University of California
Salinity Management

Effects of pH, sodicity, and salinity on soil fertility

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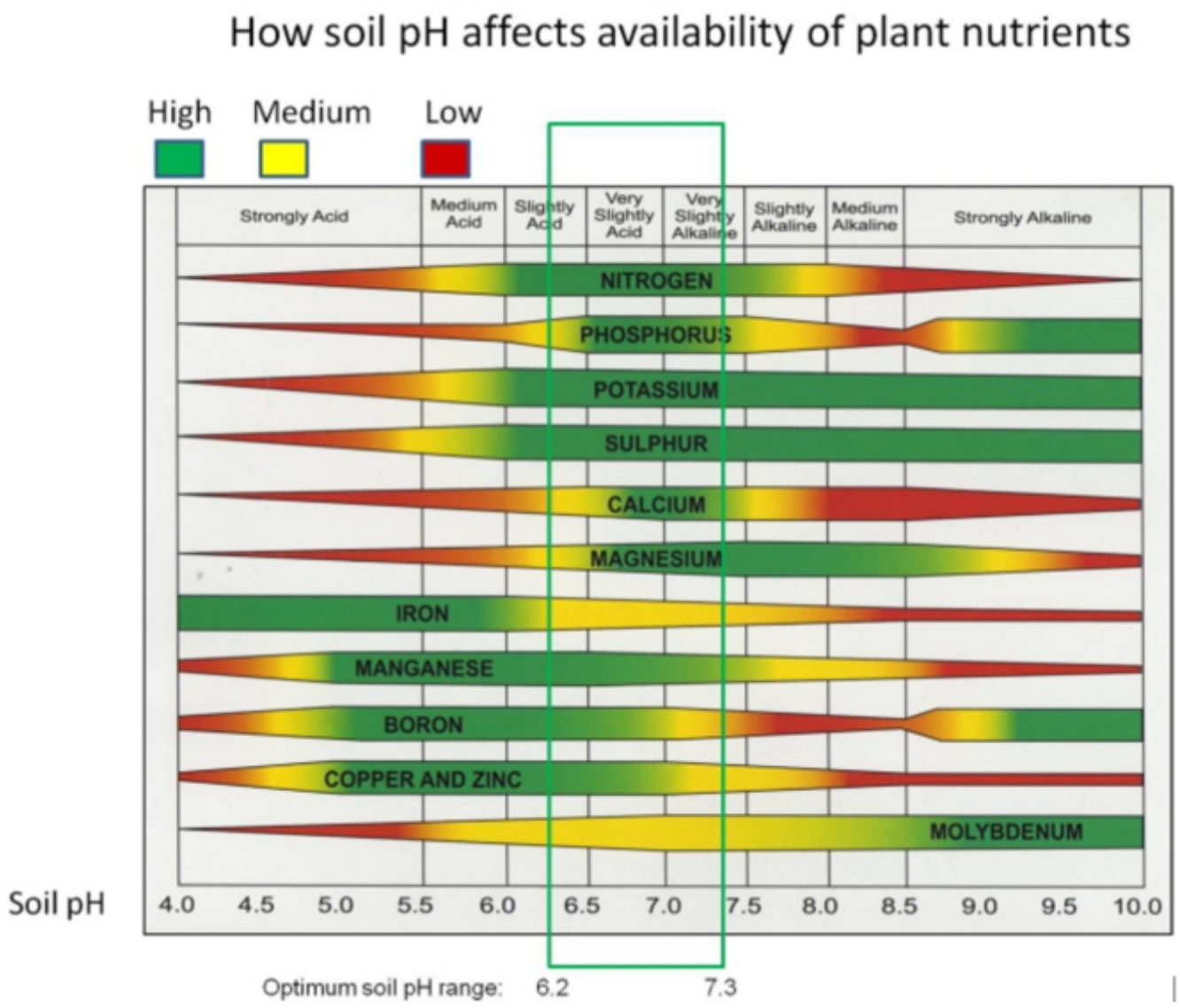
Soil pH is a characteristic that describes the relative acidity or alkalinity of the soil. Soils are considered acidic if pH < 5, and very acidic if pH < 4. On the other hand, soils are considered alkaline if pH > 7.5, and very alkaline if pH > 8.

The availability of some plant nutrients is greatly affected by soil pH. The "ideal" soil pH is close to neutral, and neutral soils are considered to fall within a range from a slightly acidic pH of 6.5 to slightly alkaline pH of 7.5. It has been determined that most plant nutrients are optimally available to plants within this 6.5 to 7.5 pH range, plus this range of pH is generally very compatible to plant root growth.

Nitrogen (N), Potassium (K), and Sulfer (S) are major plant nutrients that appear to be less affected directly by soil pH than many others, but still are to some extent. Phosphorus (P), however, is directly affected. At alkaline pH values, greater than pH 7.5 for example, phosphate ions tend to react quickly with calcium (Ca) and magnesium (Mg) to form less soluble compounds. At acidic pH values, phosphate ions react with aluminum (Al) and iron (Fe) to again form less soluble compounds. Most of the other nutrients (micronutrients especially) tend to be less available when soil pH is above 7.5, and in fact are optimally available at a slightly acidic pH, e.g. 6.5 to 6.8. The exception is molybdenum (Mo), which appears to be less available under acidic pH and more available at moderately alkaline pH values. (http://www.nutrientstewardship.com/implementation/article/soil-ph-and-availability-plant-nutrients).

It is possible to lower the pH of a soil using a liquid acid solution, or finely ground elemental S that oxidizes to sulfuric acid through the action of soil inhabiting S-oxidizing bacteria. However, this is rarely done on a field-scale basis because of the high cost. It is more commonly done in horticulture production applications where individual plant containers or limited areas (e.g. <10 to 20 acres) are managed to lower the pH for acidic soil adapted plants such as some flowers, trees, and/or small fruits (i.e. blueberry and cranberry). It is important to note that most on-going crop production will gradually lower the soil pH as the H+ ions are released and converted over to nitrate by soil microbes. This is especially true where N fertilizers such as anhydrous ammonia, ammonium sulfate, and urea are applied.



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