

# Bronx River Soil Composition

**Objective:** Students will learn what soil is composed of and determine the composition of a soil sample taken from the Bronx River.

**Materials:** Samples of clay, silt, and sand (or soil samples that are composed mainly of each one); soil sample from the Bronx River; one qt. jar with lid; 8% Calgon solution (six tbsp. of Calgon laundry powder per quart of water; automatic dishwasher detergent is a suitable substitute.); metric ruler; measuring cup; and tablespoon.

## ACTIVITY SUMMARY:

Ideally this lesson would be done in class following a field trip to the Bronx River where students took soil samples from different areas near the riverbank and from the floor of the river.

## BACKGROUND INFORMATION:

What is soil?

(Answered by the NRCS & The Soil Science Society of America)  
 “The unconsolidated mineral or organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.”

Soil contains mineral material (sand, silt, and clay) and organic matter, water, air, and other gases. The layers are referred to as horizons, whose individual characteristics are affected by climate, macro and microorganisms, location/topography, and time. In other words, the type of soil you find in any given area is affected by everything you see, what kind and shape of rock is deep down below, and how long these elements have been in play.

For example: Let’s say you were in a wooded area of a park with a grouping of oak seedlings with clean ground in one section and the remainder was a mixture of different aged species of trees and undergrowth. If you took a sample deeper than twelve inches from the two sections above, it is likely that you will find clean soil layers, or horizons, in the area of mixed trees and undergrowth. Over many seasons leaves have broken down; silt has been introduced by winter runoff and spring rains. The sample in the

## EVERYBODY

### IN THE CLASSROOM

*Soil collection may take place at the River*

Skills:

*Observe/Compare,  
Critical Thinking*

Subject/Discipline:

*Science, Math*

Science Standards:

*S1, S3, S4, S5, S6, S8*

Time:

*Prep + 1 or 2 class meetings.*

### The Inside Track:

For more information about soil quality, contact the New York City Soil and Water Conservation District (NYCSWCD).  
 212-431-9676 x335  
[www.nycswcd.net](http://www.nycswcd.net)



## NOTE:

Call the Bronx River Alliance at 718-430-4665 to obtain location information and permission to take soil samples on parkland.

seemingly more orderly oak area may only present one kind of soil. Adding up the clues, one could conclude that a forest restoration team recently planted the oaks. Can you think of another place where taking a soil sample could reveal human impact?



**PROCEDURE:**

Explain to students that soil is generally composed of three particle sizes: silt, clay, and sand. Give them a chance to feel each one. Have students discuss in small groups how each one feels:

*Does it have a fine, medium, or coarse texture? Does it stain your fingers? Is it sticky?*

Explain that silt feels like powder when dry, and slippery when wet. Sand holds together when wet, but not when dry. It feels coarse to the touch. Clay holds together when wet or dry and feels slippery and sticky.

Rulers are used in the next segment. If the edge of your rulers does not start at zero, remind students they will need to compensate with a calculation, i.e. subtract the length from the edge to zero to find the total.

Show the students the jar of soil, Calgon and water mixture. (After 24 hrs. the soil particles will have settled.) Measure the depth of the settled soil and record the results as TOTAL DEPTH.

Next, shake the jar for five minutes.

Let stand for 40 seconds. This allows the sand to settle out. Measure the depth of the settled soils and record as SAND DEPTH.

