Site Characteristics

Take note of the land use, the land cover or vegetation, the slope and aspect (direction the slope faces). Any bedrock outcrop, surface stoniness, micro-topography

Soil Profile

Do you see any **horizons**?
A dark topsoil layer is usually a good indicator for successful plant growth.
Well expressed, naturally formed horizons below this could be a sign of a stable and relatively undisturbed soil.
Multiple layers could also be a result of filling with different types of materials.

Soil colors can tell something of the origin of soil material, and the wetness.
Is the soil uniformly brown? Then it is probably well aerated.
Different colors may also indicate different sources of material.
Is the soil partially gray, or brown with spots of gray? If so, it may be waterlogged, an undesirable condition for the growth of many plants.

Soil texture has important implications for water and nutrient supply.
Very sandy soils may not hold enough water & nutrients for certain plants.
Too many coarse fragments may take up water & nutrient holding space, and even plant rooting space. What is the % (by volume) coarse fragments?
Are they natural rocks or artifacts?
Heavy clay soils may have poor drainage. Gray colors may indicate wetness.
Loamy soils (a mixture of sand, silt, and clay) are generally best for most uses.

Soil Structure reflects soil physical condition.
Well expressed granular structure in the surface is a good sign of biological activity and health. Platy structure indicates compaction and possible problems with water movement and root growth. Subangular blocky structure in the subsoil allows for sufficient pore space for movement of water and air.
Soil microbes (bacteria and fungi) produce sticky substances that hold soil particles together. Disturbances, like tillage destroy pore structure and kill fungi.

Soil Consistence also reflects soil physical health.
Firm layers can restrict water or roots.

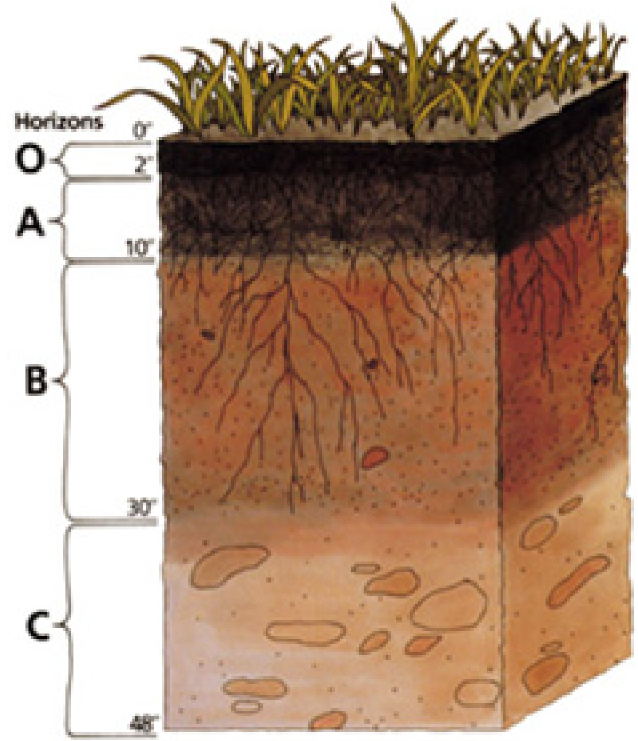
A **pH test** can give you a quick idea of the soil's chemical status.
The ideal pH for the growth of most plants is between 6.0 and 6.5.
pH values lower than this may need additions of lime (calcium carbonate).
However, most urban soils have high pH values >7.0.

If you're planning a vegetable garden, you should have your soil tested for **contaminants**, such as heavy metals, as well as pH and nutrient content.
http://www.usi.nyc/

Cornell University guidelines on Urban Farming and Heavy Metals
http://smallfarms.cornell.edu/2017/05/02/6-soil-contamination/

A Field Guide

To Describing Soils in NY



USDA-NRCS- NY
NY Technical Soil Services
United States Department of Agriculture

Keep the Soil Covered

Cover Crops promote healthy soils by reducing erosion, increase available water capacity (increasing soil organic matter) and feeding nitrogen fixing microbes.

When temperature rise to 100^{0}F cover crops and their residues can help keep soil more than 20^{0}F cooler than on cropland without cover crops.

What is soil?

Soil is a mixture of mineral and organic matter, which forms on the surface of the earth, and changes, or has changed, in response to climate and organisms.

Soil is composed of:

Solid space	&	Pore space
• mineral material		• air
• organic material		• water

The proportion of each component can vary from one soil to another.
An "ideal" agricultural soil contains:

50% solid space	&	50% pore space
45% mineral material		25% water
5% organic material		25% air

Why should we know our soil?

1) Soils perform important functions in our environment;
2) Soils are variable;
3) Soils can be degraded.

1. Functions of Soil

- Sustain biological activity, diversity, and productivity
- Regulate and partition water and solute flow
- Filter, buffer, degrade, immobilize and detoxify organic & inorganic materials
- Store and cycle nutrients and other elements
- Provide support for socioeconomic structures

2. Variability of Soil

Why are soils different? There are **5 soil forming factors**:

- *Parent material*: is the raw material or 'geologic substratum' for soil formation
- *Landscape position or topography* influences erosion and deposition, water movement, local climate (e.g., north vs south facing slope)
- *Climate* affects physical, chemical, and biological reactions in soils.
- *Organisms* affect soil through their activities, and in the decomposition of their wastes and residues.

