

## MO6 Lab Sampling Guidelines

Lakewood MLRA Office

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Sampling pedons for laboratory analyses is a necessary and important component of a high quality soil surveys. The MLRA 6 Office strongly encourages the routine collection of samples during the course of a survey as well as comprehensive characterization projects and pedologic investigations. The following provides some guidelines for sampling procedures for production soil surveys. Soil sampling for other purposes, such as for technical soil services activities, is beyond the scope of this guidance. The purpose of these guidelines is to promote efficient and cost-effective sampling that will provide meaningful data for soil surveys.

Refer to the National Soil Survey Handbook Part 631 for policies and procedures for soil sampling. The following provides additional explanation and specifies how these procedures will be implemented in the MO6 Region.

### **Analyses in the Office**

Soil investigations begin at the MLRA soil survey office or at the project office levels. Project staffs should routinely run pH and carbonate equivalent on all complete pedon descriptions. Electrical conductivity can be measured with various meters. Sand content by weight and volume of rock fragments can be measured using appropriate sieves. Full particle-size analysis can be run at the project office using the hydrometer method. These in-office analyses can answer many of the questions that arise during soil mapping.

### **Reference Sampling**

Soil property data that is necessary for soil classification can be obtained through the National Soil Survey Laboratory (NSSL). Reference samples (“grab samples”) are sent to the NSSL for routine analyses. The purpose of reference samples is to provide the soil survey staff with relatively quick data to answer questions that are critical to series or map unit concepts, that will allow the soil mapper to describe soil properties and plot soil lines with added confidence. Typically samples are collected to confirm field textures, determine properties such as salinity and sodicity, and to confirm some Taxonomic features, such as volcanic glass content, clay mineralogy, and organic carbon content. Reference samples should not be collected solely to determine soil properties that can be measured easily in the field (pH, carbonate content, etc.). However, as a check of field lab procedures, these analyses should be requested when samples are collected for other reasons.

### **Complete Characterization**

Complete characterization comprises a suite of standard soil analyses that characterizes important physical, chemical, and mineralogical properties of a soil. Because of the time, effort, and cost involved, sampling for complete characterization is more tightly controlled, has more stringent prerequisites, and requires more rigorous sampling procedures than does reference sampling. Characterization sampling projects commonly comprise several significant and representative soils. They may be significant because they are extensive series within a survey area and hence their properties have wide geographic application. They may represent soils within a continuum of Pedogenesis, or may represent soil-geomorphic relationships. Lab Work Plans are required well in advance of characterization projects to

ensure the significant soils are well thought out and resulting data will have the most meaning and widest application.

Characterization sampling is reserved for sampling projects of larger scope. Commonly this sampling is done during one week in the field, with involvement from the Soil Data Quality Specialist and often with the liaison from the NSSL. In MO6 characterization sampling will be approved only for soils in approved map units (progressively correlated).

### **Planning Sample Collection**

When in-office analyses do not provide the necessary data, reference sampling should be the next option. The analyses requested should answer immediate questions along with some routine analyses (particle-size, pH, 15 bar water, etc.), but should not be a complete set of standard analyses. A complete set of analyses, which includes grain counts, clay mineralogy, bulk density, thin sections, is reserved for complete characterization. When very few analyses are needed, such as for texture checks, or organic carbon checks, only the applicable horizons of the pedon need to be sampled and sent. For most reference samples however, several analyses are needed, and it is more appropriate to sample all horizons (or alternatively all horizons within 100cm). The reason is that if time and effort is being spent on running several analyses, the data is more useful and valuable if trends of properties with depth are available. For example, instead of getting a texture check only on a Bt horizon, it is better to sample the overlying A horizon also, to confirm the clay increase for an argillic.

There are instances when reference sampling may approach the scope of analyses normally reserved for complete characterization, such as when a nearly complete battery of chemical, physical, and mineralogical analyses are requested. The MO will approve analyses of this scope for approved map units and soils only. Pedons sampled for this degree of analysis are expected to be representative of the soil series and therefore are selected with care. Such sampling must also follow the protocols prescribed for complete characterization: the large fragments (> 20mm) must be sieved and weighed, and bulk density clods must be collected. Reference sampling must not be thought of as an easier way to get the results of complete characterization but with less rigorous procedures.

Characterization sampling is appropriate when soils have been recognized as fairly extensive and representative, and possibly represent significant pedologic features. Benchmark series are clearly candidates for characterization sampling. Typically characterization sampling is done for a group of related soils, and referred to as a characterization project.

### **Identifying Numbers for Field Samples**

The convention for the field sample number is as follows. It is not required that this number match the user Pedon ID number:

YR ST CCC 11 where:

YR = two-digit calendar year (not fiscal year)

ST = state FIPS code (e.g. CO, WY)

CCC = three digit county FIPS code (note this may not be the same as the soil survey area code)

11 = two-digit consecutive pedon number (first pedon sampled in county in that year is 01, etc.)

