**KCl extractable N protocol and calculations**

B. McGill 2012 adapted from:

Robertson, G. P., P. Sollins, B. G. Ellis, and K. Lajtha. Exchangeable ions, pH, and cation exchange capacity. 1999. in Robertson, G. P., D. C. Coleman, C. S. Bledsoe, and P. Sollins. Standard Soil Methods for Long-Term Ecological Research. Oxford University Press. pp 106-114.

**1. KCl Extraction**

Equipment and Supplies:

* 50 mL centrifuge tubes 2 reps per sample
* 20 mL plastic scint vials for storing filtrate
* 2 M KCl (x25ml per sample + extra 500mL per 25 filters rinsed)
* Re-pipettor
* Datasheet for soil mass
* KCl and DI-rinsed No. 1, 11 cm diameter Whatman filters (1x with KCl, 3x with DI) n=1 per extraction. I used about 500 mL of KCl per 25 filters rinsed.

Tasks before sampling:

* 1. Make 2.0 M KCl solution. If made in batches, combine before using. (See note above about how to calculate what volume of the solution to make).
  2. Prep the filter paper by folding them and placing each in a funnel, fill funnel with DI, let it drain. Fill with KCL solution, let it drain. Fill with DI, let it drain, do this step two more times.
  3. Flush and calibrate re-pipettor
  4. Sign up to use the TOC/TN and Lachat.

Steps:

1. Weigh two reps 2.5g (2.40-2.60 g) of 4mm sieved, moist soil into labeled centrifuge tubes and record mass. Keep tubes with soil on ice, especially if you have a lot of soil samples and they will be sitting around for a while before extraction.
2. Record exact weight.
3. Add 25mL of KCL to each tube with re-pipettor
4. Remember to make a few blanks, i.e. tubes with filtered KCL, no soil.
5. Cap and vortex 5 secs.
6. Arrange racks on shaker table so the tubes are on their side. Shake 30 min at low speed <100rpm.
7. Centrifuge at 2400rpm for 5 min.
8. For each centrifuge tube, place a clean, pre-rinsed filter paper in a clean funnel in a new scint vial--use wire rack to support.
9. Pour supernatant onto filter paper, make sure the label on the centrifuge tube and the scint vial match. Let stand til liquid has drained.
10. If analyzing within 1 week, store at 4 degrees Celsius until ready to analyze. If analyzing in over a week, freeze samples.

**2. KCl extractable N calculations**

Converting raw mg/L data from the Lachat to ug N / g dry soil

1. After you have calculated the concentrations for both NH4-N and NO3-NO2-N for your samples based on the area under the peak and your standard curve, calculate the average concentration of your blanks and subtract this from each sample. The Lachat reports concentrations in “mg N / L”. Follow the below steps for the NH4 and NO3-NO2 values separately.
2. Account for the dilution factor you used to prep the samples for the Lachat, i.e. 1 mL of sample plus 4 mL of DI means the sample is diluted 5x (1 out of 5 mL). So multiply the concentration by 5.
3. Multiply the concentration in mg/L \* 1000 to get ug/L
4. Multiply step 3 by 0.025. This accounts for the 25 mL of KCl used to extract the soil and cancels the L unit. The units are now “ug N”.
5. The standard way of reporting soil concentrations is per unit dry soil. In order to convert the fresh soil mass extracted into dry mass calculate the wet/dry conversion factor for your soils from soil moisture data, i.e. the ratio of the mass of oven dried soil / fresh soil. This ratio is different for each sample. Multiply this ratio by the mass of the fresh soil extracted to remove the mass from water in the fresh soil, making it “g dry soil”.
6. Now, divide step 4 by step 5. The units are now “ug N / g dry soil”.