  1% increase in organic matter results in as much as 25,000 gallons of available soil water per acre.
- *Time* changes the parent material into soil.

The interaction of these **5 factors** result in the **soil forming processes**:

- *Additions* include organic matter accumulation and other surficial inputs.
- *Losses* occur through "leaching" of soluble constituents downward through (and out of) the soil profile by water, and removal of soil material by erosion.
- *Translocations* involve redistribution of constituents within the soil profile (e.g., clay and/or iron).
- *Transformations* are physical and chemical changes (e.g., in minerals or organic compounds)

Geographic Description (landscape and landform)

Landscapes:

A broad or unique land area comprised of an assemblage or collection of natural landforms that define a general geomorphic form or setting. Examples:

alluvial plain (river deposits)
barrier island (also landform) – i.e. Long Island
bay [coast] - i.e Jamaica Bay
karst - A kind of topography formed in limestone, gypsum, or other soluble rocks by dissolution, and that is characterized by closed depressions, sinkholes, caves, and underground drainage
mountains, upland
outwash plain, till plain, valley (also landform)

Landforms (within a landscape)

A landform may have one kind of soil or several. The surface of the landform may extend through one kind of parent material and into another. Examples:

Alluvial fan- A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes, shaped like an open fan or a segment of a cone, deposited by a stream
Cuesta- An asymmetric ridge capped by resistant rock layers of slight to moderate dip, commonly less than 10º
Drumlin- A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift
Esker – A long, narrow, sinuous and steep-sided ridge composed of irregularly stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier, and left behind as high ground when the ice melted
Flood plain –
Kame– A low mound, knob, hummock, or short irregular ridge, composed of stratified sand and gravel deposited
Kettle – A steep-sided, bowl-shaped depression commonly without surface drainage (closed depression) in drift deposits, often containing a lake or swamp, and formed by the melting of a large, detached block of stagnant ice that had been wholly or partly buried in the drift.
Lake plain (also Landscape)
Moraine-
Outwash Plain
Oxbow
Plateau
Sinkhole - A closed depression, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, salt) or by collapse of underlying caves within bedrock; diameters range from a few meters to as much as 1000 m.
Terrace
Tidal Marsh
Till Plain

Microfeatures: Bar, Gully,…

Anthropogenic Features: Anthroscape, Artificial levee, …

Land Capability Classes-

8 Classes to indicate progressively greater limitations and narrower choices for practical use.

- Class 1-4 relate to arable land- limited by: landscape location, slope steepness, depth, texture, pH, salinity….
- Class 5-8 are generally unsuitable for cropland- pasture, range, woodland, wildlife, and recreation or esthetic purposes

Land Capability <u>Sub</u>classes- e -erosion risk, w,-wetness, s-shallow/stoniness/droughty, C- climate (cold or dry)

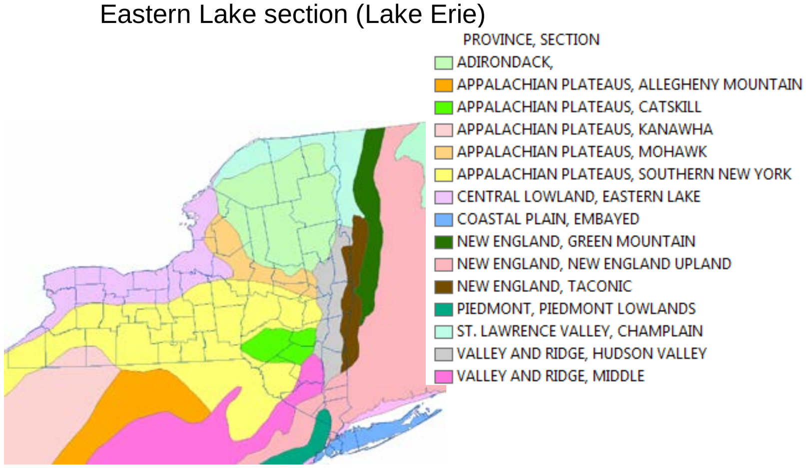
Physiographic areas related to soils of New York

Physiographic Divisions- Provinces-Sections

Atlantic Plain→ Coastal Plain→ Embayed section (Long Island)

Appalachian Highlands
- Piedmont Province
  - Piedmont Lowlands (Rockland Co.)
- Valley ad Ridge Province
  - Middle (Orange & Ulster)
  - Hudson Valley
- St. Lawrence Valley
  - Champlain section
  - St. Lawrence Valley- northern section
- Appalachian Plateau
  - Mohawk section (Black River Valley)
  - Catskill section
  - Southern New York section
  - Kanawha section (unglaciated portion- Cattaraugus Co.)
- New England Province
  - New England upland section
  - Taconic section
- Adirondack Province

Interior Plains
- Central Lowland Province
- Eastern Lake section (Lake Erie)



Soil formation is all about processes. In time, processes create a soil profile from a pile of unconsolidated rubble. With more time, the soil will look less like the parent material it came from.

