Name: _____

Determining Soil Textural Class

Part 1 Texture by feel: the soil ribbon test

This is a simple activity to determine the textural class of soil. Texture can be determined fairly well in the field by feeling the sand particles and estimating silt and clay content based on flexibility and stickiness.

Sand has a coarse gritty feel to it. Silt, when dry, has a powdery smooth feel, and when wet, has a creamy slick, slippery feel. Silt is not sticky or plastic (i.e. easily shaped or molded). Clay has a hard feel when dry, and a sticky, plastic feel when wet.
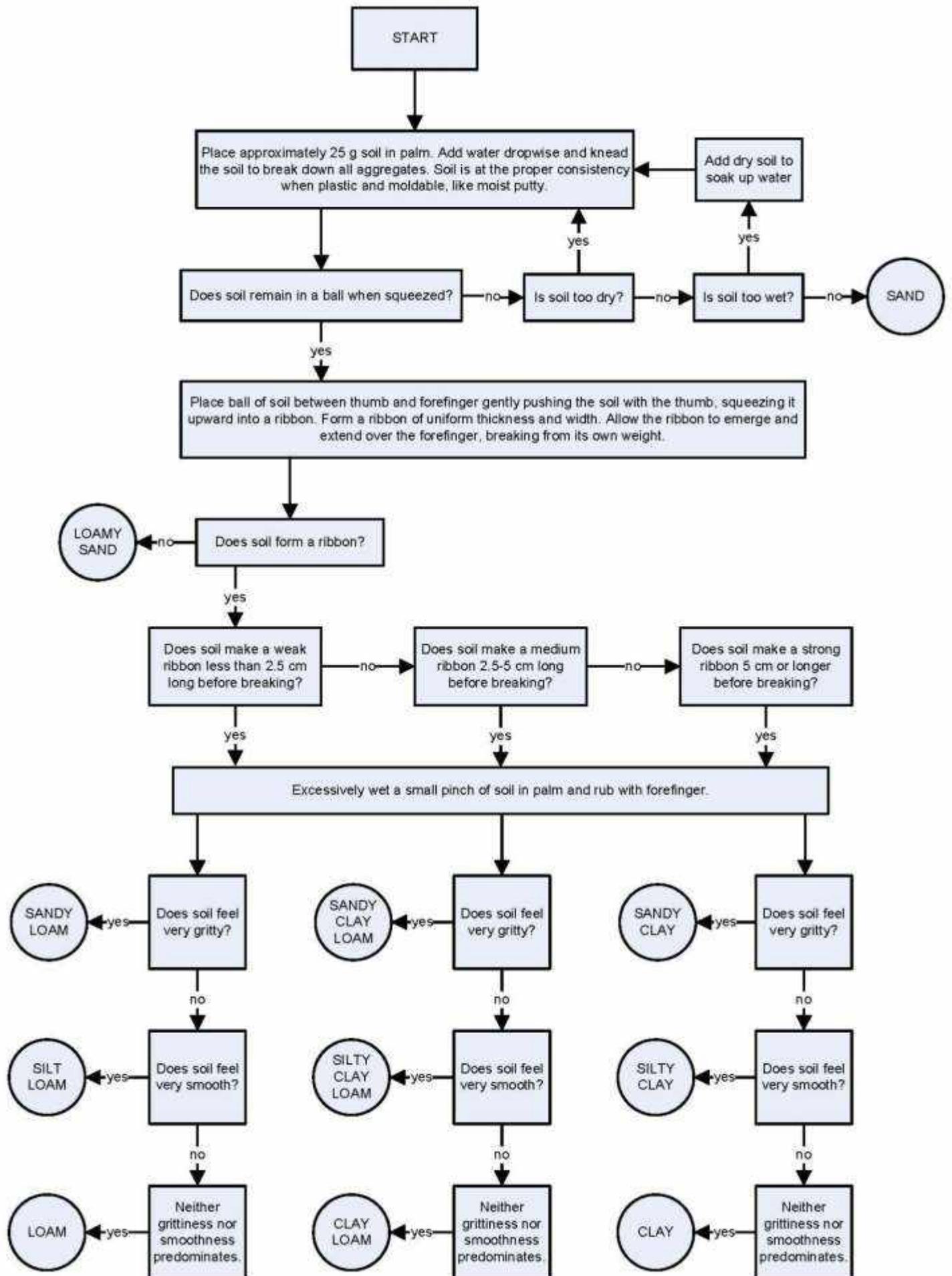
Due to the strong physical properties of clay, a soil with only 20% clay particles behaves as sticky, gummy clayey soil. The term 'loam' refers to a soil with a combination of sand, silt, and clay sized particles. For example, a soil with 30% clay, 50% sand, and 20% silt is called a sandy clay loam.

