

Soil Sampling

Slide Title: Bulk vs. Particle Density Assignment

Bulk vs Particle Density Assignment

[Pictures of grass and diagram of sediment shown]

[Professor Audio]:

In this assignment we're going to cover a number of different avenues or aspects of density in the soil and so through a combination of slides, animations and video tape, we're going to take you through the process of measuring bulk and particle density in the soil

Slide Title: Volume of Coal vs Feathers

[Animation shown]

[Professor Audio]:

To illustrate this point, let's do a demonstration with coal versus feathers. Here's a coal scuttle filling up and it, you can see, is fairly dense and that's a total of six pounds. To get the equivalent amount with something really light like feathers, we would take the equivalent of three goose down comforters in volume to have six pounds of material.

Slide Title: Sampling for Bulk Density

[Picture of someone testing for density Shown]

[Professor Audio]:

What we're going to do now is actually do an example of sampling for bulk density and since we have had the opportunity to do this, we're going to do a real live video tape of me collecting a soil sample for bulk density.

Slide Title: Sampling for Bulk Density

[Video Shown]

[Professor Audio]:

In sampling for nutrition, we would take a composite of many different samples, but sampling for bulk density we take our sample differently. We're going to use this device to push the core that I've just collected intact, up and out. Yes, that was supposed to pop off and you'll notice that not only did those two little rings come off the top, but there's a ring on the bottom as well. What I want to do is cut this so now I have an absolute perfect cylinder with a known volume of soil in it. Then I put this known volume of soil into the can and now we'll take it back to the lab and do measurements on it.

So now that we've got the sample back to the lab, what we're going to do it dry it and the reason we need to dry it is what we're trying to determine is the amount of pore space in the soil and water has weight that air doesn't have. So we're going to take the sample, to oven dry soil we always use 105 degrees Celsius for 24 hours. So we'll simply put this in the drying oven.

Slide Title: Sampling for Bulk Density

[Animation Shown]

[Professor Audio]:

Now that we have taken our sample and we bring it into the lab, what we do first is calculate the volume of the core that we've taken in the field. So here you see the calculation where the volume calculation is the height times the radius times pi and so we see all of the features there to make that calculation. It's 6 centimeters high, the radius which is half the diameter is 2.65 centimeters; pi is 3.14, so when we calculate that all out we come out with 132.30 cubic centimeters. From there, we go forward and we weigh the moist soil, that will tell us how much the total amount is, and we're at some point going to have to subtract off the weight of the column itself, but we will weigh the moist soil. So now we will take the soil and we put it in the drying oven. As I've mentioned in lectures before, to make sure that the soil is completely dry, that all of the moisture is pushed out of the soil, we dry it at 105°C for 24 hours and that was established based on clay soils, very heavy clay soils that will hold onto the moisture for a long time. So with pretty much any soils we can rely on the fact that that is going to be a sufficient length of time to dry it and drive out all the moisture. Now we go forward and we re-weigh the dry soil again. So if our initial soil with the moisture was 196 grams, when we re-weigh the soil we have just the weight of the soil which is 172 grams. So the difference in those two measurements is actually the weight of the water and we know that the density of water is one gram per cubic centimeter so that will also give us the volume of water which would, again, be the difference between the two values 196 and 172.

Okay, those are the measurements that we can make in the real world. Now let's go to make belief. If we could, in order to measure the particle density, compress all the soil so there was no pore space, so we could compact the soil into a solid. So we go from soil into rock, well then now we have the difference which would be the volume of solids versus the volume of pores. In this particular example, we see that the volume of solids is 64.9 cubic centimeters and the volume of void space is 67.4 cubic centimeters.