How are soils different?

Soil forming processes influence the **soil physical & chemical properties**:

- horizonation
- soil color
- soil texture, including coarse fragments
- soil structure
- soil consistence
- pH and nutrient supply

<u>3. Degradation of Soil</u>

It can take up to 500 years to form an inch of soil – is this a renewable resource? Soil can be degraded rather quickly by:

- Erosion (sheet, rill, gully)
- Contamination
- Compaction / infiltration

These abuses of soil can affect its ability to perform one or more functions. This continued capacity of a soil to function is often called soil quality or soil health. Soil health is affected by soil use. For more information on soils and soil health assesments visit the NRCS Health website: <u>http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/</u>

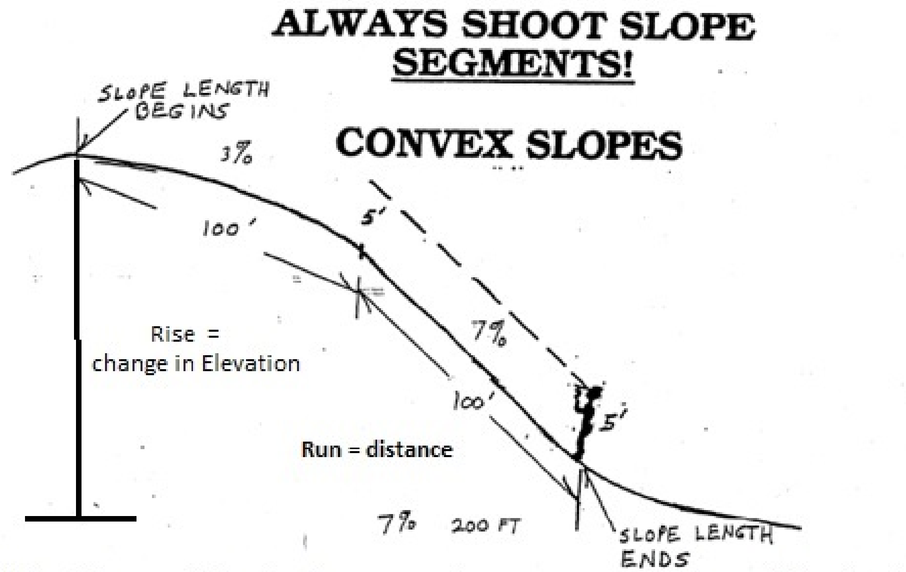
<u>Soil Description</u>

Site Characteristics

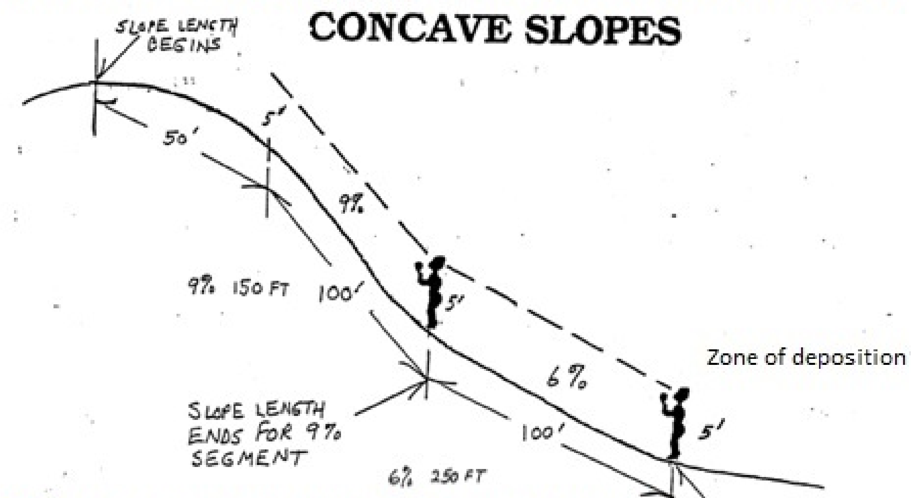
- Location: street, etc.
- Land use: athletic field, playground, woods, etc.
- Landform: *natural* - flood plain, river terrace or valley, till slope
  human modified - leveled land, fill, dump
- Vegetation: types, abundance
- Slope: What is the slant or inclination up or down? Slope can be expressed as change in elevation in feet per 100 feet lateral distance. Pace off 50 or 100 feet and estimate difference in elevation.
- Aspect: Which compass direction does the slope face (down slope)?
- Parent material: natural or fill?

Soil Profile

- Are there layers or horizons? How thick? Can they be identified?
- Depth to a root/water restrictive layer
- Color or colors for each horizon
- Texture, including coarse fragments and artifacts
- Structure
- Consistence
- Roots
- pH
- Horizon boundary



When the lower end of the slope is steeper, use the steeper segment with the overall slope length



On concave slopes use the gradient of the segment just above the point where it fattens enough for deposition to occur.