### **Procedure for Requesting Lab Analyses**

Characterization sampling is requested about one year in advance. Requests are submitted from the field to the MO, then forwarded to the National Soil Survey Center. A detailed Lab Work Plan is required by the NSSL well in advance of the field sampling.

Although it is not required to request reference sampling through the NSSC, it is advisable particularly when a large number of samples are anticipated. This is a way to ensure lab time is reserved. Requests

for reference sample analysis are handled by the Lakewood MO, and no work plan is required. However requests for analyses must be approved by the Soil Data Quality Specialist prior to sending samples in to the National Soil Survey Lab. Approval will be given when the following are submitted and reviewed:

1. Pedon descriptions of the sampled pedons must be entered in NASIS prior to sending samples to the lab. A full and complete pedon description must be entered. The pedon description must include the following:

Site latitude and longitude coordinates, with datum name

Site Area Overlap (enter overlaps with legend, County, MLRA, and mapunit)

Pedon User Site ID

Pedon Horizon Sample –Field Sample ID (the field sample number for the horizon, e.g. 07WY041001-01) (These numbers do not need to be consecutive - if horizons are skipped during sampling, there will be a skip in the horizon sample numbers)

DO NOT ENTER Pedon Horizon Sample –Lab Sample # - this is a number assigned by the lab only (such as 08N00362)

Pedon Soil Name As Sampled

Pedon Taxonomic Class

Pedon PSC Top Depth

Pedon PSC Bottom Depth

DO NOT ENTER Pedon – Lab Pedon # - this is a number assigned by the lab only (such as 08N00560)

2. A completed Request for Soil Analysis (attached) with a cover letter briefly describing the purpose of the analyses. The attached key to the analysis codes and their applicability for various taxonomic features can be used to determine appropriate analyses to request. The User Pedon ID number must be clearly indicated for each pedon sampled - the NSSL must be able to easily access the pedon description in NASIS.

3. Sample bags must be labeled with Field Sample ID number (e.g. 07WY041001-01), Horizon symbol, and depths; and these labels must be identical to the entries in NASIS Pedon.

The purpose for the MO review of lab requests is to 1) ensure that the correct and most needed analyses are requested (that results will be as useful as possible); 2) ensure that all the necessary information is forwarded to NSSL to allow them to proceed with analysis; and 3) ensure that the soils sampled are truly representative and the data obtained will have wide and valid application as possible.

### **References for Laboratory Investigations**

Soil Survey Laboratory Information Manual, Soil Survey Investigations Report No. 45, Version 1.0, 1995.

Soil Survey Laboratory Methods Manual, Soil Survey Investigations Report No. 42, Version 4.0, 2004.

## Common Lab Analyses

### Physical

<u>Code</u>	<u>Analysis name</u>	<u>Common Taxonomic Applications</u>
DbWR	Bulk Density, Clod-----	Andic materials
PSDA	PSDA, Air-dry, <2 mm Particles----- [special request: fine clay] ----- [special request: carbonate clay] -----	Particle-size families Argillic horizon Particle-size families
WR15b	Water Retention, 15 Bar, Pressure-Plate, <2mm -----	Isotic mineralogy, Particle-size if poorly dispersed

### Chemical

<u>Code</u>	<u>Analysis Name</u>	<u>Common Taxonomic Applications</u>
Carb	Calcium Carbonate Equivalent, <2mm-----	Calcic horizon; also needed to calculate organic carbon in calcareous soils
Carb2	Calcium Carbonate Equivalent, 2-20mm-----	Carbonatic and gypsic mineralogy
CEC	CEC and Cations, Routine -----	CE Activity, various base saturation criteria, Natric (Exch. Sodium (ESP))
EC	Electrical Conductivity, 1:20, <2 mm Particles -----	Salic horizon
Gyp2	Gypsum, <2mm -----	Gypsic horizon
Gyp2_20	Gypsum, 2-20mm -----	Gypsic mineralogy
NZPRe	New Zealand Phosphorus Retention-----	Andic materials
Oxal	Acid Oxalate Extract-----	Andic materials, spodic materials
pHNaF	pH, NaF-----	Isotic mineralogy, andic materials
pHRou	pH, Routine	
SatP	Saturated Paste and Soluble Salts -----	Natric horizon (Sodium Adsorption Ratio (SAR))
TotC	Carbon, Total -----	Mollic epipedon, spodic materials, Fluventic features

### Mineralogy

<u>Code</u>	<u>Analysis name</u>	<u>Common Taxonomic Applications</u>
Xray	Clay Mineralogy, X-ray Diffraction -----	Clay mineralogy class
OptFull	Optical Analysis, Full Count-----	Siliceous, paramicaceous mineralogy classes; genesis studies
OptG	Optical Analysis, Glass Count-----	Andic materials, ashy and glassy families

### Other

Tsect	Micromorphology, Thin Section -----	Genesis study
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