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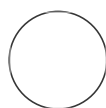
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Field Sampling Protocol

In 2 collections

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ABSTRACT

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This protocol describes soil core sampling for the 1000 Soils Pilot Campaign. Please keep in mind that it is the collector's responsibility to ensure compliance with any environmental regulations associated with sampling (e.g. permits and site access). After QA/QC, data generated by the 1000 Soils Project will be publicly available according to FAIR principles (<https://www.go-fair.org/fair-principles/>), and we encourage data collectors to abide by CARE principles surrounding indigenous peoples (<https://www.gida-global.org/care>). Upon receipt, please verify that this kit contains the materials listed below. Sampling should be completed between Thursday and Saturday and shipped overnight to EMSL between Sunday and Tuesday the following week using the provided return shipping labels. Please contact Maggie Bowman (maggie.bowman@pnnl.gov) with any questions.

Summary of Field Work and Samples Collected

As part of the 1000 Soils field sampling, you will be collecting meter measurements (temperature, volumetric water content, and electrical conductivity), soil samples (3" x 12" Abiotic/Biotic paired cores and 2" x 4" smaller cores), and infiltration measurements.

Identify Sampling Location

Identify one sampling location per site that is as representative of the landscape as possible. When possible, samples should be collected with ~100 m of an eddy covariance tower or climate monitoring station. Please note a short description of the sampling location about the surrounding landscape on the metadata sheet (e.g., upslope, downslope, North facing, etc.).

Prior to Sample Collection

Before collecting samples, please ensure that the kit contains all materials listed below. In addition, please place the blue ice provided for shipping in the freezer and fill the four included bottles with 444 ml of water each for infiltration measurements.

ATTACHMENTS

[field protocol list.docx](#)

MATERIALS

1000 Soils sampling kit should contain the following:

- Cooler

Freezer blue ices packs (please place in freezer for minimum 48 hours prior to return shipping)

Return shipping labels

Nitrile gloves (bags containing small, medium, and large gloves)

2 bags per site core to prevent leaking

Zip top plastic storage bags

Core liners (Two–3"x12" and four – 2"x4"liners with caps per site)

Four 3" core catchers (if needed)

Pool Noodle (used to stabilize cores/fill open space in coring tubes during shipping).

Kimwipes

- Pelican Case

Clipboard

Hard copy of data sheet

Writing utensils

Tape

Ear protection

Tape measure

Box cutter

Return shipping label

AMS slide hammer

AMS Intact Corer

AMS Soil Recovery Auger Corer (SRA)

AMS Extender (2' and 3')

AMS Auger Handle

Wrenches (strap and crescent)

Wooden block

Hammer/Mallet

Infiltration Ring



Plastic Wrap

Two 500 ml Nalgene Bottles

Meter group PROCHECK + Teros 12 meter

Items provided by you:

- Cooler and blue ice (separate from shipping blue ice) to keep samples cold in the field
- Method for collecting latitude and longitude in decimal degrees in the field (this

- can be done using a smart phone)
- Method for taking pictures of field site and sample cores (this can be done using a smart phone)
- Stopwatch (can use phone app)
-  500 mL of water
-  -20 °C freezer to freeze ice packs prior to shipping (do not freeze cores)
- Refrigerator to store cores prior to shipping
- Access to a FedEx shipping location to return packages.
- Packing tape to close shipping kit.
- Optional field measurements (please include measurements, methods and units on the data sheet if applicable).

Collect Metadata

- 1 Record the sample kit number, general vegetation type (e.g., conifer forest or tall prairie), general weather conditions (sunny, rainy, extreme heat, etc.), longitude and latitude in decimal degrees (smart phone app 'My GPS Coordinates'), and the time and date of sampling.
- 2 If the kit is received damaged, but useable, please make a note of this on the metadata sheet.
- 3 Take pictures of the sampling location prior to sampling. Please include pictures of the soil with the measuring tape extended to 1 meter and 3 additional pictures of the ground cover, overlying vegetation, and landscape.
- 4 Please ensure that all metadata is collected prior to leaving the field.

Collect Field Measurements

- 5 At the center point between the two soil cores, collect measurements for temperature, moisture and electrical conductivity.