SLOPE PERCENT- measures rise in elevation in feet per 100 feet
(This example is with a Clinometer)
Can also use level and calculate percent slope= (rise/run)*100

SLOPE LENTH- measured from the point water would flow to a point of deposition, concentrated flow, or change in downhill slope or soil boundary.

Soils in NY

Soils form over time, through a series of processes, from mineral and organic parent materials. In general, soils can be formed directly from the weathered bedrock, or from some type of deposit above the bedrock. Most of New York state is covered with glacial deposits, left behind after the last ice age. Glacial deposits include two main groups: **glacial till**, an unsorted and unstratified mixture of materials left directly by the ice, and **glacial outwash**, the sorted and stratified material left behind by glacial meltwater. In some areas, particularly where the bedrock is more resistant, the ice did more scraping and abrading than depositing. **Bedrock outcrops** are common here, along with shallow soils. Sediments deposited by running water in floodplains are called **Alluvium**. Sediments that settled out of still bodies of water like glacial lakes are called **Lacustrine**.

Because of the high population density and resulting intense land use, soils in highly populated areas are usually disturbed. This disturbance may include:

- mixing of soil horizons or removal of topsoil;
- cutting & filling or grading of areas to level land (for buildings, ballfields, etc.);
- filling of areas that are wet, or possess undesirable soil characteristics;
- paving over or "sealing" soils beneath concrete, asphalt, etc.

Material used to 'fill in' an area can be natural soil material (derived locally or not), waste materials (e.g., coal ash, dredged spoils), or a mixture of both. Soils in urban areas can contain cultural artifacts (garbage); construction debris, and various waste products.

Parent materials for soil in New York include:

- deep glacial till:
- "shallow" glacial till over bedrock:
- glacial outwash;
- alluvial or recent stream deposits
- lacustrine (lake deposits)
- tidal marsh deposits;
- organic materials (very wet areas);
- Colluvium (base of slopes, transported by gravity):
- Loess (windblown silty deposits)
- "anthropogenic", or human-transported materials (HTM), also known as fill. These can be found almost anywhere in the urban environment.

Fill can be composed of:

- ❑ "Clean" soil materials without any human "artifacts"
- ❑ Construction debris
- ❑ Dredged materials
- ❑ Coal combustion waste
- ❑ Municipal solid waste

Potential problems with urban soils include:

- o Greater variability in horizonation & geographic distribution
- o Little/no organic matter addition
- o Presence of artifacts which can contain contaminants
- o Modified soil temperatures
- o High probability of compaction & contamination

Soil Consistence is the resistance of soil to deformation or rupture under an applied stress. It can also describe the difficulty of excavating the soil. Soil consistence, and its description, depends on soil moisture content. Terms commonly used to describe consistence in a moist soil are:

Rupture Resistance for Peds/clods (dry/moist)

Loose – non coherent when dry or moist; does not hold together in a mass.
Friable – when moist, crushed easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm – crushed under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Very Firm –needs considerable pressure to crush between thumb and forefinger

Plasticity (wet) [redacted]

The degree to which 'puddled" soil and be permanently deformed without rupture
Non plastic- will not form 6mm diameter roll; can't support itself if held on end.
Slightly plastic- 6mm dia. roll supports itself; 4mm dia. does not.
Moderately plastic- 4mm dia. roll supports itself; 2mm dia. does not.
Very plastic- 2mm dia. roll supports weight (roll is 4cm in length for all categories)

Roots

Root content reflects both plant and soil conditions. It can indicate zones in the soil that are physically restrictive to rooting.

Describe quantity:	and	size:	
Few	<2% of total volume	*Fine*	<2mm
Common	2-20% of total volume	*Medium*	2 to 5mm
Many	>20% of total volume	*Coarse*	>5mm

Soil pH

The most important effect of pH in the soil is on ion solubility, which in turn affects microbial and plant growth. A pH range of 6.0 to 6.8 is ideal for most crops because it coincides with optimum solubility of the most important plant nutrients. Most of the micronutrients for plant growth, and most heavy metals are more soluble at lower pH. Management of pH is important in controlling movement of heavy metals (and potential groundwater contamination) in soil.
In humid areas such as the eastern US, soils become naturally acidic over time as rainwater replaces basic cations (Ca, K, Mg, Na) with hydrogen. Some types of vegetation, particularly conifers, produce organic acids, which can also contribute to lower soil pH values. Addition of certain fertilizers to soil can also produce hydrogen ions. Liming the soil adds calcium, which replaces exchangeable and solution H^+ and raises soil pH.
In general, soils in urban areas have been found to have higher pH values than undisturbed natural soils. These may be due to additions of basic cations from road salts, concrete, plaster and other "anthropogenic" materials.

