



# Topsoil Testing Procedure

This procedure provides SWMP designers with direction on how to plan, collect, and ship topsoil sample(s) to a recommended laboratory. Site depth inventories and laboratory testing provide critical data to determine the topsoil management strategy and topsoil amendment requirements during the design phase.

## PRESAMPLING PLANNING

Topsoil inventory and field collection can occur year-round but requires pre-planning. The first step is to make a preliminary determination of the number of revegetation units within the project's Limits of Disturbance Area (LDA). Revegetation units are areas with distinctly different topsoil characteristics based on observation. Most projects will only have one revegetation unit. Large projects with greater landscape diversity may have more than one revegetation unit. SWMP Designers should consider the following to determining the number and boundaries of revegetation units for the project:

- significantly different existing topsoil characteristics and depths
- microclimates
- vegetation types
- slope gradient and aspect
- drainage patterns
- constructability to segregate topsoil stockpiles

As early in the design process as possible, the SWMP designer should discuss with regional environmental staff the proposed number of revegetation unit(s) on the project. Each revegetation unit requires a separate composite sample and laboratory testing.

If the topsoil from different project locations will be combined into one stockpile, then only one composite sample is required. If the project has work areas separated by large distances, then each work area should be identified as a revegetation unit and will require separate composite samples.

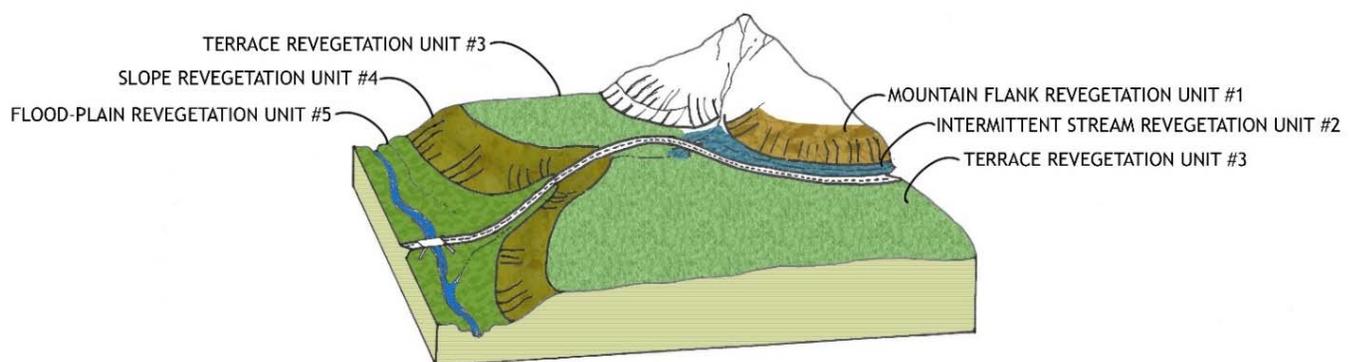


Illustration of Potential Revegetation Units



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Prior to collection, determine where you are sending samples and post office hours. Have FedEx, UPS or USPS overnight box and mailing label ready. Soil samples should be shipped for overnight delivery on the same day as collected. It is important to keep samples cool during warm weather. The nitrogen results can change dramatically if the samples overheat. Therefore, keep samples in the shade or in a cooler with ice to help prevent excessive heating.

### **Supplies you will need for collection:**

- box for mailing/pre-addressed label
- One-gallon plastic bags
- sharpie
- clean, rust-free spade shovel (do not use galvanized or brass implements)
- clean bucket
- soil knife with depth markers (a clean utility or putty knife will also work)
- cooler to keep samples cool
- notebook to note general depth of topsoil at each revegetation unit and litter and duff

## **FIELD INVENTORY AND COLLECTION PROCEDURE**

For most projects, a composite sample from each revegetation unit will provide an accurate representation of the site topsoil. The composite sample minimizes testing costs.

If the determined soil management strategy is to salvage and stockpile on-site, the locations of the soil pits and depths of topsoil should be shown in the SWMP Initial Site Maps.

### **TOPSOIL DEPTH INVENTORY**

Conduct a topsoil depth inventory by digging six (6) assessment pits within each revegetation unit. Using a clean rust-free spade or shovel, dig each pit. Overall pit depth is based on the visual indicators of the existing topsoil layer depth, and it should range in depth from three (3) inches to eight (8) inches. Repeat the depth inventory procedure for each vegetation unit.

Once the depth inventory is completed and the areas of anticipated disturbance are determined, an estimate of the amount of available topsoil can be calculated. A revegetation best practice is to redistribute topsoil at a depth equal to or greater than the topsoil horizon of the undisturbed site. Because the majority of CDOT projects will have additional coverage of hardscape after completion, CDOT's standard is to redistribute topsoil at a six-inch (6") depth. If sufficient topsoil quantities are not available, reduce the depth of topsoil redistributed to a minimum of four inch (4") depth and document on the plans and specifications.

