Determination of Soil pH and EC in water

Introduction

Soil pH is the measure of activity of hydrogen ions [H^+] in the soil by way of extraction with either water or a salt solution. The pH of a soil can be an important control and easily measured indicator of chemical and biological status. pH ranges can be indicative of the presence of certain ions such as aluminum or carbonate (Thomas 1996). Electrical conductivity (EC) is an indirect measurement of a soil's salt content (Brady and Weil 2008a). Soil pH and EC can also influence the type of vegetation that colonizes an area (Brady and Weil 2008). Soils that are too acidic or alkaline can pose problems to flora and fauna in situ and downstream.

Equipment Needed

100 mL beakers (one for each sample)
400 mL or 1 L beaker (waste beaker)
Fresh Deionized water (squirt bottle)
Field wet soil
Parafilm
pH meter and buffer set (pH 4, 7, 10)
EC meter and standard set (1413 uS/cm)
Balance
Kimwipes
Glass stir rod (optional)

Procedure

*Notes before beginning:

- Prepare 10 samples per hour
- Follow good pH meter protocol
  o Use new standards if greater than 2 weeks old
  o Rinse probes with milliQ between samples, **<u>BLOT</u>** dry with Kimwipe **(<u>NO WIPING</u>)**
  o Do not let electrode dry out (hold in a beaker of milliQ)

<u>Sample preparation:</u>

1. Tare beaker.
2. Weigh out **25 ± 0.1** g field wet soil.
3. Tare beaker/soil weight.
4. Add **25** g milliQ water (change water before beginning).
5. Swirl beaker for 1 minute and make sure all soil is in solution (can also use glass stir rod rinsed between samples).

Note: If there is no solution on the surface after mixing, increase the water ratio until there is solution present and record the new ratio (usually a 1:2 soil to water ratio works).

6. Cover with Parafilm.
7. Record time or set timer and let your samples sit for 1 hour.

While waiting for samples, calibrate pH meter:
1. Create a 3 point calibration curve using pH 4, 7, and 10 buffers.
2. Use std 7 as a check calibrant after creating the standard curve.
   i. Record measurement if within 0.02 of standard.
   ii. If greater than 0.02 difference, redo curve.
3. Calibrate EC probe with the 1413 uS/cm standard.

After the hour of sample equilibration, mix the sample then read and record pH of soil samples 3 times (must wait for pH reading to become stable). Rinse probes between readings and remix sample by swirling or using a glass stir rod to create independent measurements.

4. Remember to check and record calibration at the end of your samples (use pH 7).
5. Rinse pH probe and store in electrode storage solution.

References

Brady, N.C. and Weil, R.R. (2008).Soil Acidity. In *The Nature and Properties of Soils*. Upper Saddle River, NJ: Pearson Prentice Hall, pp. 358-374.

Brady, N.C. and Weil, R.R. (2008a).Soils of Dry Regions: Alkalinity, Salinity, and Sodicity. In *The Nature and Properties of Soils*. Upper Saddle River, NJ: Pearson Prentice Hall, pp. 401-442.

Thomas, G.W. (1996). Soil pH and soil acidity. In *Methods of Soil Analysis-Part 3 Chemical Methods*. Madison, WI: Soil Science Society of America, Inc., pp.475-490.