Horizon Boundary

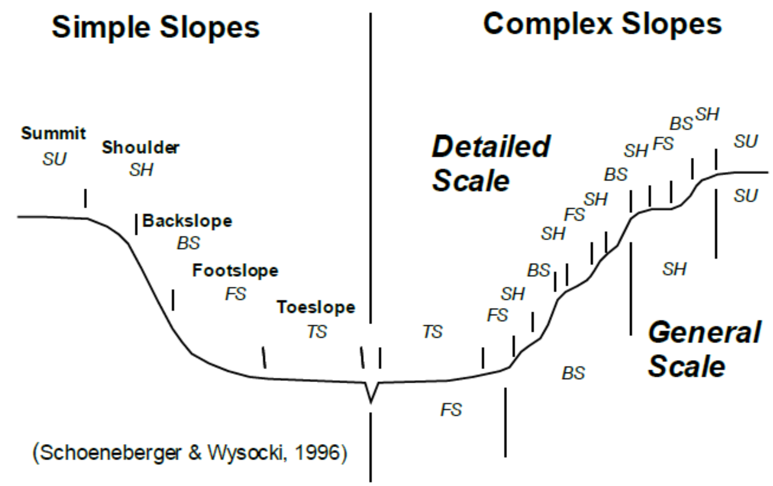
How distinct/thick is the boundary between horizons? It can indicate recent deposition or filling.

Abrupt: <1"
Clear: 1 to 2 ½"
Gradual: 2 ½ -5"
Diffuse: >5"

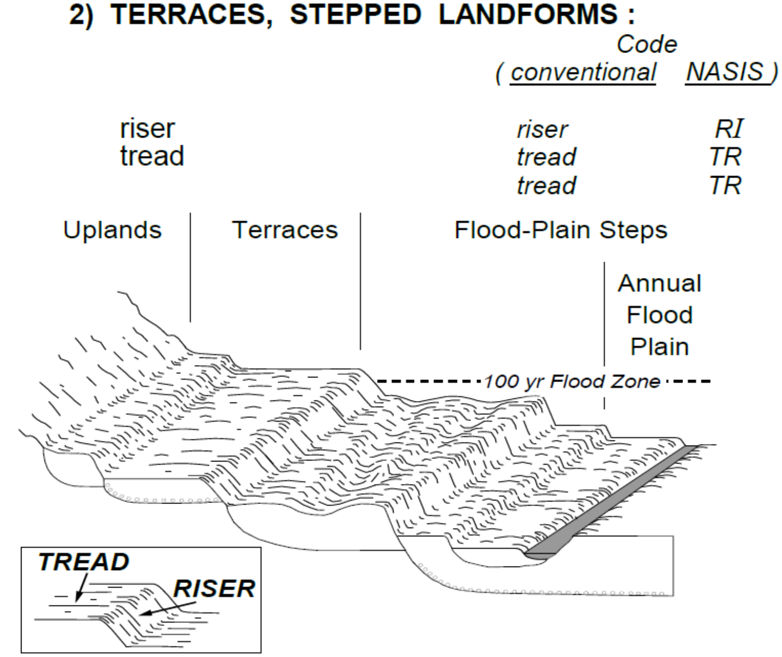
What is its shape?

Smooth: nearly straight
Wavy: pockets where width>depth
Irregular: pockets where depth>width
Broken: discontinuous

1) HILLSLOPE – PROFILE POSITIONS:



2) TERRACES, STEPPED LANDFORMS :



Healthy Soils Management:

- Disturb the Soil as Little as Possible (i.e. minimize tillage)
- Promote Diversity of Vegetation
- Keep Living Roots Growing Throughout the Year!
- Keep the Soil Covered as Much as Possible

Soil Horizonation

A soil profile is a sequence of horizons. Soil horizons form naturally as a result of soil forming processes. Horizon nomenclature reflects the dominant process(es). Horizons may also be the result of natural or anthropogenic deposition.

In describing horizonation, you can use these terms if you wish. Separate out horizons when there is any difference in the appearance (color, texture, coarse fragments, structure, roots, or feel (texture, consistence) of a soil layer.

<u>Description of Master Horizons</u>

***O** horizons* are dominantly organic soil material. Organic matter is composed of original and decomposed plant, animal, and microbial components (humus). It is very important in soils as it helps aggregate and loosen soil, provides nutrients, and holds water and nutrients. **Comment**: not found in all soils. O horizons can be found in wooded areas (increasing thicknesses at high altitudes), or in wet areas, as organic material can accumulate in very wet, waterlogged conditions, or cold conditions where decomposition is slower.

Definition: Organic horizon
Process: accumulation of slightly to highly decomposed plant & animal residues
ID: surface material, lighter in weight and darker in color than mineral material,

***A** horizons* are mineral layers that formed at the surface or below an O horizon, that show one an accumulation of humified organic matter intimately mixed with the mineral fraction.

Definition: organically enriched mineral horizon (topsoil)
Process: incorporation or mixing of organic material into mineral soil
ID: darker mineral horizon at the soil surface

***E** horizons* are layers in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these, leaving a concentration of sand and silt particles. **Comments**: not found in all soils

Definition: horizon characterized by the loss of some component
Process: eluviation (washing out or *leaching*) of iron or clay
ID: paler color or lighter texture than below, just below A

***B** horizons* are layers that formed below an A or E and show one or more of the following:

(1) lighter, brighter, or redder colors than above;
(2) more clay than above; (ex. Bt-argillic)
(3) subangular blocky, prismatic, or columnar structure.

