SOIL!

How to collect soil samples for forensics events (not for gardening)

- Find a patch of soil you have permission to dig up. For varying soil types try gardens, yards, the woods, near a stream or lake, near water runoff, or anywhere else a variable might give you different results
- Scrape all the surface "contaminants" away, like leaves, sticks, rocks, mulch, grass, etc. so you have a patch of bare soil.
- Dig up a section of soil, try to dig a fairly small, deep hole as opposed to a large shallow one. You'll get more interesting results if you get away from the surface a little bit. You can do a soil profile or soil horizon if you want to see the layers before you test it.
- Check your sample when you're done digging, if there are roots or plant bits in it, remove them. If there are large rocks , worms, or other debris, remove it too.
- Break apart the clumps in your sample if there are any.

What to look for in your sample:

At the elementary level students do not actually need to know what causes the colors or the definition of the soil sizes, they just need to be able to recognize that the samples are different based on colors or size or texture. Acceptable answers to questions that would be asked would be things like,

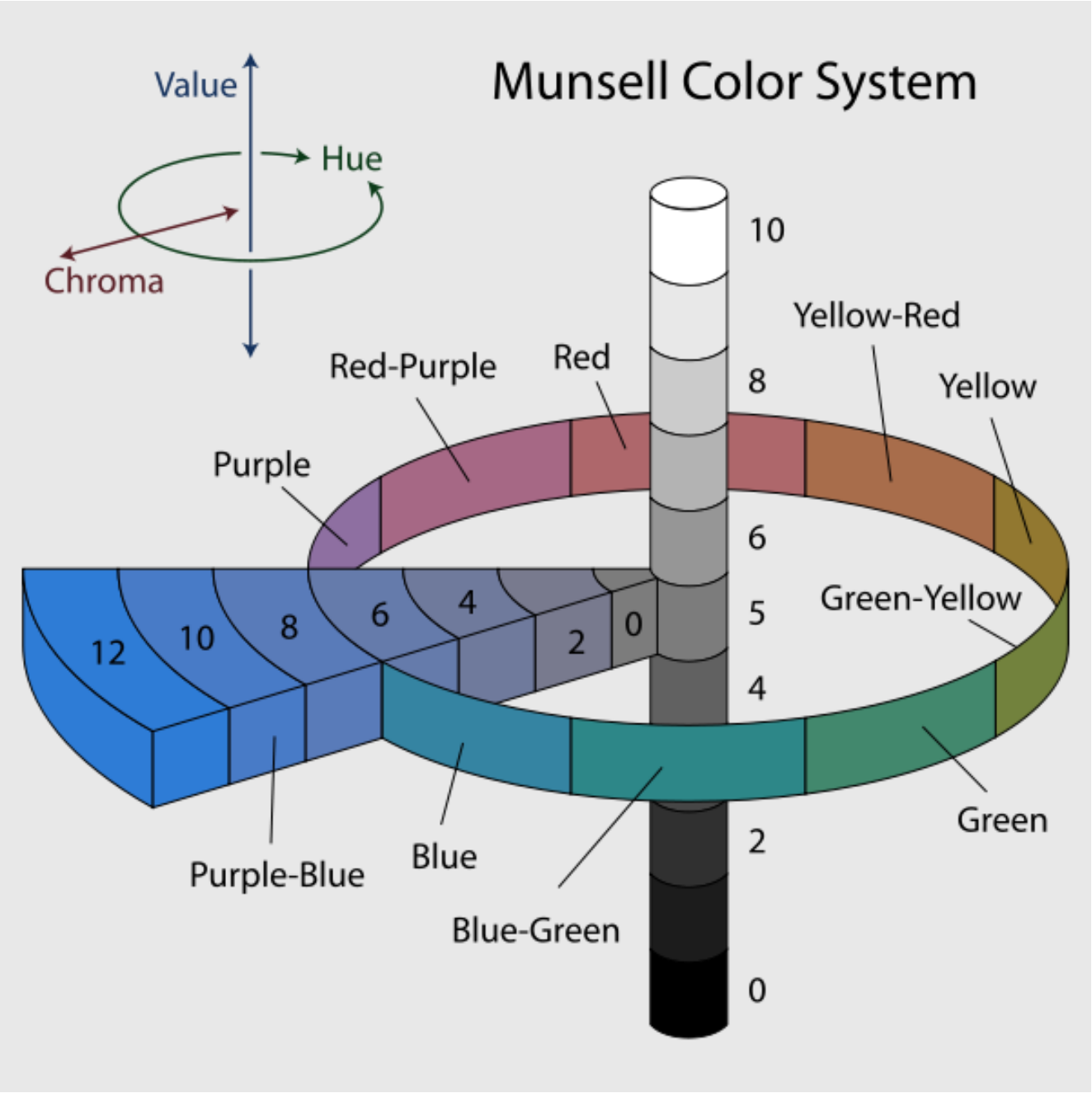
- The soil at the scene matches suspect 3 because it has a similar reddish color and coarse grain.
- The pH was mildly acidic.
- Other suspect samples didn't match because they had too much organic matter in them.