- 6 Start by removing the Meter Group Procheck and Teros 12 from the case.
- 7 Insert the Teros 12 serial cable into the top port on the Procheck meter.
- 8 Using the Menu button, turn on the Procheck and press Enter to start measuring.
- 9 Remove the foam cover over the 3 metal probes (be careful the probes are sharp)
- 10 On the Measurement tab ensure that the instrument is set up for mineral soils (this wetting will be used for all soil types and the word mineral will appear on the bottom of the screen).
- 11 Gently press the probes into the ground, if there is any resistance do not force the probes. Move the probe over a few inches and try again.
- 12 Once the probe is in the ground, allow the readings to stabilize for 3 minutes.
- 13 Save the data by pressing the "SAVE" button and using the up and down arrows to select characters and numbers using the enter button to advance to the next space. Save the data using the 4 character site code followed by a "-" and 0001 or 0002.

13.1 This will help keep multiple measurements from the same site/project separate.

14 Press Save one final time to store the data on the ProCheck meter.

14.1 For example, PROS-0001 and PROS-0002 for 2 measurements at the Prosser site.


15 Record the save name and measurements on the metadata sheet.

Infiltration Measurements

16 Clear the sample area of debris and place the 6" ring on the soils. Using the block of wood and hammer drive the 6" ring into the soil. Drive the ring into the ground about 1".

17 Within the soil use your finger to firm up the soil around the inside edges of the soil ring.

18 Line the top of the ring with the provided plastic wrap to prevent disturbance to the soil when adding the water.

19 Add  444 mL of water from the plastic bottles. Poor the water into the ring lined with plastic wrap.

- 20** Remove the wrap leaving just the water in the ring and start recording the time using a stopwatch. Record the amount of time (in minutes) it takes for the water to infiltrate the soil. Stop timing when the soil surface is just glistening.
- 21** In the same ring, repeat steps 17-20 for a second infiltration measurement.

https://www.nrcs.usda.gov/wps/PA_NRCSCconsumption/download?cid=nrcseprd1358428&ext=pdf

Collect Intact Soil Cores

- 22** Within the selected area, identify 2 specific locations within 1 meter of each other for replicate cores, and put on the provided nitrile gloves.
- 23** Brush away any surface litter and debris using the stainless-steel bench scraper to cut a square into the surface soil and remove the vegetation layer. Do not remove the organic soil horizon. Place the removed litter layer in the provided Ziploc bag.
- 24** Locate the sample coring tube labeled “Core A”(abiotic core). Remove the end caps and store in a clean dry place.
- 24.1** Abiotic cores will be used to measure soil pore structures and hydraulic properties, it is imperative that the soil core remain as intact as possible. To do this we will be using a pool noodle to prevent the core from separating after collection.
- 25** Assemble the intact coring assembly by inserting the core catcher (white cup, if needed) into the base of the soil core liner (see attached photos). Place the core liner into the intact coring barrel with the catch cup at the tip of the core. Screw the corer onto the slide hammer using the provided wrenches. If more height is needed you can add the 2’ and 3’ extension.

25.1



To prevent damage to the equipment, ensure that all connections are secure and do not force them to together this can result in cross threading and damage to the equipment.

- 26** Hammer the soil corer into the ground by sliding the hammer up and striking down.
- 27** Hammer the soil corer until no further progress is made or until the top of the coring barrel is even with the surface soil and no further progress can be made. Remove the slide hammer and attach the handle to turn the core and pull the core up.
- 27.1** If you are still having trouble removing the core, rock the core left and right to loosen the core from the surrounding soil and remove the core vertically by pulling upward.
- 27.2** If you feel the soil will not stay in the core liner during removal even with the soil catcher installed, dig adjacent to the core, and insert a trowel horizontally at the bottom of the core prior to removal from the ground.

- 28 Remove any coring equipment from the intact core and using the slide wrench around the coring barrel and the crescent wrench at the top, remove the lid of the corer.
- 29 Using a gloved hand, push from the base of the soil core upwards to push the liner up out of the top of the coring device.
- 30 Pull the core liner out maintaining the vertical orientation and cap both the top and bottom of the core liner with the caps provided.
- 31 Trim the pool noodle to fill the remaining space in the coring tube using the provided box cutter. Cap the top of the tube and secure both the top and bottom caps with the provided black electrical tape.
- 32 Repeat steps 25-31 with the tube labelled "Core B" (biotic core).
- 33 Keeping cores vertical, take pictures of both cores with the measuring tape and record the total depth of each core on the metadata sheet.