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Use the following four indicators to assist with inventorying topsoil depths:

1. **Topography** - Deeper topsoil depths are usually located in drainages and areas undisturbed by previous transportation development. Steep slopes and roadways with cut and fill conditions usually have less topsoil. The location of the six (6) assessment pits should represent anticipated different soil depths based on existing topography within the Limits of Disturbed Area. Do not dig assessment pits in locations of existing shouldering adjacent to the pavement.

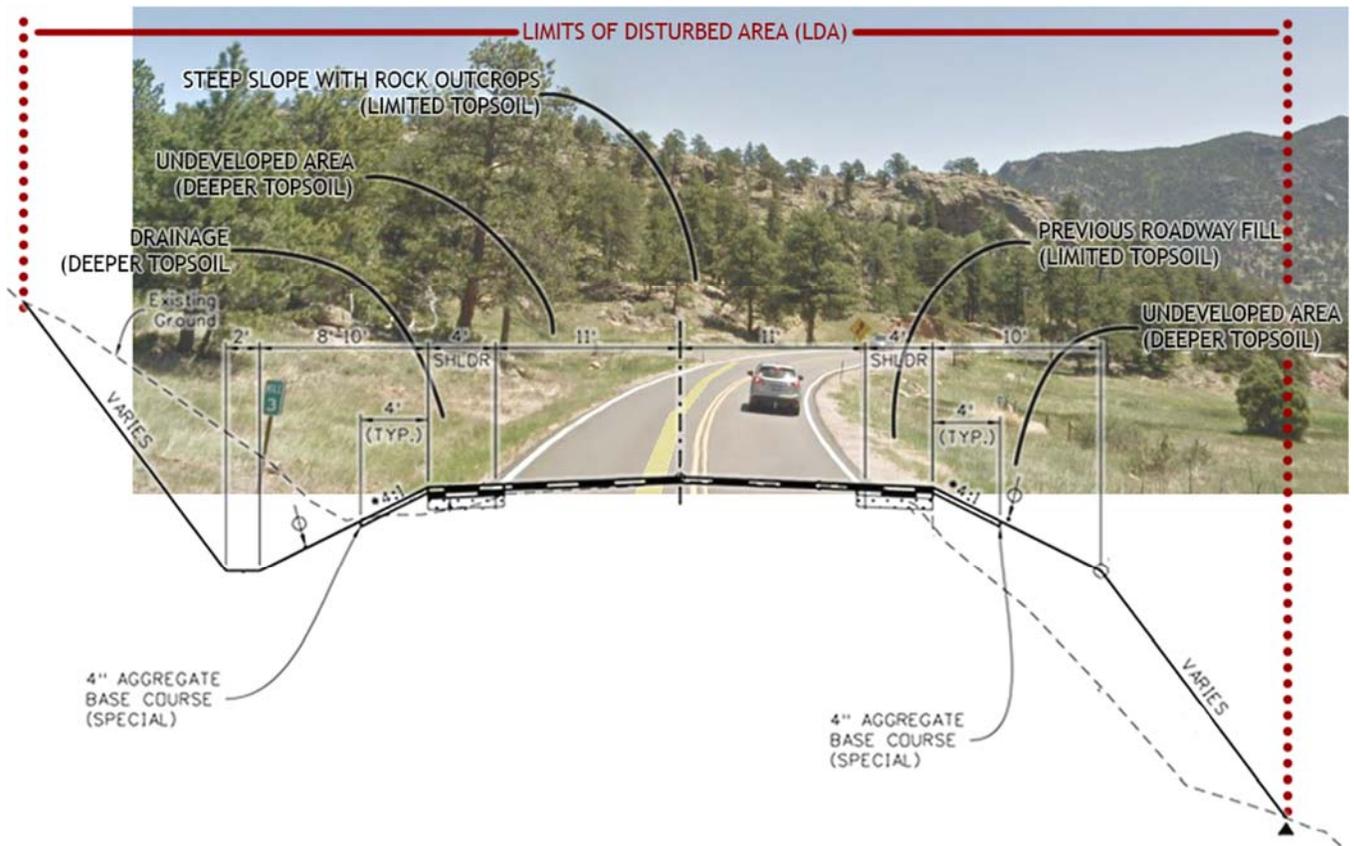


Illustration of how topography within the LDA can affect topsoil depth

2. **Color** – An indicator of topsoil is the brownish or darker colors that occur near the surface. When the tones lighten or a distinct color change occurs, it generally indicates topsoil has ended.

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Visually distinct color differences between topsoil and subsoil

**3. Topsoil Structure and Texture** - Topsoil has a more balanced texture than the subsoil material. Topsoil layers have consistent textures. Subsoils, especially in high clay conditions will have an irregular blocky appearance.



