Practical soil sampling in planted forests – soil chemistry

WHY MEASURE SOIL CHEMISTRY?

- **Diagnosis of nutrient deficiency** – assessed using soil nutrient concentration
- **Monitor the soil resource** – to assess changes in soil nutrient reserves or soil quality over time. (Bulk density also needs to be measured to calculate the nutrient content of the soil)

2015 International Year of Soils

EQUIPMENT NEEDED

Sampling equipment. Soil Hoffer, club hammer, table knife, plastic tray, cleaning cloth, soil bags, sample tags, Vivid marker pen.

Repair equipment. Ball pein hammer, files, metal cylinder punch.

HOW TO COLLECT

Soil sampling can be undertaken using:

- A pre-defined plot area – sampled through time to measure change (e.g. PSP; permanent sampling plot).
- A proportional sampling method – to target landform/soil classes to monitor a larger area.

Fifty Hoffer cores are typically collected from each area of interest to cover the natural variability of soils. A minimum of 30 Hoffer cores can be taken within a pre-defined PSP area.

Typical sample depth for nutrient diagnostic and bulk soil microbial purposes is 0-10 cm. Deeper sampling gives more information on nutrients available (e.g. 10-20 and 20-30 cm).

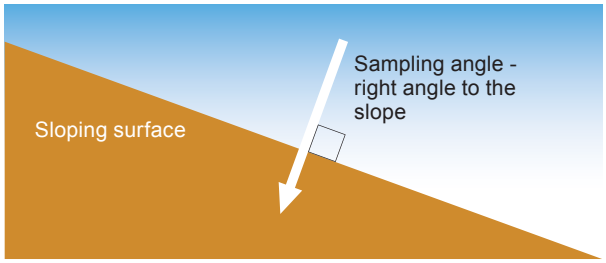
IDENTIFY THE MINERAL SOIL SURFACE

The first step is to identify the mineral soil surface under the forest floor layer LFH (litter, fragmented litter, humified litter).

L, **F** and **H** organic horizons from a pine forest. Arrows indicate base of horizons. *(Photo, John Adams).*

USING THE HOFFER

1) Ensure the forest floor is removed and the mineral soil surface is identified.



2) Place the Hoffer tube at right angles to the mineral soil surface.

3) Push the Hoffer tube into the ground 10 cm or the sampling depth required and carefully pull out again.

4) Remove the soil that has adhered to the outside of the tube. Push or tip the soil sample up the tube and place into the labelled sampling bag.
5) To sample more than one depth, carefully put the Hoffer tube back into the 0-10 cm hole and push the Hoffer down to 20 cm depth. If the soil is hard, use a rubber mallet to hit the Hoffer into the ground.
6) Remove the core from the hole and view the top of the soil core for loose soil contamination from the upper soil depths – remove this soil with the table knife.
7) Repeat steps 1 – 6 for a number of sampling points to make a bulked composite sample for each sampling depth.

8) When finished sampling put a clearly marked label inside the bag and tie another label around the top of the bag.

Additional points:

- If a tree root is struck that cannot be pushed through, pull the Hoffer out and start again.
- If a rock is struck, pull the Hoffer out and start again. Take care with hitting the Hoffer into the ground if rocks are expected as this will bend or rip the Hoffer tip. If this happens use the repair kit.
- If the site is very rocky the soil is best sampled by the bulk density method or by the pit method (Davis et al., 2004). The same sample can be used for both chemistry and bulk density measurements.

References:
Davis, M.R., Wilde, R.H., Garrett, L.G., Oliver, G.R. (2004). *New Zealand carbon monitoring system: soil data collection manual*. Published by Caxton Press, New Zealand.
Davis, M., Xue, J., Clinton, P. (2010). *Plantation Forest Nutrition*. New Zealand Forest Research Ltd.

www.scionresearch.com
June 2015