**Measuring soluble salts (Electrical Conductivity) and pH in soils by the 1:2 (V:V) soil:water extract method**

Probe preparation (using an ExTech ExStik EC500):

1. Remove cap and immerse electrode end of probe in tap water for about 10 minutes before calibrating or making measurements. Do not use RO or deionized water. White KCl crystals may be present on electrode – this is normal; they will rinse away with tap water.
2. Each week, calibrate probe with Electrical Conductivity (EC) calibration solution (1413 S/cm), pH 7.0 buffer, and pH 10.0 buffer, in that order.

Probe calibration:

1. Add ~30 ml of EC calibration solution (1413 S/cm) to the 50 ml plastic beaker.
2. Rinse ExStik in dI water.
3. Turn ExStik ON, press and hold MODE/HOLD button to scroll to “S” mode, and insert electrodes fully into solution. Tap gently to remove air bubbles from electrodes.
4. Press and hold CAL/RECALL button until “CAL” appears on display. The main display will start flashing.
5. Watch the readout several seconds until “SA” briefly appears, indicating a successful calibration. If “SA” does not appear, turn ExStik off and repeat from step 2.
6. Remove probe from EC calibration solution, rinse with dI water and shake off excess. Do not touch electrodes.
7. Discard EC calibration solution, rinse beaker with dI water, and add ~30 ml of pH 7.0 buffer to the 50 ml beaker.
8. Press and hold MODE/HOLD button to scroll to “pH” mode, then insert probe fully into pH 7.0 buffer.
9. Press and hold CAL/RECALL button until “CAL” appears on display. The pH reading of the buffer will flash.
10. Watch the readout several seconds until “SA” briefly appears, indicating a successful calibration. If unsuccessful, repeat pH calibration procedure from step 8.
11. Remove probe from pH 7.0 buffer and discard buffer. Rinse probe with dI water and shake off excess.
12. Repeat steps 7 through 10, except with ~ 30 ml of pH 10.0 buffer. The ExStik is now calibrated.

Measurement procedure:

1. Using the 50 ml graduated beaker, measure out 25 ml of 2-mm sieved, air-dried soil and add to sample cup.
2. Add 50 ml of deionized or RO water to cup and stir thoroughly with a piece of plastic for 15 seconds.
3. Let stand 30 minutes to allow suspended particles to settle.
4. Rinse ExStik in dI water.
5. Press ON button on ExStik (“8888” and then “SELF CAL” will appear on the display for a few seconds).
6. Press and hold MODE/HOLD button to scroll to “S” mode. Scrolling will take several seconds.
7. Insert probe into liquid portion of sample and make sure the electrodes are completely submersed, but keep them above settled particles at the bottom.
8. Stir solution slowly to remove air bubbles from around electrodes.
9. Record the EC reading, carefully observing units reported on the ExStik. Conductivity readings from 0 to 1999 S/cm (microsiemens/cm) are displayed as “**S**”. Conductivity readings above 1999 S/cm are displayed as “**mS**” (millisiemens/cm) on the readout.
10. Press and hold the MODE/HOLD button to scroll the mode to “pH” mode. A small “pH” is displayed below the large numbers.
11. Continue to hold the bottom of the probe above settled particles in the cup and slowly stir probe in the liquid. The pH sensor is on the very end of the probe.
12. Record the pH reading.
13. Remove probe from the cup after making EC and pH readings.
14. If continuing to another sample, rinse probe with dI water and shake off excess water. Do not touch the conductivity electrodes or the pH sensor at the end of the probe.

ExStik storage:

If measurements are complete for the day, turn off probe, rinse with tap water, shake off excess water, and reapply protective cap. The material in the end of the cap should be dampened slightly with tap water so the pH probe is in contact with that wet material in storage.

Citations:
From Oregon State's iSNAP project.  The 1:2 (soil:water) interpretive table is on the last page of the document:
<http://isnap.oregonstate.edu/WERA_103/Methods/WCC-103-Manual-2003-Soil%20pH%20and%20EC.PDF>

From University of Delaware's extension soil testing program.  Table for 1:2 (soil:water) is on last 2 pages:
<http://extension.udel.edu/lawngarden/files/2012/10/CHAP10.pdf>

Units relationships:

1 dS/m (decisiemens/m) = 1 mS/cm (millisiemens/cm) = 1 mmhos/cm (millimhos/cm) = 1000 μS/cm (microsiemens/cm)