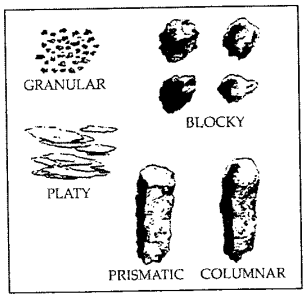
Soil lab – in your field journal



Choices of Soil Structure

Soil Structure

Take a sample of undisturbed soil in your hand. Look closely at the soil and examine its structure. Soil structure is the shape that the soil takes based on its physical and chemical properties. Each individual unit of natural soil is called a *ped*. Possible types of soil structure are granular, blocky, platy, columnar, and prismatic. Sometimes the soil may be structure-less or have no specific shape. In this case, the soil structure is either single-grained (like sand at the beach) or massive (soil sticks together in a large mass). Such conditions are more commonly found in the C horizon. If you find more than one soil type, record only the one that is most common.

Color

Take a ped and note whether it is moist, dry or wet. If it is dry, moisten it slightly with water. Break the ped apart and hold the color chart next to it. From the color chart, find the color that most closely matches the color of the inside surface of the ped. Sometimes a soil sample can have more than one color. If this is the case, record the dominant color and the subdominant color.

Consistence

Take a new ped from your soil sample. While holding the ped between a thumb and forefinger, gently squeeze it until it pops or falls apart. Record one of the following categories of the soil ped consistence:

- Loose: you have trouble picking out a single ped and the structure falls apart before you handle it.
- Friable: The ped breaks with a small amount of pressure.
- Firm: The ped breaks when you apply a good amount of pressure, and the ped dents your fingers before it breaks.
- Extremely Firm: The ped can't be crushed with your fingers (you need a hammer).

Texture – qualitative

The texture of soil refers to the amount of sand, silt, and clay in the soil; the composition of a sample determines the way the soil feels when you rub it between your fingers. Usually a combination of different size particles (sand, silt, clay) is found in a soil sample. Take a sample of soil about the size of a small egg and add enough water to moisten it. Work it between your fingers until it is the same moisture throughout. Then, squeeze the soil between your thumb and forefinger in a slow snapping motion to try to form a ribbon of soil. Follow the "Texture By Feel Analysis" chart. Record your results.

Texture – quantitative (overnight)

Place 30 ml of soil into a baby food jar. Then add a pinch of Cascade soap (this is a wetting agent that speeds up the process by coating the particles). Fill the jar up to the 100 ml mark with distilled water. Cover and shake vigorously for one minute. Let the soil sample sit and begin timing immediately. After 12 minutes, look at the amount of sediment on the bottom. This sediment is sand. Record the findings. After 24 hours, record the amount of silt added to the sand layer. The clay is still in suspension. To find this amount, subtract the amount of sand and silt from the original 30 ml of soil used. Divide the amounts of sand, silt, and clay by 30ml to find the percentage of composition. Determine what the soil's texture type is by using the "soil triangle". Locate the percentage of sand on the bottom side of the triangle, the percentage of clay on the left, and the percentage of silt on the right. Where the percentage lines meet is the soil texture type.

Carbonates

Look carefully at your soil profile for white coatings on the soil and rocks that might indicate that free carbonates are present. Spray vinegar on the soil. Do not touch the soil with your hands because the oils and other minerals on your hands may contaminate the outcome. If carbonates are present, there will be a chemical reaction between the vinegar and the carbonates to produce carbon dioxide. When carbon dioxide is produced, it bubbles or effervesces. The more carbonates, the more bubbles.

? Nutrients Follow the directions in the test kit.

? Percent Organic Matter and soil moisture

To measure the organic matter, you will have to burn the soil at high temperature to convert as much of it as possible into CO_2 and H_20. Since the general procedure involves measuring mass loss, you must first ensure the dryness of the sample. To begin, record the mass of a clean, dry porcelain crucible and fill it about 1/3 full of your soil sample. Place it in the drying oven overnight at a temperature of 90-95 ^oC to drive off the water. When that has been accomplished, record the mass of the soil and crucible. Any mass loss will most likely be water. Record the mass lost in grams and by percentage...this is the moisture content. To find percent organic matter, place the crucible on a ring stand in the fume hood (use an iron ring and iron mesh). Heat it gently for a few minutes and then heat it as hot as you can for about 30 minutes. Shut off the burner and allow the crucible to cool. Now record the mass of the crucible and soil again. Record the mass lost in grams and by percentage…this is the organic content.

Pore-Space – dry

Measure 200 ml of the dried soil sample in a graduated beaker. Slowly pour 100 ml of water from a graduated cylinder into the soil until the soil is completely soaked and any additional water would pool on top (you may need to refill the graduated cylinder). Record the amount of water you poured into the soil.

pH and Percolation - dry

Measure 200 ml of dried soil. Put this into the lid of a cut-off plastic bottle with a screen over the lid. Fill your graduated cylinder with 100 ml of water. Test the initial pH of the water in your graduate cylinder using a pH test strip. Pour the water into the soil. Measure the amount of time it takes for the first drips to fall out of the soil. Record the number of seconds and label it "Percolation test". Then, test the final pH of the water that has dripped out of the soil with a pH test strip. Record these results.

Ion Exchange Capacity

The ability of a soil to bind and hold nutrients depends on the number of charged ion-binding sites in the soil. We will test the soil for both positive (crystal violet) and negative (eosin Y) ions. Divide a cotton ball in half. Place one half in the bottom of a centrifuge tube (save the other half for the second test). Add 7 grams of soil to the tube and place the centrifuge tube into a 50 ml beaker. Add 20 drops of one of the above dyes evenly to the top of the soil. Once the dye has been absorbed, add water in 1 ml increments until water that has passed through the tube contains the dye (20 ml maximum). Record the volume of water added and the color intensity of the water that was eluted. Clean the tube and repeat with the other dye. Finally, determine the ion exchange capacity using the key.