Collecting Auger Cores

- 34 If the above coring methods do not work for your soils, you can collect cores using the soil recovery auger (SRA).
- 35 Place a soil core liner with the soil catcher in the bottom into the SRA and recap the auger.

- 36 Attach the SRA to the appropriate extender length and handle.
- 37 Using the provided mallet, hammer the corer into the soil about 2 cm to start the corer.
- 38 Once started turn the auger handle clockwise to collect a core. Stop once the auger can no longer core or the auger has reached the full depth.
- 39 Follow the above instructions to remove the auger and core.

Collecting Surface Cores


- 40 To collect surface cores using the smaller 2" diameter cores remove the litter layer from a spot within 1 m of Core A and Core B. Label the 4 mini cores Core C1, C2, C3, and C4.
- 41 Place the coring liner into the soil and using the hammer and block of wood to hammer in the coring liners.
- 42 Cap the top of the core liner (this forms a vacuum and reduces the amount of material lost) and rock the core back and forth to release it and pull the core liner and core up. If the core cannot be easily removed use the trowel to dig the core out.
- 43 Cap the mini cores and tape the ends with electrical tape.

- 44 Place the closed mini cores in the provided bag.

Contingency Plans and Alternative Methods



- 45 If the above coring methods do not work for your soils, you can collect cores using any coring methods that work at your field site. Please indicate on the metadata sheet that Intact soil cores failed, and in the notes, section provide details on the coring alternative. If possible, maintain the approximate vertical structure of the core (e.g., mineral vs. organic layers). Note whether approximate spatial structuring was maintained on the metadata sheet.
- 46 If no other coring methods exist, an alternative method for collecting soils is to use a trowel or shovel to dig a soil pit and pack a core with the material removed doing your best to maintain the soil depths. Like above, please indicate on the metadata sheet that Intact soil cores failed, and in the notes, section provide details on the coring alternative. If possible, maintain the approximate vertical structure of the core (e.g., mineral vs. organic layers). Note whether approximate spatial structuring was maintained on the metadata sheet.

Transport and Store Samples After Collection

- 47 After cores are collected, transport them on blue ice to a refrigerator ( 4 °C) and store vertically when possible.
- 47.1 Do not freeze cores

Upload Metadata and Photos

- 48 Send images of the metadata sheets and soil cores to Maggie.bowman@pnnl.gov with the header 1000 Soils – Site – Metadata in the subject line.

49 All cores should be stored in the refrigerator until they are shipped between Monday and Wednesday. It is critical that overnight shipments be made no later than a Wednesday. Please don't ship later in the week in case there are shipping delays. We cannot receive cores over the weekend. Contact maggie.bowman@pnnl.gov before you sample/ship if this is not possible. It is vital to store samples vertically in the refrigerator or cooler and ship within  72:00:00 following sampling, though  48:00:00 is preferable. It can be useful to pack the cooler as close as is reasonable to the time FedEx will ship the package. This maximizes the time cores stay cold.

5d

50 When you're ready to ship, place each sample locations cores in the provided large zip top bags and place vertically in the cooler. Place the metadata sheet into a plastic bag and seal it to prevent leaking. Place the frozen "blue ice" and other unused consumables back into the cooler and seal with tape.

51


Pack all remaining materials and the soil probes as received in the pelican case(See photos attached).

52 Please do not return used gloves or other waste generated. Please dispose of the waste appropriately.

53 Adhere the provided shipping labels to the outside of the pelican case and cooler by removing the

backing from the return shipping label.

- 54 Drop the package off at FedEx, or have it picked up by FedEx (must ensure same day pick up).
- 55 On the same day you ship the package, please notify Maggie.bowman@pnnl.gov that you shipped the package, and include the FedEx tracking number in your email. This is critical to ensure sample integrity and timely delivery. The subject line of the email should be "1000 SOILS SHIPPED SAMPLES – [Sample kit ID #].