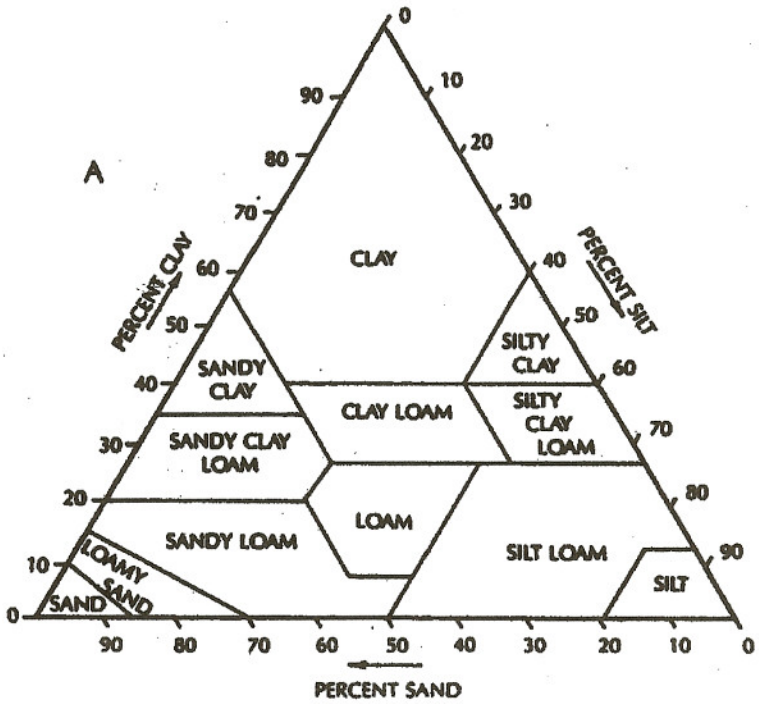
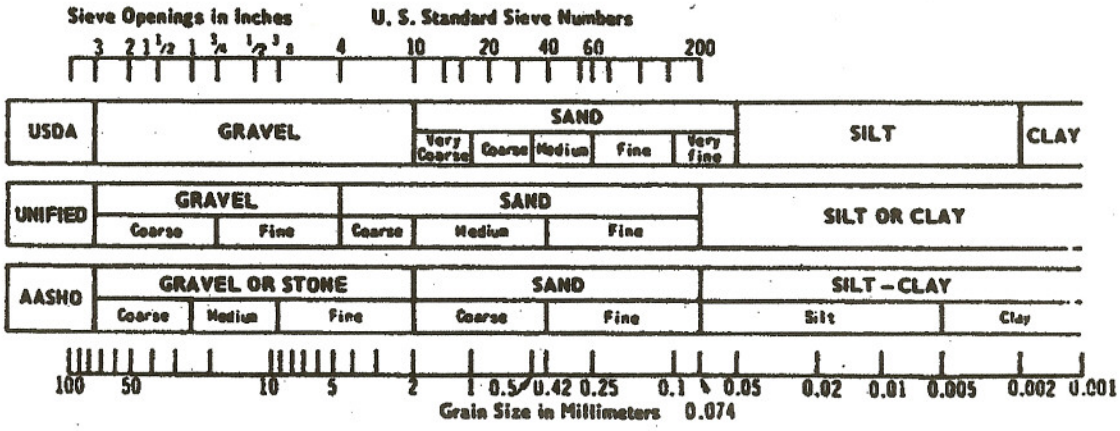
Sedimentology and Stratigraphy
Laboratory Exercise 1b
Sediment Textures by Touch

Purpose: To acquaint you with techniques and criteria for field categorization of sedimentary textures based on relative percent of silt, clay, and sand.

Procedure: Commonly, you will be called upon to make quick judgments regarding the texture of unconsolidated sediments in the field, without the advantage of lab equipment. This is typically done using sense of touch. Because this technique has inherent inaccuracies, we do not concern ourselves with attaining exact measurements. Instead, we attempt to place samples within broad fields depicting relative percent of silt, clay, and sand content. A common standard for categorizing these textural fields is the USDA texture triangle (Below).



COMPARISON OF PARTICLE SIZE SCALES



Field assignments of sediments into the textural categories on the USDA triangle are accomplished by rubbing moist sediment samples between one's fingers. Which category the sample falls into can be assessed using the following criteria.

Clay (C): Can be molded into thin ribbons by smearing samples between one's fingers. Smearing samples between your fingers will produce smooth surfaces with well-developed slickensides having good striations. Note that the C category may still contain up to 60% silt. Don't be surprised if the sparkles of tiny silt grains are still quite visible across the slickensided surface. Note as well that sometimes samples may contain concretions, fossils, or other stray grains that give the clay a "lumpy' form, but such stray grains will not alter the textural classification unless they are a major component of the sample, and are not judged as secondary contamination or diagenesis.

