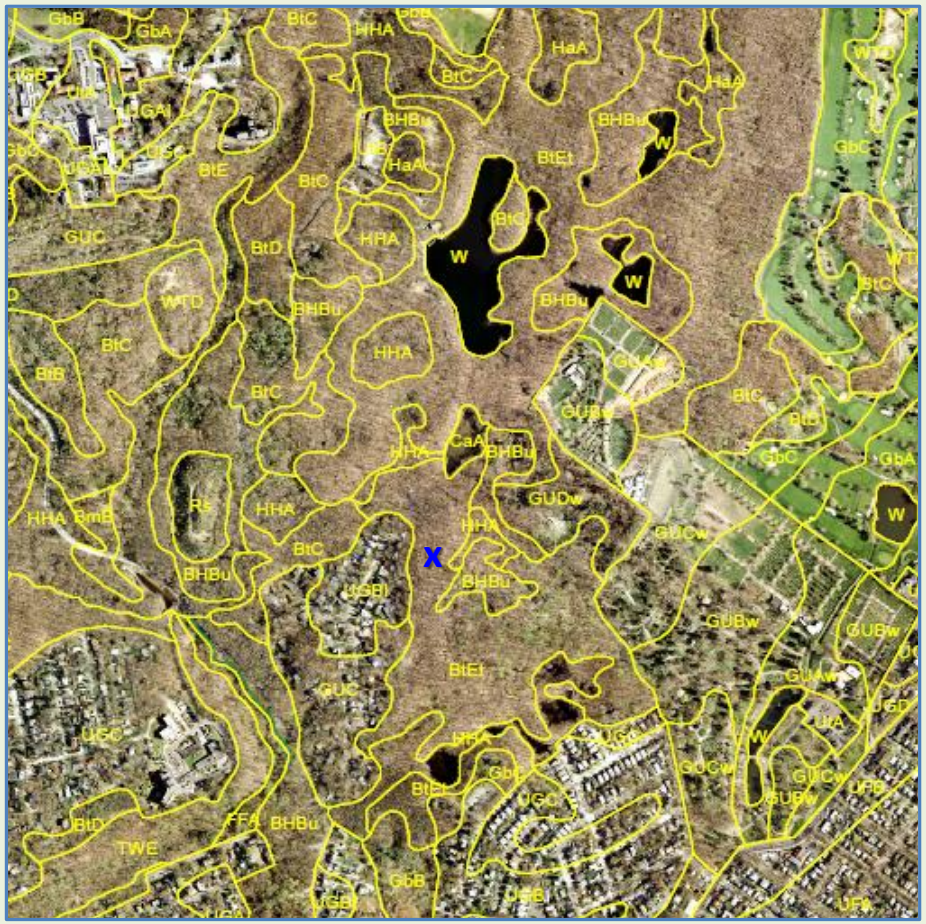
Merrill et al., 1902
1:62,500 scale (1"= 1 mile)



High Rock Park Soil Survey

Some soil map units:

BHBu	Boonton-Haledon complex, 0 to 8% slopes
BtC	Boonton loam, 8 to 15% slopes
BtEt	Boonton loam, 15 to 35% slopes, terminal moraine
HaA	Hasbrouck silt loam, 0 to 3% slopes, frequently ponded
HHA	Haledon-Hasbrouck complex, 0 to 3 percent slopes



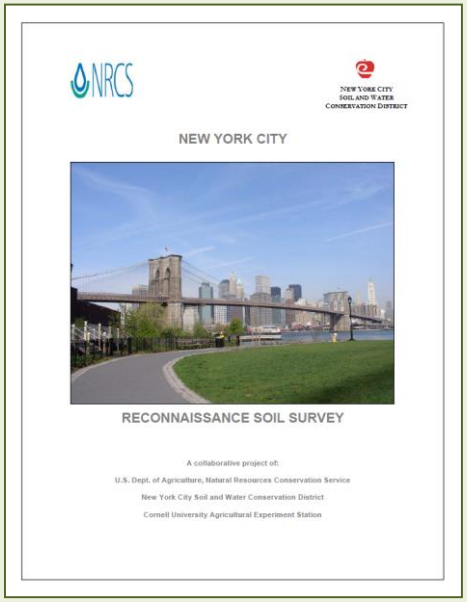
1:12,000 scale (1" = 1000 ft)

Soil Surveys

- ✓ Soil map
- ✓ Soil descriptions / properties
- ✓ Soil ratings & interpretations

NYC Soil Survey now available online at Web Soil Survey

https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm



Some Soil Survey Information

Hasbrouck silt loam

HaA Hasbrouck silt loam, 0 to 3% slopes, frequently ponded

Soil Properties

- Typical Profile: Oe/A/Bg/Btg/Btx
- Ponding: >once every 2 yrs.
- Depth to water table: 0 cm
- Drainage Class: Poorly drained

Ratings and interpretations

- Small commercial buildings: very limited
- Paths and trails: very limited
- Hydric soil: yes

Soil Survey
Physical & Chemical Properties

- Depth to water table
- Depth to restrictive horizon

For each horizon

- Organic matter content
- Particle size distribution
  (USDA, Unified, AASHTO)
- Bulk density
- Available water capacity
- Engineering properties
- pH & cation exchange capacity

Boonton loam

2017 Environmental Issue

"Agricultural Soil and Water Conservation Stewardship"

- **Problems**
  - ✓ Erosion (water or wind)
  - ✓ Runoff
  - ✓ Nutrient leaching losses

- **Solutions**
  - ✓ Soil and water conservation BMPs
    - Conservation tillage, cover crops, buffer strips, nutrient mgmt. plans

- **Big picture**
  - ✓ Soil health, sustainable agriculture, & environmental quality

Gericke Farm, Staten Island

Key study points, Soil Science

- ✓ Basic soil properties & practical implications
- ✓ Soil ecosystem services
- ✓ Local (urban soil) issues
- ✓ Use of topo map & soil survey
- ✓ Understand slope and aspect

USDA United States Department of Agriculture

More Soil Resources

- **Soils training materials at:**
  http://www.soilandwater.nyc

- **NY State Envirothon:**
  http://www.nysenvirothon.com/

- **USDA soils site (including Web Soil Survey):**
  http://soils.usda.gov/

Bill Mauldin (1921-2003)
45th Infantry
Pulitzer Prize winner