pH: To measure pH of a soil sample, put a spoonful in a cup and add water until you get runny mud. Dip your pH paper in the mud. If you can't see the color of the pH paper anywhere because it's covered in too much mud, try scraping some off. If that doesn't work you can use distilled water to rinse the mud off.

Color:

Observe the color. Soil color is affected by the proteins in the soil. The chart and diagram below is for your curiosity/reference only, students do not need to know this, just recognize colors.

Color	Presence of
Yellow or Red	Iron oxides, oxidation (high oxygen content)
Dark brown or black	High organic content
Grey	Low oxygen
Black	Manganese Oxide
Green (unusual)	Glauconite
White	Calcite



In colorimetry, the Munsell color system is a color space that specifies colors based on three color dimensions: hue, value (lightness), and chroma (color purity). It was created by Professor Albert H. Munsell in the first decade of the 20th century and adopted by the USDA as the official color system for soil research in the 1930s.

Soil Texture and Grain:

Students will not need to measure or identify the actual grain of soil, since we are not giving them proper materials to measure something on this small of a scale. They only need to recognize samples as being finer or coarser than another, and comparing their composition from a purely visual basis.

The Unified Soil Classification System (USCS) is a soil classification system used to describe the texture and grain size of a soil. The classification system is represented by a two-letter symbol.

First and/or Second letters:			Second Letter:	
G	Gravel	> 2 mm	P	Poorly Graded (uniform particle size)
S	Sand	0.1 – 2 mm	W	Well Graded (diversified particle size)
M	Silt	0.01 – 0.1 mm	H	High plasticity
C	Clay	< 0.01 mm	L	Low plasticity
O	Organic			

GRAVEL: Coarse. Unconsolidated rock fragments that have a general particle size range and include size classes from granule to boulder sized fragments. Gravel is categorized into granular gravel (2 to 4 mm) and pebble gravel (4 to 64 mm).

SAND: Coarse. Sand is a naturally occurring granular material composed of finely divided rock and mineral particles. It is defined by size, being finer than gravel and coarser than silt. Sand can also refer to a textural class of soil or soil type; i.e. a soil containing more than 85% sand-sized particles (by mass).

SILT: Fine. Silt is granular material of a size somewhere between sand and clay whose mineral origin is quartz and feldspar. Silt may occur as a soil or as sediment mixed in suspension with water in a body of water such as a river. It may also exist as soil deposited at the bottom of a water body. Silt has a moderate specific area with a typically non-sticky, plastic feel. Silt usually has a floury feel when dry, and a slippery feel when wet. Silt can be visually observed with a hand lens.

CLAY: Fine. Clay is a fine-grained soil that combines one or more clay minerals with traces of metal oxides and organic matter. Clays are distinguished from other fine-grained soils by differences in size and mineralogy.

ORGANIC: The organic matter in soil derives from plants and animals. In a forest, leaf litter and woody material falls to the forest floor. When it decays to the point in which it is no longer recognizable it is called soil organic matter. When the organic matter has broken down into a stable substance that resist further decomposition it is called humus.

GRADATION: A classification of a coarse-grained soil that ranks the soil based on the different particle sizes contained in the soil. A well graded soil is a soil that contains particles of a wide range of sizes and has a good representation of all sizes from the No. 4 to No. 200 sieves. A poorly graded soil is a soil that does not have a good representation of all sizes of particles from the No. 4 to No. 200 sieve.

PLASTICITY: Soils, particularly clays, display a significant amount of plasticity (not being able to return to original shape) under load. The causes of plasticity in soils are strongly dependent on the microstructure, chemical composition, and water content. Plastic behavior in soils is caused primarily by the rearrangement of clusters of adjacent grains.

References:
Wikipedia www.usda.gov
www.munsell.com www.engr.uconn.edu/~lanbo/CE240LectW032Soilclassification.pdf