Visually distinct texture and structure differences between topsoil and subsoil. Note the litter and duff layer.

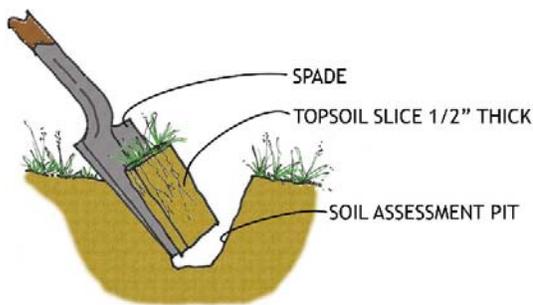
As part of inventorying topsoil depths for the revegetation unit, the designer should also identify and note if the topsoil surface contains areas of litter and duff. "Litter and duff" is the layer of fresh and decomposed needles and leaves covering the ground surface of forest and shrub plant communities. This organic material is a valuable source of seeds and nutrients for

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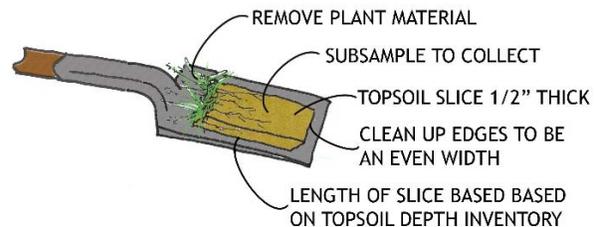
plant growth. Based on the site assessment of desirable or problematic preexisting plant species, the direction should be given to either stockpile litter and duff with the topsoil or dispose of it offsite. Document the topsoil management strategy for each of the revegetation units on the SWMP site maps.

### SAMPLE COLLECTION

- To collect a representative slice from each of the soil assessment pits, use the spade and cut a 1/2" thick slice, straight down and not angled, from the side of the soil pit. Evenly sample the topsoil based on the determined depth. For example, if the topsoil depth is six inches (6"), sample the entire six inches (6") equally (see diagram below).



**Step One - Remove slice**



**Step Two – Prepare Slice**

- Remove any plant material (leaves, twigs, etc.) from the sample.
- Place the six (6) samples from each assessment pit into a bucket and thoroughly mix with the shovel and break up the clods.
- Place approximately three (3) cups of the sample into a one-gallon zipper-seal plastic bag. This is the composite sample from the six assessment pits for the revegetation unit.
- Label the plastic bag with the name and telephone number of the SWMP designer/sample collector, revegetation unit #, project construction code and approximate Mile Marker Post.
- Repeat the soil sampling procedure for each vegetation unit. Use a separate plastic bag for each vegetation unit sampled.
- Keep samples cool by leaving in shade and/or place in a cooler with ice.



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### SENDING SAMPLES TO LABORATORY FOR TESTING

Use one of the laboratories below. Complete the form prior to shipping sample. Find forms and examples on the Landscape Architecture website (link at page bottom). Place form in the box with the bagged soil samples. Do not put form in soil sample bags.

All costs associated with shipment and testing will be the responsibility of the consultant developing the SWMP. Test results will be available in approximately 2 to 3 weeks. Allow for sufficient time to interpret the results and include topsoil amendment protocols on the Final Office Review (FOR) plans.

<b>LABORATORY NAME</b>	Colorado State University Soil, Water and Plant Testing Laboratory	Weld Laboratories Inc.
<b>SHIPPING ADDRESS</b>	200 West Lake Street, A320 NESB 1120 Campus Delivery Fort Collins, CO 80523- 1120	1527 1st Avenue Greeley, CO 80631
<b>VENDOR #</b>	2000008	1110169
<b>PHONE NUMBER</b>	970-491-5061	970-353-8118
<b>WEBSITE FOR ADDITIONAL INSTRUCTIONS**</b>	<a href="http://www.soiltestinglab.colostate.edu/documents/soilsample_horticulture.pdf">http://www.soiltestinglab.colostate.edu/documents/soilsample_horticulture.pdf</a>	<a href="https://weldlabs.com/ag-soil/">https://weldlabs.com/ag-soil/</a>
<b>REQUEST THE FOLLOWING TESTS</b>	Routine Garden and Landscape Soil Test (Reclamation Application). Add Sodium Evaluation and Sulfate-Sulfur	Essential Soil Analysis including sodium, chloride and SAR
<b>ESTIMATED COST</b>	\$60	\$65

\*\*Examples of completed soil sample forms can be found on the Landscape Architecture website: [www.codot.gov/programs/environmental/landscape-architecture](http://www.codot.gov/programs/environmental/landscape-architecture)

Contact the Landscape Architecture Section with any questions.