Ion Exchange Capacity Key		
Low	Medium	High
1-20 ml of water and dark color	1-10 ml of water and light color	15-20 m of water and medium color
1-10 ml of water and medium color	10-15 ml of water and medium color	10-20 ml of water and light color

Soil structure _____ SAMPLE DATA TABLE

Color

Dominant _____

Subdominant _____

Consistence _____

Texture (qualitative) _____

Texture (quantitative)

Sand (after 12 min) _____ml _____%

Silt (after 24 hr) _____ml _____%

Clay (by subtraction) _____ml _____%

Chart texture type _____

Carbonates present (yes/no) _____

? Nutrients

Nitrogen (N) _____ Phosphorus (P) _____ Potassium (K) _____

? Percent Soil moisture

Mass of empty crucible _____

Mass of crucible & moist soil _____ Mass of moist soil (by subtraction) _____

Mass of crucible & dry soil _____ Mass of dry soil (by subtraction) _____

Mass of moisture _____ % moisture _____

? Percent Organic matter

Mass of crucible & soil after heating _____ Mass of soil after heating (by subtraction)_____

Mass of organic material _____ % organic material _____

Pore space _____ ml water added

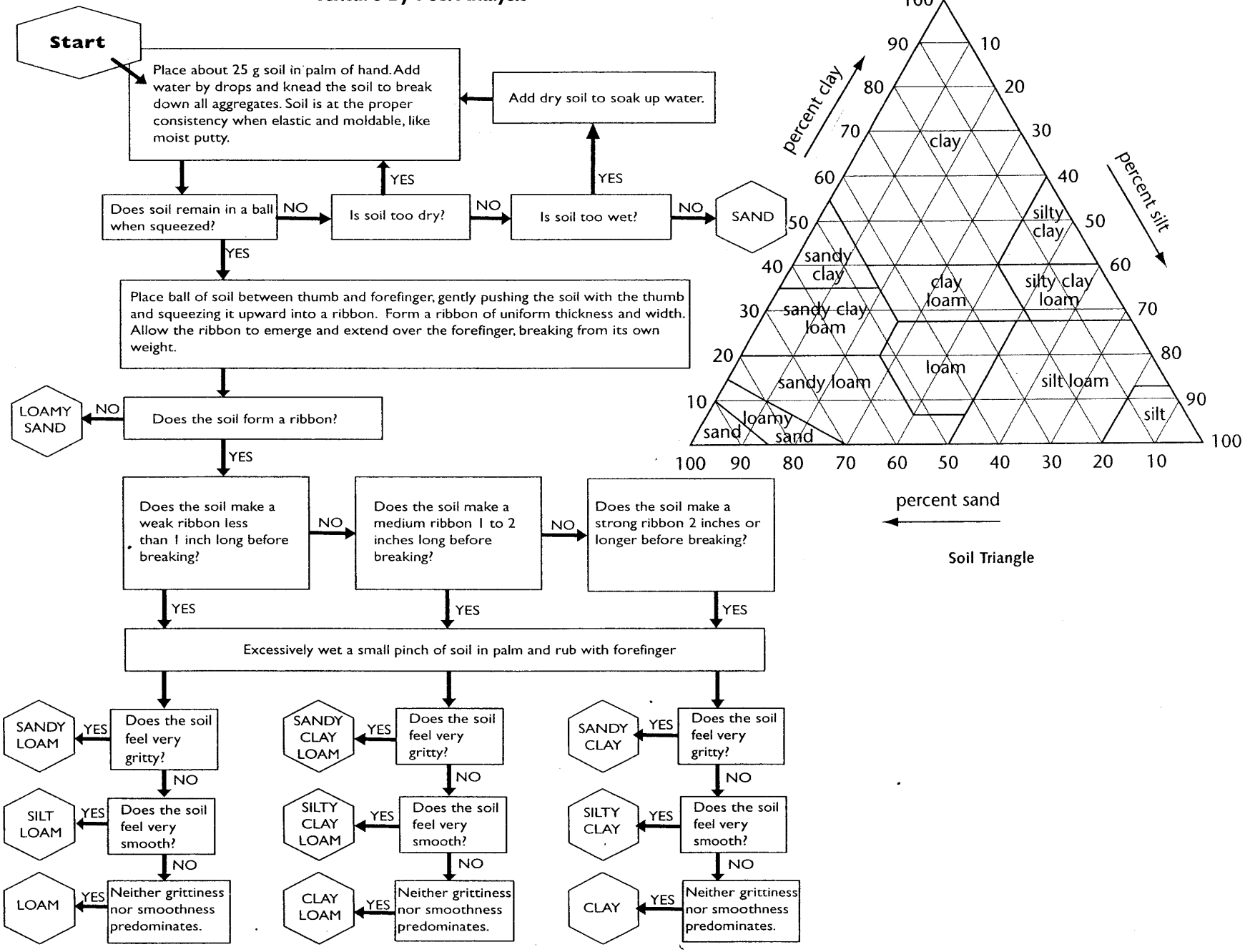
Initial pH _____ Final pH _____

Percolation test _____ seconds

Ion Exchange Capacity

Crystal Violet			Eosin Y		
Volume of water added	Color intensity (light, med, dark)	Ion exchange capacity	Volume of water added	Color intensity (light, med, dark)	Ion exchange capacity

Texture By Feel Analysis



Soil Triangle