BES 316 2010

**SOIL FIELD ANALYSIS AND COLLECTION**

Goals for Today

1. To learn about selected approaches in the analysis of soils from field sites
2. To understand equipment applications & limitations
3. To explore properties of soils from contrasting field sites
4. To understand ecological implications of various soil properties

***SCHEDULE for MAY 6, 2010***

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| **Time Period** | **Activity** |
| 8:45 – 9:10 | Drive to St Edward State Park |
| 9:20 – 12:10 | Soil measurements and collection |
| 12:10 – 12:40 | Drive back to UWB |
| 12:40 – 1:05 | Initial processing of collected soils in the lab  |

**TASKS FOR TODAY**

As a 4-student team you will take measurements, describe soil properties, and collect soils for later lab analyses from the two forest stands we used for vegetation analysis at St. Edward State Park.

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| **Field measurements today** | **Lab analyses on collected soil** (later) |
| Soil horizon descriptions (1 / site) | pH |
| Litter type and depth, humus depth (4 / site) | Organic matter content |
| Soil texture class (4 / site) | Moisture |
| Surface hardness (10 / site) | Texture |
| Soil infiltration rate (4 / site) | Bulk density |

Soils develop as a product of the parent material, climate, relief, weathering processes, organisms, and time. Soils are dynamic systems that influence the plant community and in turn are influenced themselves by the plants themselves (as well as other biota). There are many properties of soil systems that influence the vegetation, other biota, and ecological processes. In this exercise you will collect information (some immediately in the field, some later in the lab) to characterize soils form different forest stands at St. Edward State Park. The selection of parameters to be measured was done to balance the collection of data about typically used soil characteristics, important parameters, and the limitations in time and expertise of those undertaking the analyses. Often a more complete characterization would include a technical description of soil horizons, soil color, soil structure, and taxonomic classification as well as further technical analyses of physical and chemical characteristics.

# Soils Field Measurements Today

1. **Soil Horizon Description**

At ONE characteristic location within each forest stand you should dig a small soil pit about 18 - 24 inches deep. On one side of the pit cut a clean vertical wall. Describe the horizon development that you see and measure (the vertical dimension) of the horizons that you describe. When describing horizons be sure to include information on color, texture, variability, and the sharpness of horizon divisions.

1. **Litter Depth & Type / Humus Depth**

Litter is dead plant material on the surface that is still recognizable as plant material. Further down there should be a layer of partly decomposed material that is clearly decomposing organic debris but is no longer recognizable as plant fragments – this is “humus”. They are both sitting on the surface of the mineral-dominated horizons of the soil.

You should (1) take notes on the relative composition and variability of the litter layer (type of plant material, e.g., coniferous vs. deciduous); (2) measure the depth of the litter layer; and (3) measure the depth of the humus layer at FOUR characteristic locations within your forest stand.

1. **Soil Texture Class**

One field method to assess the texture class of soils has been adapted for local soils by Professor Rob Harrison, UW Seattle. This simple, rapid assessment of texture is based upon tactile perceptions and particle cohesion. Begin by collecting enough soil from the depth range of 5 – 15 cm to form a ball approximately a half inch in diameter. Follow the instructions on the flow chart at the end of this handout. Assess texture in this way at FOUR characteristic locations in each site.

1. **Surface Hardness**

Clear the litter and humus away from a small area (a few cm2) of the mineral soil surface at TEN representative spots within each forest stand. At these cleared areas, measure the surface hardness with the soil penetrometer. Be sure the white plastic ring on the penetrometer is placed back at zero before placing the end of the penetrometer against the soil surface. Press the end of the penetrometer against the soil surface, pushing the end into the soil until the scored line reaches the surface. Read the value indicated by the white plastic ring. This is the force (measured by compression of a spring) required to push the penetrometer into the soil up to that scored line (in kg/m2). The greater the amount of force required, the harder the surface.