The **ribbon test** is done by squeezing a small wet clump of soil in your hand and determining the soils ability to form a ribbon.

- Sandy or sandy soils won't ribbon
- Loam, silt, silty clay loam or clay loam soil ribbons less than 1 inch
- Sandy clay loam, silty clay loam or clay loam ribbons 1 to 2 inches
- Sandy clay, silty clay, or clay soil ribbons more than 2 inches

Note: A soil with as little as 20% clay may behave as a heavy clayey soil. A soil needs 45% to over 60% sand to behave as a sandy soil.

To perform the soil ribbon test, follow the chart on the next page.

START

Place approximately 25 g soil in palm. Add water dropwise and knead the soil to break down all aggregates. Soil is at the proper consistency when plastic and moldable, like moist putty.

Add dry soil to soak up water

Does soil remain in a ball when squeezed? —no→ Is soil too dry? —no→ Is soil too wet? —no→ SAND

yes → (Is soil too dry? yes → Add dry soil to soak up water)
yes → (Is soil too wet? yes → back to knead)

yes ↓

Place ball of soil between thumb and forefinger gently pushing the soil with the thumb, squeezing it upward into a ribbon. Form a ribbon of uniform thickness and width. Allow the ribbon to emerge and extend over the forefinger, breaking from its own weight.

LOAMY SAND ←no— Does soil form a ribbon?

yes ↓

Does soil make a weak ribbon less than 2.5 cm long before breaking? —no→ Does soil make a medium ribbon 2.5-5 cm long before breaking? —no→ Does soil make a strong ribbon 5 cm or longer before breaking?

yes ↓ (all three)

Excessively wet a small pinch of soil in palm and rub with forefinger.

SANDY LOAM ←yes— Does soil feel very gritty?
SANDY CLAY LOAM ←yes— Does soil feel very gritty?
SANDY CLAY ←yes— Does soil feel very gritty?

no ↓

SILT LOAM ←yes— Does soil feel very smooth?
SILTY CLAY LOAM ←yes— Does soil feel very smooth?
SILTY CLAY ←yes— Does soil feel very smooth?

no ↓

LOAM ←yes— Neither grittiness nor smoothness predominates.
CLAY LOAM ←yes— Neither grittiness nor smoothness predominates.
CLAY ←yes— Neither grittiness nor smoothness predominates.

References: USDA-NRCS, Soil Science Society of America, and Colorado State University Extension

Soil Ribbon Test Results

1. Based on the soil ribbon test, what is the soil texture for each of the soil types tested?

   Soil 1: _____

   Soil 2: _____

   Soil 3: _____

2. What impact will the texture have on the ability of water to move through the soil?

3. What impact will the texture have on the nutrient holding capacity (e.g. CEC) of the soil?

Part 2 Soil Hydrometer test

The Jar method

1. Fill a tall, slender jar (e.g. a quart canning jar) 1/4 full of soil.

2. Add water until the it is 3/4 full

3. Add a teaspoon of non-foaming dishwasher detergent or table salt.

4. Put on a tight fitting lid and shake hard for about 10 minutes. This shaking breaks apart the soil aggregates and separates the soil into individual mineral particles. Place the jar somewhere it will not be disturbed for several days.

   The heavy coarse sand particles will settle out first, in just 1 minute. After 1 hour, the darker, finer silt will settle. Finally, the lighter, superfine clay particles will settle. This can take 1-3 days or sometimes weeks to completely settle (i.e. make the water clear). Organic matter will float on the top.

5. After 1 minute, mark on the jar the sand line

6. After 4-6 hours, mark on the jar the silt line

7. After 1-2 weeks, mark on the jar the clay line

8. **Measure the depth (or thickness) of each textural layer**

Depth of sand deposit: _____

Depth of silt deposit: _____

Depth of clay deposit: _____

Depth of total deposit: _____

9. **Calculate the percentage of sand, silt, and clay.** To calculate the percentage, divide the depth of each layer of soil by the total soil depth in the jar, and multiply by 100.