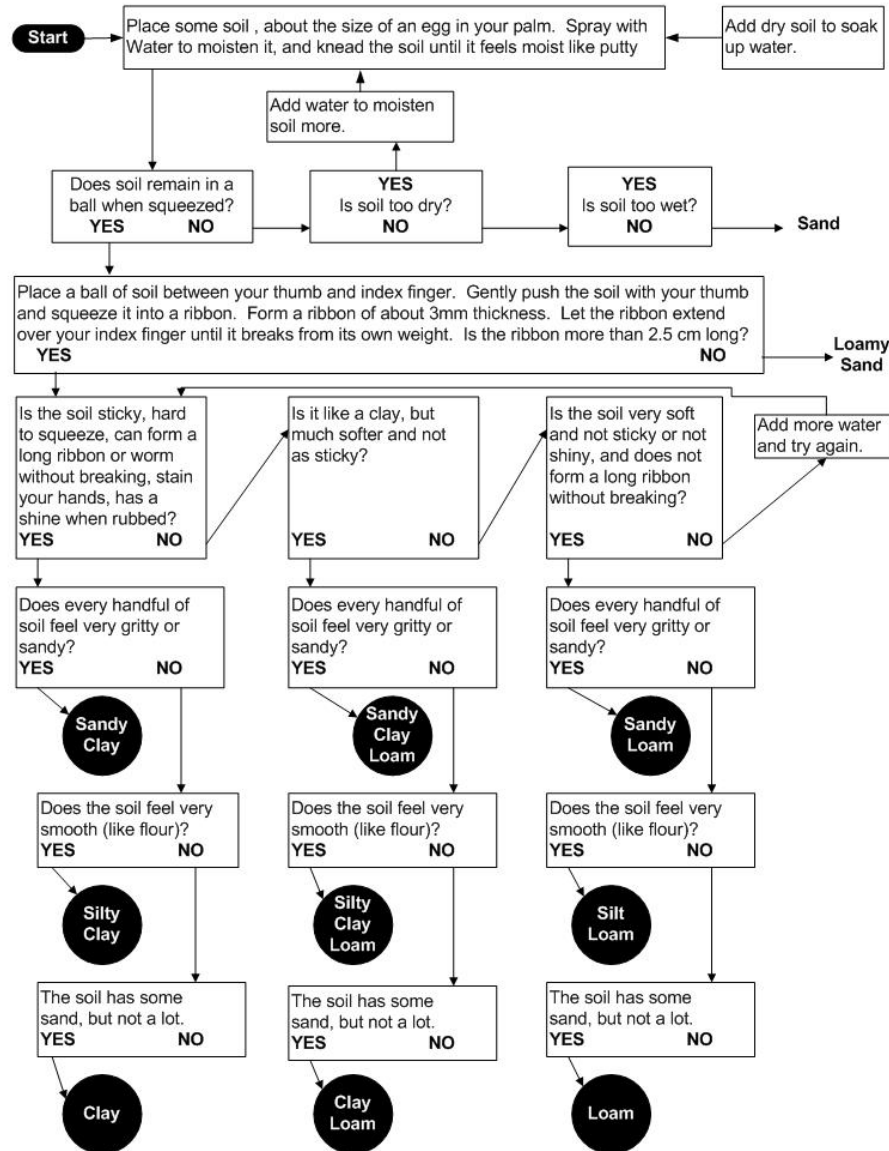
Next, let the jar stand for 30 minutes (do not shake again). Measure the depth and subtract the sand depth to get the SILT DEPTH.

The remaining unsettled particles are clay. Calculate the CLAY DEPTH by subtracting the silt and sand depths from the total depth. Now, students can calculate the percentage of each solid component using the formulas above right.

<b>% sand</b>	<b>=</b>	<b><u>sand depth</u></b>	<b>x100</b>
		<b>total depth</b>	
<b>% silt</b>	<b>=</b>	<b><u>silt depth</u></b>	<b>x100</b>
		<b>total depth</b>	
<b>% clay</b>	<b>=</b>	<b><u>clay depth</u></b>	<b>x100</b>
		<b>total depth</b>	

EXTENSION (ADVANCED):

In the 30 minutes it takes for the silt particles to settle, use the USDA NRCS chart below to walk your students through determining the texture of soil through touch. After the soil particles in the jar have settled, compare your results.



Submitted by Chrissy Word.  
 Some of the information for this lesson was derived from:  
*Rivers and Streams* by Patricia A. Fink Martin, of the  
 "Exploring Ecosystems" series, Franklin Watts, 1999.  
*Nature of Soils Workshop* by Rob Bennaton of the NYC  
 Housing Authority.  
 Background material by Jill Weiss and NRCS.  
 Edited by Karlee Yurek, Jill Weiss and Rich Shaw.