

Appendix

Soil Testing Lab Methods

Soil samples that come to the lab are assigned a lab number and a subsample is dried overnight at 130 degrees F in a large oven. The soil is then put through a 2 mm sieve to remove coarse fragments. All of the available nutrients are measured in an extract of this sample. Four milliliters (mL) of soil (about 1 tsp) is shaken for 15 minutes with 20 mL of modified-Morgan's solution (1.25 M ammonium acetate at pH 4.8). The original Morgan's extract was developed at the University of Connecticut in the 1940's. The modified- Morgan's solution, which improves the extract's ability to remove potassium from fine textured soils, was developed in the 1960's by Dr. J. McIntosh at the University of Vermont. While our extraction process is similar to these methods, we use more modern methods for the determination of the nutrients in the extract. Calcium, K, Mg, Zn, and Al are measured on an ICP, an analytical instrument capable of accurately determining many elements simultaneously. We still run P by visible spectroscopy—basically adding chemicals to make a blue P compound and measuring the intensity of blue with an analytical instrument.

Reserve P is determined in a separate extract by the same blue method. This extraction uses the modified-Morgan's solution with added fluoride, which removes some of the "fixed"—or reserve—P from the soil samples.

Soil pH is measured in 10 mL of a weak calcium chloride "salt" solution (0.01 M), using 5 mL of soil. Using a weak salt ensures a more accurate reading with less seasonal fluctuation. This pH reading averages 0.6 pH units less than a pH measured in water and we adjust our "salt" pH readings upwards to be comparable with results from other labs. Organic matter is determined by "weight-loss-on-ignition." A dry, weighed sample of soil is brought to 700 degrees F until all the soil organic matter is burned off. After reweighing, % organic matter is calculated from the weight loss.

Soil Test Categories Expressed in Alternative Units

Soil test results can be expressed in different units. The UVM lab reports results as parts per million (ppm), but some labs use units of pounds per acre (lb/acre). Multiply ppm by 2 to get lb/acre, assuming the soil plow layer weighs 2 million pounds. See Table 18 for UVM soil test categories expressed as lb/acre.

Table 18. Vermont soil test categories expressed as pounds per acre (lb/acre, or pp2m) in elemental form.

	Low	Medium	Optimum	High	Excessive
	lb/acre				
Available P	0-4	4-7	8-15	16-40	> 40
K	0-100	101-200	201-260	261-325	>325
Mg	0-70	71-100	101-200	>200	—

Conversion Factors for Soil Test Units

- ppm x 2 = lb/acre in plow layer
- $P_2O_5 \times .44 = P$ (phosphorus, elemental form)
- $P \times 2.27 = P_2O_5$
- $lb P_2O_5/acre \times .22 = ppm P$
- $ppm P \times 4.6 = lb P_2O_5/acre$
- $K_2O \times .83 = K$ (potassium, elemental form)
- $K \times 1.2 = K_2O$
- $lb K_2O/acre \times .42 = ppm K$
- $ppm K \times 2.4 = lb K_2O/acre$