How to Collect Shallow Soil Samples

for Geochemical Analysis

1. Plan your sampling program

1.1. Planning is easier in a nice air-conditioned office than in the field while swatting insects and stepping over snakes.

1.2. Sample layouts are usually lines or grids.

1.2.1. Samples should be closer along lines where you don't have the support of surrounding samples from a grid design. 500 foot spacing is a popular spacing along sample lines.

1.2.2. Grids can be square, rectangular, offset, or many other styles. The important thing is sample density (number of samples per square mile, per square kilometer, etc.). For example:

1.2.2.1. A square grid spacing of 500 feet is a density of about 100 samples per square mile.

1.2.2.2. A square grid spacing of 750 feet is a density of about 50 samples per square mile.

1.2.2.3. A square grid spacing of 1000 feet is a density of about 25 samples per square mile.

1.2.3. Sample spacing usually is a compromise between sample coverage and budget.

1.3. Use land maps to outline permitted areas.

1.3.1. In the USA, Texas is a mineral trespass state. Other states are different. Know the state laws and local practices.

1.3.2. In some places both mineral and surface permits may be required. Consulting an oil and gas attorney about legal

issues before a problem arises is usually cheaper than afterward.

1.3.3. Know your rights and obligations to land and mineral owners before going to the field

1.4. Use topographic maps to study access and obstacles.

1.4.1. USGS or local topographic (topo) maps at 1:24,000 or 1:25,000 scale are good for finding roads, fences, etc. At about US$6 each from local map stores or on the Internet, they are a very good investment.

1.4.2. Topo maps were interpreted from stereo pairs of air photos. Therefore, air photos have more details and may be more current than topo maps. Air photos are more expensive, harder to get, and more difficult to interpret than topo maps. But, air photos can be a valuable resource for ground details, and especially for finding recent trails.

1.5. Plan your sample routes carefully.

1.5.1. If walking:

1.5.1.1. Plan small loops that return to your vehicle every 2-3 hours to drop samples and re-supply water.

1.5.1.2. Where possible, go uphill early in the sample loop and save downhill for later when the sample load is heavier.

1.5.2. If riding an ATV or other vehicle:

1.5.2.1. Work sample loops from your road vehicle placed near the center of an area. That minimizes walking distance if the machine breaks down.

2. After your sampling program is planned, prepare to go to the field.

2.1. Safety is paramount. Think about what could happen.

2.1.1. Field supplies should include:

2.1.1.1. Cell phone— an important safety device—don't forget the battery charger

2.1.1.2. First aid kit should contain supplies for cuts, scrapes, and insect bites.

2.1.1.3. Snakebite kit if appropriate for the area. Experts recommend the suction type. Read instructions and be familiar with use before going to the field.

2.1.1.4. Sunscreen

2.1.1.5. Water—never go off-road without water.

2.1.1.6. Food is optional

2.1.1.7. Magnetic compass. A cheap magnetic compass will be invaluable if the GPS unit fails. Don't bet your safety on a couple of AA batteries.

2.1.2. Know where to get local hospital or emergency medical care before an emergency happens.

2.1.3. Use a buddy system.

2.1.3.1. Tell a friend or family member where you will be and when you are returning.

2.1.3.2. Leave a copy of the planned sample map with someone in case field rescue becomes necessary.

2.1.3.3. If sampling alone, call someone each evening. Be sure they know what to do in case you don't call.

2.1.3.4. Have a field rescue plan in place. Know who is going to do what, and when in an emergency.

2.2. Make a field supply list, and use it. The list should include:

2.2.1. All safety supplies listed above

2.2.2. Sampling equipment (discussed below)

2.2.3. Sample bags or containers

2.2.4. Maps

2.2.5. Log sheets

2.2.6. GPS

2.2.7. Extra batteries for GPS

3. Getting to the sample location

3.1. Use simple sample numbers. Two to four digits are usually sufficient. Simple numbers are less prone to error and easier to write on sample bags and on log sheets. Of course, each sample number has to be unique on a particular project.

3.2. If you have planned sample coordinates loaded in the GPS:

3.2.1. Use Garmin "Nav" button and enter next point to navigate to. Other GPS brands will use a different method to select the navigation point.

3.2.2. Use bearing and distance on the GPS instrument to navigate to the point.

3.2.3. When on location, record the actual GPS reading, even if at the planned location.

3.2.3.1. Use the "Mark" button on Garmin instruments. Other brands have a similar function.

3.2.3.2. Record memory location of actual sample coordinates and the sample number on the log sheet. On Garmin units, the Waypoint is a sequential number of stored coordinate locations. Other GPS brands have similar coordinate storage methods.

3.3. If you <u>do not</u> have planned sample coordinates in the GPS

3.3.1. Rely on topo maps and landmarks to get near the planned sample location.

3.3.2. Use the GPS to determine distance and bearing to last sample to verify location.

3.3.3. Record actual coordinates and write the Waypoint (or other memory location) and sample number on the log sheet as in described in 3.2.3 above.

4. Collecting the sample

4.1. Use a clean shovel to collect a soil sample from 6-8 inches deep

4.1.1. If petroleum products may have contaminated the shovel, clean with soap and water before going to the field.

4.1.2. A sharpshooter-style shovel is a good choice, but any digging tool will work, including posthole diggers.

4.1.3. Soil sample can be taken from the tip of the shovel, or from the bottom of the hole. In any case, the sample should be from 6-8 inches (15-20 cm) below the surface, or shallower in rocky areas.

4.2. Place at least 100 grams (big handful) of soil into a clean sample bag.

4.2.1. Plastic Ziplock bags are good for samples. Spend a little more for thicker plastic and a better seal.

4.2.2. Use bags with a white writing block, e.g. freezer bags, if samples are to be carried on an ATV or shipped to the laboratory. Markings are less prone to rub off the white area.

4.2.3. Mark sample number on the bag using a permanent marker, e.g. Sharpie brand.

4.2.4. Be sure the sample number on the bag matches the sample number on the log sheet.

4.2.5. Place sample bags into backpack or other carrier.

4.3. Mark the collected sample location on the field map so you won't collect it again on another sample loop.

4.4. Before leaving the sample location, look around for sample bags, shovel, or anything else that might be left behind. Take trash with you. Geochemical sampling enjoys a reputation for low impact. Keep it that way!

5. Each evening:

5.1. Call your safety buddy.

5.2. Inventory samples:

5.2.1. Check to be sure all sample ID's on log sheets match those on bags.

5.2.2. Be sure all collected sample locations are marked on your field map. Not marking the field map is the main reason samples get double collected.

5.3. Store each day's samples separately. Trash bags work well. Write the date on each large bag. A daily bag of samples ties to a daily log sheet, which makes finding a particular sample easier, and makes resolving mistakes easier.

5.4. Store samples in a safe place away from heat. A hotel room is OK. If taken to the field in summer, put samples in shade. Protect samples from loss after that hard work collecting.

5.5. Take log sheets, or copies of log sheets, to the field on subsequent sampling days. You may need to verify if a sample was collected.

5.6. If a computer is available, download GPS coordinates. Even if coordinates remain in the GPS, two copies are safer than one.

6. At the end of the field sampling program:

6.1. Be sure you have all log sheets, daily sample bags, and coordinates.

6.2. Celebrate with a drink of your choice.