Silty Clay (SiC): Samples in this category will appear the same as samples in the C category; however, the sample will be pushed into the SiC category when the notice of silt as a major component becomes unavoidable. One criterion for making this assertion is that slickensides will not be as well developed. Rubbing the sample between the fingers will still produce ribbons with slickensides, but slickensides will no longer be smooth. Instead, rollups/pills will invariably appear when slickenside formation is attempted. This category, however, is only used to denote that your "C" sample seams to contain a lot of silt.

Silt Loam (SiL): When you no longer find yourself saying "my clay sample contains a lot of silt," and instead find yourself saying "my silt sample seems to contain a lot of clay," you are into the category of SiL. This category should be considered when the abundant presence of silt is obvious, and no longer requires question. Dominance of clay over silt content is apparent in this category. Samples here will still contain sufficient clay to be moldable into well developed ribbons, and slidensides may still develop somewhat. Slickensides will however be very dull, striations will be hard to develop, and rollups/pills will be a common component of the slickensided surface. Note that the Silt Loam category is very large. When in doubt, pick SiL. Note also that SiL can contain a respectable amount of sand. For hydrodynamic reasons, this is typically very fine sand, and not that different in appearance form silt. Still, don't be surprised if the gritty presence of some sand is there, but generally a muted and seemingly accessory component.

Silty Clay Loam (SiCL): This is the boundary category that you will use when you just can not decide if you are looking at a SiC or a SiL sample. Consider this your decision if you just can't make a decision. Note that this category is actually quite small, and not many natural samples will fall in this area. This category should not be over used. Plan to make a decision between SiC and SiL in most all cases, and reserve this category for the true boundary case.

Silt (Si): Pure silt is hard to deposit. Most natural systems will tend to leave some significant amount of clay within any silty deposit. Wind is the exception. Wind can

winnow out clay and segregate silt quite effectively. Don't expect this small category to be a common pick unless dealing with some very texturally mature deposit like loess. Pure silt will be difficult to mold into ribbons. The ribbons will have a tendency to fall apart. The grain size will be very small, and individual grains will be just at the visible boundary for the 20/20 eye. The texture of silt will feel like that of dry flour, even when the silt is wet. This "flour" feel will be true not only of the Si category, but also the silty parts of the SiL category.

Loam (L): When SiL samples reach the stage where the presence of sand becomes noticeably obvious, but is still not appearing to dominate, you are in the L category. Note that samples will still be easily moldable into ribbons and other stable shapes, but slickensides will not be notable on smeared surfaces. To the touch and eye, L will be that category where clay, silt, and sand appear to be somewhat evenly mixed, though the sample will be mostly silt and sand. A little clay goes a long way. If your sample is 20% or more clay, the sample will be moldable into virtually any shape and will still retain its form well.

Sandy Loam (SL): When the sample behaves like L, but is clearly dominated by sand, the SL category is applied. An SL sample will by sight and feel appear as a sand sample. It will still however be very moldable. The amount of clay may be low enough that molded shapes crack on the surface, or are not "potter quality," but shapes are still fairly easy to mold. Samples of silty sand that contain little clay will also fall into this category, but, like pure silt, this is a fairly rare occurrence.

Loamy Sand (LS): This is functionally a sand sample. It will look and feel and act like sand. It will however not be "clean" sand. When handled wet, it will leave clumps and residues of mud on the fingers. It will also be sticky when wet and clump into blobs. It will not tend to be moldable into stable shapes like ribbons, but you will be able to get it to roll into poorly developed balls if it is particularly loamy. Though this category is small, it is reasonably common. This is simply because it tends to be difficult to get sand to be completely cleaned by hydrodynamic processes, but is easy to get sand fairly clean.

Sand (S, usually further modified as vfS, fS, mS, cS): Clean sand. This sand is not sticky, and leaves no muddy residue on the fingers when wet. It falls apart at the gain level when handled. When damp, it can hold a pre-formed shape briefly owing to inter-pore surface tension of water (the sand-castle effect), but it is not moldable into shapes. Though small, this is a common category.

Sandy Clay Loam (SCL), Sandy Clay (SC), and Clay Loam (CL): These are not categories that are commonly formed by hydrodynamic processes. It is difficult to get clay and sand to deposit together in sub-equal abundance in primary water and wind deposition. These deposits typically reflect either deposition by poor-sorting gravity or ice processes, or reflect mixing of sediment at a later date after deposition by bioturbation, liquefaction, etc. Still, if you find you have a clay sample that appears to have a lot of sand lumps within, call it one of these three, depending upon how common and large the lumps appear.

(Note: If particles larger than sand are present in any of the above categories, modify the category as ____ with ___% ____(size class of particles [e.g., granules, pebbles, gravels, etc.]). Also take caution that the particles are not diagenetic precipitates (e.g., concretions, etc.) or contaminants generated during collection.).

Assignment: Categorize the provided samples into one of the sample categories on the USDA triangle. Attach appropriate modifiers (e.g., fS, %gravelly, etc.).