Standard Soil Test Guidelines

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HOW TO READ THE STANDARD SOIL TEST REPORT

Total Exchange Capacity (TEC)	The holding capacity of the soil. This test provides TEC, not just cation exchange capacity (CEC), and may be higher than other labs that provide only CEC. The TEC represents the ability of the soil to hold nutrients on colloidal sites. Colloidal sites are plate-like structures made up of mostly clay and organic matter, although there are other elements that can increase TEC. In soils such as sands, where clay and organic matter are low, the TEC is low and fewer nutrients will be available. In heavy soils, the TEC will be greater, as will be the pounds per acre (value found) of most nutrients.
pH	Measures the acidity or alkalinity of the soil. Representing the "percentage of hydrogen" on the soil colloid, pH is responsible for the acidity and/or the alkalinity of the soil. It is very important to understand that pH should not be the focus of any management program. pH only represents the **balance** of the basic cations found in the base saturation, and is easily managed by managing Ca, Mg, K, Na and the other cations. Always ask, "What is driving the pH?" because it may not always be Ca.
Organic Matter Percentage	This does not represent pure humus in the soil. Organic matter will encompass roots and thatch, both of which are long-chain forms of carbon and are not easily digested by soil microbes. Organic matter is however, very important as a foundation for the development of humus, and for building soil buffers and TEC levels in the soil.
Sulfur (S)	Sulfur is expressed in parts per million (ppm), which when multiplied by 2 equals pounds per acre. Sulfur levels should be maintained between 50 and 100 pounds per acre. Grasses will use about the same amount of sulfur as they do phosphorus. It is essential for the uptake of nitrogen and the development of many amino acid, enzyme and protein systems. Sulfur plays a major role in mobilizing excessive nutrient levels out of the soil.
Easily Extracted Phosphorus	Shown here as P_2O_5 in pounds per acre. P levels should be at least 250 pounds per acre, but can be even higher in heavy soils. Phosphorus is not readily available in most soils because of its negative charge, which causes it to "lock up" with other nutrients. Phosphorus is an essential building block for sugar development, the development of healthy roots, and the transportation of other nutrients into the plant.
Calcium	Is used more in weight and volume than any other nutrient, and is perhaps the most over-looked. Calcium is noted here in pounds per acre, but more importantly, the base saturation percent shows the balance of calcium with other cations. It is this balance that is so important, and Ca should be maintained at 68% base saturation on heavy soils, and 60% base saturation on sandy soils. The recommendations are calculated by an elaborate formula that will allow for the optimum Ca level to be achieved. Sources of Ca include high calcium lime (low Mg), dolomitic lime (high Mg), gypsum (calcium sulfate) and many liquid products. Depending on how much Ca is needed, a combination of high calcium and dolomitic lime may be needed to avoid driving off too much Mg. Calcium imbalances will severely affect soil compaction by restricting air and water movement through the soil, thereby limiting microbial activity.

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Magnesium	Shown in pounds per acre, Mg has a close relationship with Ca and should be managed by balancing base saturation. Often it is high Mg that is driving up pH. Ideal Mg levels should be 12% base saturation on heavy soils, and close to 20% on sandy soils. Mg is essential for photosynthesis and the development of many amino acid and enzyme systems. Good sources for supplying Mg to the soil are dolomitic lime, Pro-Mag or Sul-Po-Mag. Liquid forms of Mg are also important to a balanced program.
Potassium	Potassium is important for root development and reducing plant stress. K should be managed by base saturation, but do not over-apply because it is a very mobile nutrient. Ideal K levels should be 5% base saturation. When the pH is above 6.5, potassium availability is limited and building levels of K in the soil without the use of organic sources becomes very difficult.
Sodium	Levels should not exceed 40-50 pounds per acre, or 3% base saturation. High levels of Na in the soil will severely restrict the activity of beneficial bacteria. Be aware of the overuse of high salt fertilizers, top dressings, composts or other common sources of Na. The % of Na should never be higher than the % of K in the soil, or a sodium-induced wilt could result.
Base Saturation Percentage	The percent of cations on the soil colloid. This is where management of the soil begins, because it represents "balance." Manage to 68% Ca, 12% Mg, 5% K, 2% Na, 3% Other Bases (trace nutrients) and 10% H. Base saturation always adds up to 100%, so if one nutrient is high, another can be exchanged for it. If these numbers are in their "ideal" percentages, pH will always be between 6.0 and 6.5.
Boron	Maintain 1.2 ppm. Boron is a very soluble nutrient, and is needed in most soils on a small but frequent basis. Boron can be very toxic, however, if deficient, nitrogen uptake will be limited, as well as many other plant/soil functions. Boron is the "gate keeper" for calcium uptake.
Iron	Ideal soil levels are 100 - 150 ppm, but most soils can easily tolerate higher levels. There is a critical Fe: Mn relationship, which should always be at least 1.5:1.
Manganese	Manage to a minimum level of 25 – 40 ppm, with a maximum of 120 ppm. Mn will mobilize Fe in the soil, and can be a good Fe replacement when Fe is high. Mn, like most micro-nutrients, plays an important role in the metabolism of both plant and soil micro-organisms, but when deficient, can create significant plant stress, encouraging disease.
Copper	Manage to a minimum of 5 ppm. Copper is a major player in disease suppression if levels in the soil are maintained at 10-15 ppm. Cu is a major ingredient in many popular fungicides, and can be very helpful in this role if available in the soil.
Zinc	Manage to a minimum 6 ppm, with an optimum of 10-20 ppm. Zn can also play a major role in disease suppression if found in ample amounts in the soil.

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