(sand depth / total soil depth) *100 = _____ % sand

(silt depth / total soil depth) * 100 = _____ % silt

(clay depth / total soil depth) * 100 = _____ % clay

1. **Interpreting the Results**

Once you have determined the percentages of sand, silt, and clay, follow the lines toward the adjacent side of the triangle to determine your soil textures. For example, if you have 50% sand, 40% silt, and 10% clay, your soil type would be a loam.
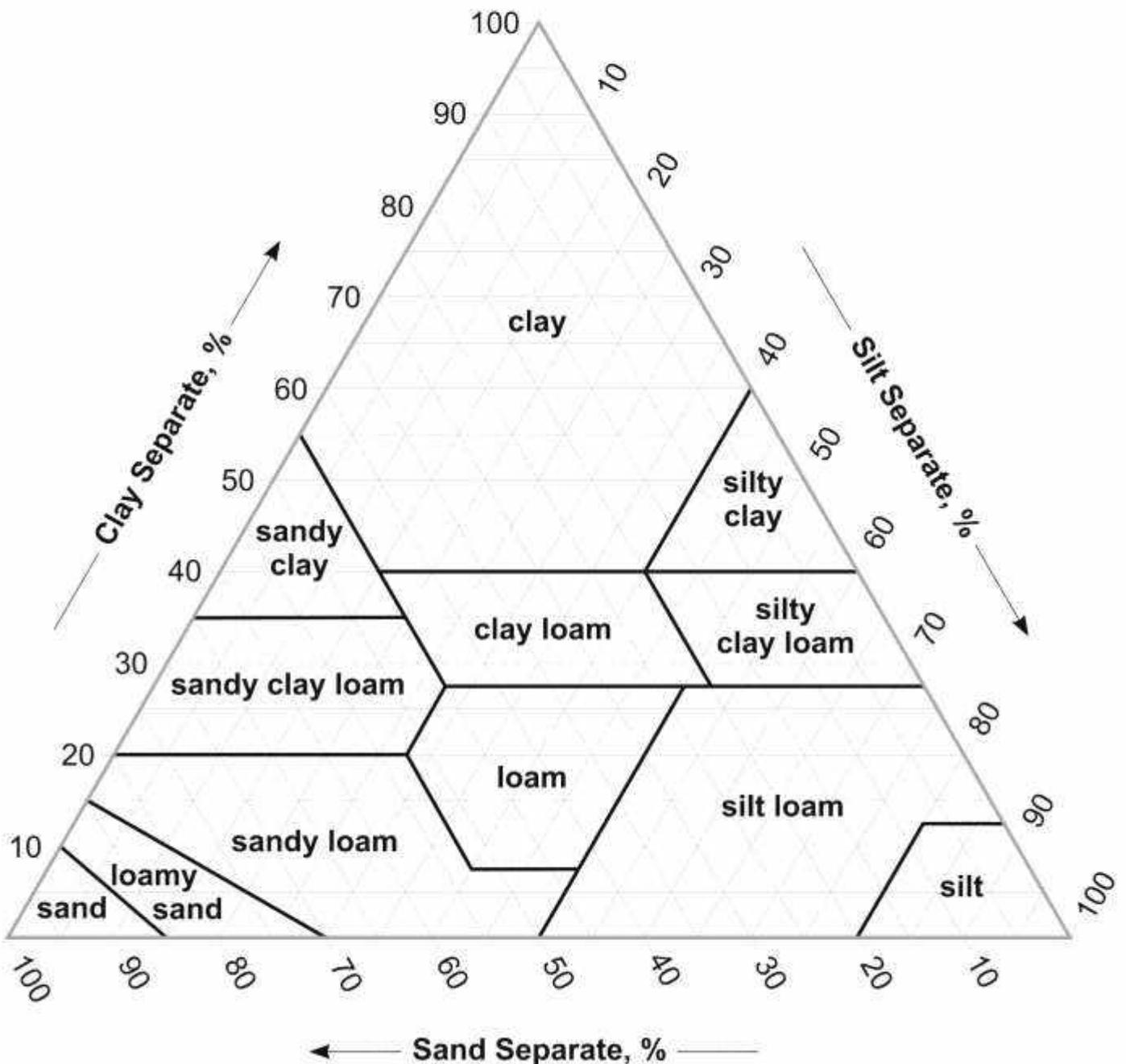
Soil Type:

Soil 1: _____

Soil 2: _____

Soil 3: _____

Soil Textural Triangle

Texture questions

2. What is the lowest clay percentage allowed for a texture to be classified as:

   a. Clay _____   c. Clay loam _____

   b. Sandy clay loam _____   d. Sandy clay _____

3. What is the lowest silt percentage for a texture to be classified as:

   a. Loam _____   b. Silt loam _____   c. Sandy loam _____

4. Did your soil ribbon test, match the results of the jar method for each soil type? What do you think the pros and cons of each method are?