Definition: horizon of accumulation, or development of structure or color
Process: development of structure or color, illuviation (moving in) of iron or clay
ID: noticeable structure, brighter or redder color, more clay or iron than above,

***C** horizons* are layers which are not bedrock and are little affected by soil forming processes and lack properties of O, A, E or B horizons.

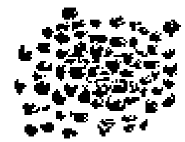
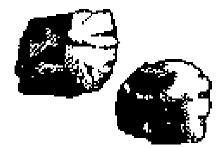
Definition: parent material
Process: no evidence of soil forming processes (can have weathering)
ID: unconsolidated material below B; no structure

***R** horizons* are layers of hard bedrock. **Comment:** Not found in all soils

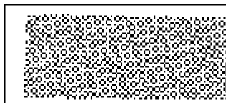
Definition: bedrock
Process: no soil forming processes, little evidence of weathering
ID: hard, consolidated bedrock

Soil Structure is the combination or arrangement of primary soil particles into secondary units or aggregates. Organic materials and clay are important binding agents, and wetting & drying cycles are important in creating structure. Soil structure influences pore space and water movement in soils.

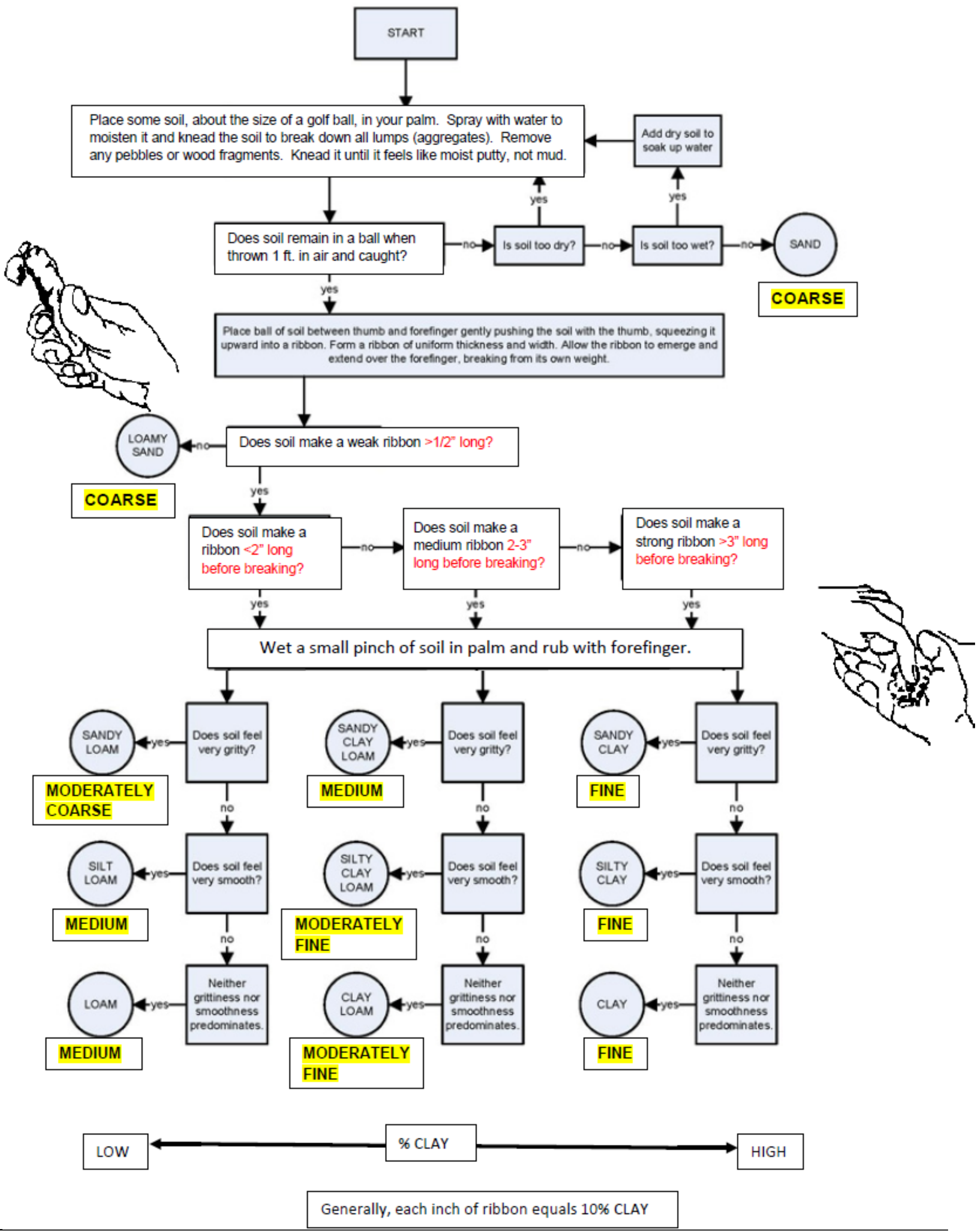
Types of Soil Structure

	**Granular** – roughly spherical, like grape nuts. Usually 1-10 mm in diameter. Most common in A horizons, where plant roots, microorganisms, and sticky products of organic matter decomposition bind soil grains into granular aggregates.
	**Platy** – flat peds that lie horizontally in the soil. Platy structure can be found in A, B and C horizons. It commonly occurs in an A horizon as the result of compaction.
	**Blocky** – roughly cube-shaped, with more or less flat surfaces. If edges and corners remain sharp, we call it *angular blocky*. If they are rounded, we call it *subangular blocky*. Sizes commonly range from 5-50 mm across. Blocky structures are typical of B horizons, especially those with a high clay content. They form by repeated expansion and contraction of clay minerals.
	**Prismatic** – larger, vertically elongated blocks, often with five sides. Sizes are commonly 10-100mm across. Prismatic structures commonly occur in fragipans.

Structureless Soil Types

	**Massive** – compact, coherent soil not separated into peds of any kind. Massive structures in clayey soils usually have very small pores, slow permeability, and poor aeration.
	**Single grain** – in some very sandy soils, every grain acts independently, and there is no binding agent to hold the grains together into peds. Permeability is rapid, but fertility and water holding capacity are low.

GUIDE FOR ESTIMATING SOIL TEXTURE BY FEEL



Conservation Practices:

Crop Rotation, Winter Cover Crops, No-till planting, Zone- Tillage, Mulching
- Increase Organic Matter Content of the soil and reduces soil loss, compaction, sedimentation of water bodies.

Pest Management & Nutrient Management
- Promotes Water Quality by reducing leaching into groundwater

Horizon Suffixes:

- **d**, densic (water/rooting restricting)
- **h,** Illuvial organic matter accumulation
- **m**, strong cementation (pedogenic massive, cemented spodic -Ortstein)