This instrument provides a measure of the hardness (compaction) of the soil surface and uppermost layers. More compacted soil often experiences greater runoff and reduced water infiltration rates (there are exceptions though, as macrostructural characteristics can also affect infiltration – e.g., surface cracks can greatly enhance infiltration even though the surface may be very hard).

1. **Soil Infiltration Rate**

Select FOUR representative locations within each forest stand. Use the double ring infiltrometer to measure the rate at which water penetrates the soil.

Push the infiltrometer into the soil until the horizontal flange is flush with the surface. Fill the inner ring and outer rings with water up to the top (10.7 cm of standing water). When the pointer on the instrument’s scale reaches zero immediately start a stopwatch.

After 10 minutes or when all of the water is gone from the inner reservoir (whichever comes first), stop the measurement. If all of the water infiltrates before 10 min, record the time it took for all 10.7 cm to infiltrate and express it as cm water / minute. If there is water left, record the amount of water that has infiltrated (on the instrument’s scale in inches – you need to convert to cm) and express infiltration again as cm water / minute (remember to divide by 10 to account for the 10 min measurement period). Clean the soil from the rings after removing the infiltrometer.

# Soil Collection for Lab Analyses

Collect soil from one representative site in each forest stand for lab analyses next week. I would recommend using the same site chosen for your soil horizon pit above. Record information on the dominant plants and litter type. Carefully scrape away the litter and humus layers and place them aside (for replacement when you aer done). Collect the following from the 5 – 15 cm in depth:

1. **Collection for soil moisture, organic matter and bulk density:**
* Using the bulk density corer, collect soil for 6 soil tins at each site. You will be instructed in its use, but be careful to remove intact, undisturbed cores. There is only one bulk density corer, so the two groups will have to share it. Removing a consistent, known volume of soil is critical for calculations of bulk density (dry weight of soil per unit volume). Once each core is lifted from the soil, it can be scraped from the brass cylinder into a soil tin without concern for its structure. Close the tin tightly so moisture does not escape.
* Place ONLY the soil from the lower of the 2 cm-wide brass rings into the tin. This will be the depth range of 4 – 7 cm and will yield a soil volume of 68.67 cm3 per sample. This soil will be used to calculate moisture content, organic matter concentration, and bulk density.
* While collecting the soil, be careful to first scrape away the O horizon so as to not include large organic debris.
* 6 tins/site x 2 sites = 12 tins total
* Be sure to note the numbers of the tins that correspond with each site! DO NOT write on the tin itself – use the number already there.
1. **Collection for texture and chemical analyses:**
* At each site, collect 4 bulk samples of about 1 liter each of soil from the depth range of 5-15 cm and place it into a labeled paper bag (label with your group members’ names, site number, date, and class – BES 316). Remove large organic debris and stones. Roll the top of the bag closed for transport back to the lab. This soil will be used for measures of texture and pH.

Once you have completed each soil collection, be sure to carefully back fill in your hole and redistribute the litter layer to minimize your visual and ecological impacts.

# Immediate Soil Processing

Upon our return to UWB you will need to undertake some immediate processing to begin your soil analyses. You will process your samples in our classroom laboratory, the lab prep room (CC1-320), and in your instructor’s research lab (UW2-231). Christy and I will be there to help you with this.

1. **Paper bags full of soil**

Open up your paper bags and place them upright on a designated counter in our classroom. This will allow the soils to air-dry in preparation for our lab analyses next week.

1. **Tins full of soil**

In the classroom, weigh each soil tin to the nearest milligram (.001 g) on the designated balances. **Be sure your balance is zeroed properly and you know how to use it properly! Ask if you do not know!** This weight should be that of the wet soil, soil tin bottom, and soil tin lid. Record this in your field notebook. All students should have the data (in case one set is lost).

After weighing, open each soil tin, place the lid on the bottom of the tin, and place it in the drying oven (inside room 320) at 105 °C to dry. These should be reweighed next Tuesday (May 11). **Be sure all students have all of the data and information!**

