UMBS Soils Laboratory

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Soil Processing Procedures

Separating the fine earth fraction from coarse fragments and fine roots (mineral soils)

Equipment:

2mm sieve with catch pan	Spoon or scraper
Placemat or large paper work surface	Pestle or pulverizer
Tins or pans for roots, rocks, fine earth, etc.	Dissecting probe
Forceps	Magnet
Stiff-bristled brushes	

Procedure:

1. Spread the placemat or paper on top of the work surface, in order to keep a clean work area and also recover any material spilled during processing (samples are quantitative and all material must be weighed and accounted for).

2. Place the sieve on the catch pan and empty the mineral soil sample from its bag or drying tray onto the sieve. Shake the sample bag, or use a stiff-bristled brush to clean the drying tray to ensure complete sample recovery.

3. Shake the sieve back and forth several times, and/or use the forceps to poke the sample. The aim here is to spread the sample ±evenly over the sieve for visual inspection. Note and record any unusual or difficult sample properties. Common problems in mineral soil samples may include large amounts of charcoal, metal fragments (i.e., coring tool fragments which can be removed with a magnet), abundant clumps of fungal hyphae that are difficult to separate from the fine earth fraction, animal midden material, and macro-organisms (which should be removed). Also, be alert for surface litter or plant matter in deeper soils; these represent contamination.

4. Using the forceps, remove any coarse fragments (rocks, charcoal or roots >2mm diameter) and place them in separate, labeled tins. Also use forceps to remove fine roots (<2mm diameter) and place them in a separate tin. If soil particles adhere to coarse fragments or roots (mostly a problem on wetter soil samples), use the brushes or tap the forceps on the edge of the sieve while holding the root to knock off adhering soil particles. It is important to minimize the amount of adhering fine earth fraction on roots and coarse fragments.

5. Shake or swirl the sieve periodically to encourage fine earth materials to pass through the sieve mesh and into the catch pan, and to expose hidden coarse fragments and fine roots. Repeat #4 as necessary.

6. Use spoons, pestles, pulverizers and scrapers to gently crush aggregates or other soil structural units (*e.g.*, soil particles adhering to fine roots). After breaking up structural units, repeat #4 and 5 as necessary until all fine earth fraction has passed through the sieve, and all coarse fragments and fine roots have been removed and placed into the appropriate tins.

7. Remove the sieve from the catch pan and use the forceps to swirl around the fine earth fraction. Remove any obvious fragments of fine roots >1 cm length, which sometimes pass through the sieve but belong in the fine root tin. Set the catch pan aside

8. Invert the sieve on top of the work surface (placemat) and use the dissecting probe and brushes to push out coarse fragments that were small enough to plug the sieve mesh, but too large to pass through. This is primarily a problem for soils with charcoal fragments or very small gravel.

9. Inspect the work surface and recover coarse fragments and any spilled materials into their appropriate tins.

<u>Physical measurements of fine earth, coarse fragments, and fine roots</u>

Equipment:

Balance accurate to 0.01g	Lab spatula
Graduated cylinders	Munsell color book
Water supply (preferably deionized)	50 mL beaker or paper cup(s)
Waste container for rocks and water	Labeled vials or bags for archiving
pH meter	Labeled vials for oven drying
Eye dropper	Labeled tins for loss on ignition
Tongue depressor or glass stirring rod	

Procedure:

1. Weigh fine root samples to the nearest 0.01g. Record the mass and sample ID in the data sheet. Be sure not to include the mass of the tin or pan in the mass that you enter into the data sheet.

2. Weigh the coarse woody fragments and repeat the other steps as in #1.

3. Weigh the coarse mineral fragments (rocks) and record the mass on data sheet. Fill a graduated cylinder (size appropriate to the volume of the rocks in the sample) with water to a known, exact volume. The water need not be deionized. Record the volume on the data sheet. For example, if coarse fragments are small and few, fill a 10mL graduated cylinder to 5mL.

Empty the rocks into the graduated cylinder. Record the final volume of water on the data sheet. These data are necessary to measure the mass of the rocks and their volume by displacement.

4. Unless the rocks are desired for mineralogical analysis, empty the graduated cylinder into the waste container.

5. Weigh the fine earth fraction and record the mass to the nearest 0.01g. If subsampling for the air-dry : oven-dry ratio is desired, use a lab spatula to remove a representative subsample (3-5g) and place into a small, pre-weighed and labeled vial or tin. Record the mass of the tin and the tin+sample on a data sheet. Place the vial into a drying oven at 105°. After 12-16 hours, re-weigh the sample; the mass of the dried sample will be used to compute an air dry : oven dry ratio.

6. Place 20-200 g of fine earth material in a labeled bag or vial for archiving and set aside. The remaining material may be used for pH, color determination, or organic matter measurements.