- **p**, plowed horizon (Ap)
- **t,** Illuvial accumulation of silicate clay
- **s,** Illuvial sesquioxide (aluminium/iron) and organic matter accumulation
- **x,** fragipan characteristics (water /root restricting)

Depth to restrictive layer (impedes movement of water / air, restricts roots):

Bedrock
Cemented layers: Ortstein- iron cementation
Dense layers: basal till, fragipan: brittle with a high bulk density

Bulk Density =mass/volume. Fine textured soils tend to have higher total pore space (between and within granules) and lower bulk densities. Root grown is greatly impaired at bulk densities of 1.6Mg/m^3 or above. Soils typically range from 1.00 (clay) to 1.75 Mg/m^3 (sands). In comparison Quarts is 2.65 Mg/m^3

Soil Color

Important coloring agents in soil include:

1) *Organic matter,* which darkens the soil, depending on the content, and the extent of decomposition;
2) *Iron,* which gives soil a brown, yellow, red color, depending upon the mineral type present. When the soil is saturated, iron can become soluble and can be removed, leaving the soil with “mottled” brown and gray colors, or complete gray depending on the extent of the wetness. Iron can turn shades of blue or green in wet soils when it is not removed.

Other factors affecting soil color include:

- Parent material
- Soil wetness
- Translocation of iron or clay

Why is soil color important?

- Indicative of source, or parent material
- Color differences in a profile reflect soil forming processes
- Can be an indicator of soil wetness

Describing soil color

Soil Scientists use a color chart, where color is matched to a chip. Hue, Value, and Chroma are the variables.

Some horizons may have more than one color present, in streaks, spots, or mottles, which may be indicative of wet conditions. These are called “**redoximorphic features**.” For these horizons, describe the main color, as well as the color of any streaks or spots. Also describe the abundance, size, and contrast of the streaks or spots as follows:

Abundance	Size	Contrast
Few: <2% of total area	*Fine*: <5mm	*Faint*: Indistinct
Common: 2 to 20%	*Medium*: 5 to 15mm	*Distinct*: Easily seen
Many: >20%	*Coarse*: >15mm	*Prominent*: Striking

Soil Texture

Soil texture refers to the relative amounts of the three particle size separates in mineral soil material. Derived from weathered rocks, these are:

- *sand* - 2 to 0.05 millimeters - gritty feel - can be seen with eye
- *silt* - 0.05 to .002 millimeters - smooth feel- can be seen with microscope
- *clay* - less than .002 millimeters -sticky feel- can be seen with electron microscope

* sand and silt (mostly quartz) are relatively inert; they form the 'soil skeleton'
* clay particles (layer silicates & oxides) are the active portion of the mineral soil – they have an electrical charge and a high surface area resulting in a high attraction for water, nutrients, other clay particles
* varying proportions of each size give the soil a 'texture'

Soil scientists use 12 textural classes (see Textural Triangle, page 8), which can be estimated with the fingers (see Flowchart for Estimating Soil Texture, page 9).

