# Basic soil sampling protocol

## Collecting soil

### Equipment

#### Required

* Soil corers
* Butter knife (or similar)
* Ruler
* Ziplock bags
* Cooler
* Ice (for cooler)
* GPS device
* All-weather paper
* Clipboard
* Soil moisture probe
* Temperature probe
* Back-up batteries

#### Optional

* Map of field(s)
* Rain poncho(s)
* Sunscreen

### Method

* Soil cores can be taken along transects or random locations.
* Depends on sampling scheme.
* Standard core depth: 5 cm
* Taking a soil core:
* Push corer into ground.
  + Make sure to sample deeper than needed.
* Pack topsoil down with corer.
* Pull out core, with first twisting to ensure core separation.
* Measure core length needed.
* Use butter knife to remove excess core .
* Place remaining core in ziplock bag.
* Store ziplock bags of soil cores in cooler for transport back to the lab.
* Sieving may be done in the field depending on the distance to travel back to the lab.

## Soil sieving

Goal: break down soil structure (homogenize) and combine samples from the same sample point.

### Equipment

* 2mm sieves (clean)
* Gloves
* Soil!

### Method

* Place soil on sieve.
* Sift and mash soil through sieve.
* The sieve may need to be washed **and thoroughly dried** periodically to prevent cloggin.
* Store soil in ziplock bags in the fridge until further processing.

## Downstream sampling processing

### Freezing

* Aliquote soil into centrifuge tubes and freeze at -20oC or -80oC

### Geochemical analyses

* [Cornell Nutrient Analysis Laboratory](http://cnal.cals.cornell.edu/)

### Stable isotope analysis

* [Cornell Stable Isotope Laboratory](http://www.cobsil.com/)

### Determine soil dry weight (and water content)

* Place 10-30 g of soil on a weigh boat.
* 15 g soil seemed to work fine.
* Make sure to recore the weight (don't tare the weigh boat).
* Dry in drying oven for ~24 hrs.
* Re-weigh the soil.
* dry weight = original weight - dried weight

#### Sean Berthrong's method for determining water holding capacity:

I basically dried out the soil (you can either air dry or oven dry), and then put a filter paper in a funnel. I sat the funnel in a beaker or flask and saturated the filter paper with DI. I let the water drain and emptied the beaker. Then I got the mass of the wet filter+funnel+beaker. Then I added the dried soil to the filter funnel and saturated the soil with DI. Let the soil free drain until it stops dripping—how long depends on your soils, but usually not more than a few minutes. Get the mass of the now wet soil plus apparatus, the difference is the mass of water held. Hope that all makes sense.

* Sean's determination of 50% holding capacity for Penn Yan soil: 0.3 g (H2O) / g (soil)

### Microcosm incubations

* See 'SIP\_microcosm' protocol for detailed instructions.
* Place soil into Erlenmeyer flasks.
* The amount of soil and size of flask is dependant on the experimental design.
* Cover flasks with sterile foam stoppers.
* Allow to de-gas for ~14 days.
* Basically, just wait for the CO2 respiration rate to level off.
* Stopper flasks with rubber stoppers.
* **Make sure:** the seals are air tight.
* SIP incubations & gas sampling:
* See 'SIP\_microcosm' protocol