Why is soil texture important?

It affects:

- water movement and storage
- aeration
- nutrient and contaminant adsorptive capacity
- excavation difficulty or ease of tillage

Materials greater than 2mm are considered coarse fragments. Common coarse fragments in the NY area include:

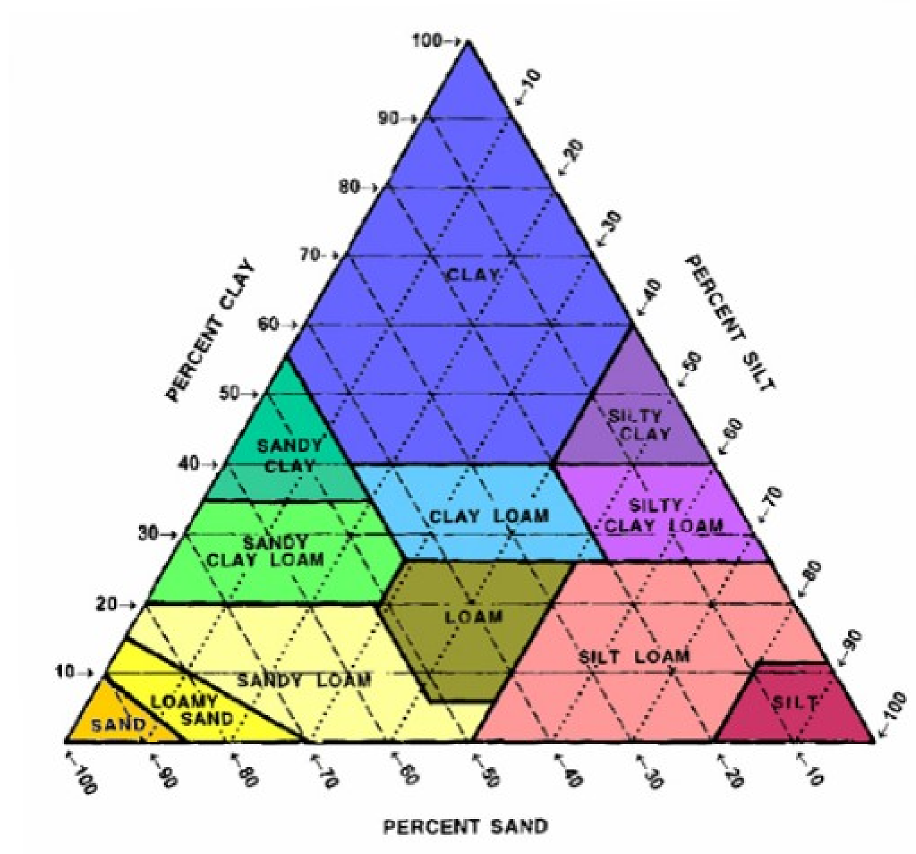
- gneiss, schist, granite
- red sandstone and shale, with associated igneous rocks such as diabase (coarse-grained) and basalt (fine-grained)
- serpentinite (green meta-igneous rock from Staten Island)
- quartz or chert (coastal plain deposits in Staten Island, Brooklyn, Queens)
- human-made "artifacts" are also common in urban areas: glass, brick, wood, concrete, asphalt, etc.

Coarse fragments can also be subdivided by size.

- *gravel* - 2 to 75mm (2mm to 3 inches)
- *cobbles* – 75 to 250mm (3 to 10 inches)
- *stones* – 250 to 600mm (10 to 24 inches)
- *boulders* - >600mm (>24 inches)

In describing soil texture, estimate the percent by volume of coarse fragments in the soil. Describe the type of coarse fragments, especially whether they are natural or artifacts. In addition to influencing the physical properties of a soil, coarse fragments can provide information on parent material or origin.

Ksat: Saturated hydraulic Conductivity: is the ease with which a saturated soil can transmit water through the pore space. It can be estimated from texture, bulk density, and soil structure (grade/size). Soil pores (quantity, size, and connectivity) and consistence are important factors. Sandy soils have higher bulk density but have large continues pores and are inherently very conductive soils. Increasing soil organic matter decreases bulk density & promotes strong soil structure that increases soil conductivity. Soil organism and plants can also promote soil conductivity by improving soil porosity and soil structure through bioturbation & biological glues (root exudates: sugars, amino acids, & proteins).



Textural Triangle showing the percentages of sand, silt, and clay in the basic textural classes.

http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=NRCS142P2_054167

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

The National Cooperative Soil Survey utilizes USDA Soil **Taxonomy** for the classification of soils. A soil series is the lowest category of the taxonomic classification system. The name of a soil series is the common reference term used to name soil map units.

Soil Map Unit- a delineation on a map that represents an area dominated by one or more soil components. Due to the mapping scale and variability of survey areas most map units consists of more than one soil component. The dominant soil is the major component(s) by which the map unit is named, and the minor components are included only in the description of the soil map unit.

Official Soil Series Descriptions (OSD)
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/class/?cid=nrcs142p2_053587