

**Plant Nutrition**  
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***I. Plant Essential Elements*** (16)

An element is essential if the plant cannot complete its life cycle (produce seed) in the absence of such element or if it forms a plant component that in itself is essential such as Mg in chlorophyll.

**Macronutrients from air & water...C H O**

**Primary macronutrients.....N P K**

**Secondary macronutrients.....Ca Mg S**

**Micronutrients.....Zn Fe Mn Cu B Mo Cl**

**Nitrogen (N)** becomes a part of many essential plant compounds so it is needed in higher amounts than any other element. Excess N results in excessive, weak, dark-green leaves and few if any fruits.

**Phosphorus (P)** promotes early growth, rooting, maturity and seeding.

**Potassium (K)** promotes translocation of sugars and starch, roots, disease resistance, overall quality.

**Calcium (Ca)** becomes part of cell structure.

**Magnesium (Mg)** chlorophyll constituent, enzyme activator.

**Sulfur (S)** forms amino acids, nitrogen fixation in legumes.

**Zinc (Zn)** forms enzymes, hormones.

**Iron (Fe)** chlorophyll constituent, N fixation, respiration.

**Manganese (Mn)** chlorophyll constituent, enzymes.

**Copper (Cu)** forms vitamin A, enzyme activator.

**Boron (B)** regulates metabolism, meristematic cell differentiation.

**Molybdenum (Mo)** nitrogen utilization and fixation.

**Chlorine (Cl)** photosynthesis.

***II. Soil pH***

- is a measure of the soil's acidity or alkalinity, expressed on a scale from 1-14; 1=extremely acid, 7=neutral, 14=extremely alkaline (see figure 1.)

-scale is logarithmic rather than linear so that pH 4 is actually ten times more acid than pH 5, pH 3 is 100 times more acid than pH 5.

-affects the availability of essential elements for plant uptake (see figure 2).

- optimal range is 6-7 for most horticultural crops.

### III. *Fertilizers*

- analysis on label = % of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O
- % P<sub>2</sub>O<sub>5</sub> x .43 =% actual P
- % K<sub>2</sub>O x .83 =% actual K
- Organic sources more slowly available while inorganics are generally available for plant uptake immediately

### IV. *Fertilizer application*

- Broadcast = Spread over entire area
- Band=Places nutrients in bands
- Sidedressing=banding to the side of established plants
- Foliar=apply solution directly to foliage
- Fertilizer spikes=processed into spike or stick form
- Injectors=stakes inserted directly to root system

### V. *Soil Testing*

- How do you know what to add if you don't know what you have?
- Test every 3-5 years.
- Make sure sample is representative.

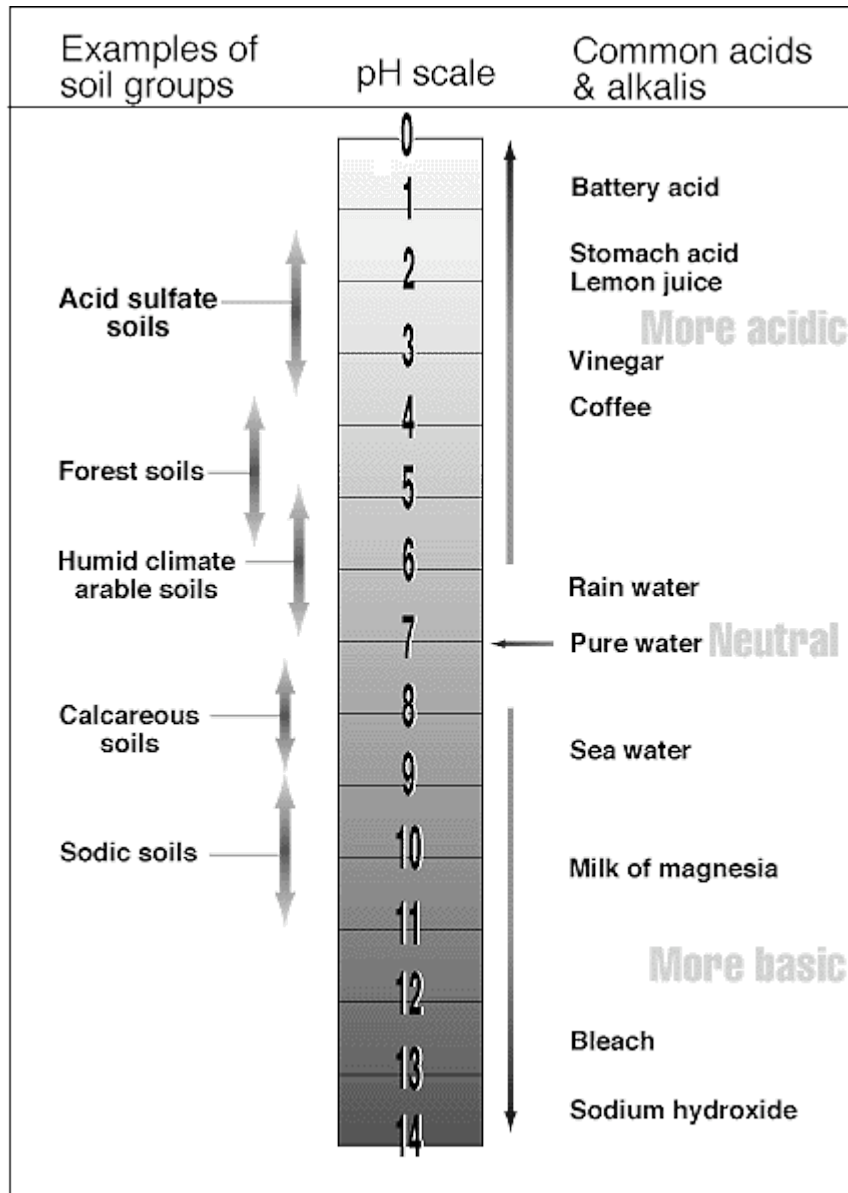


Figure 1: The PH scale showing the pH of common acids and bases and soil groups

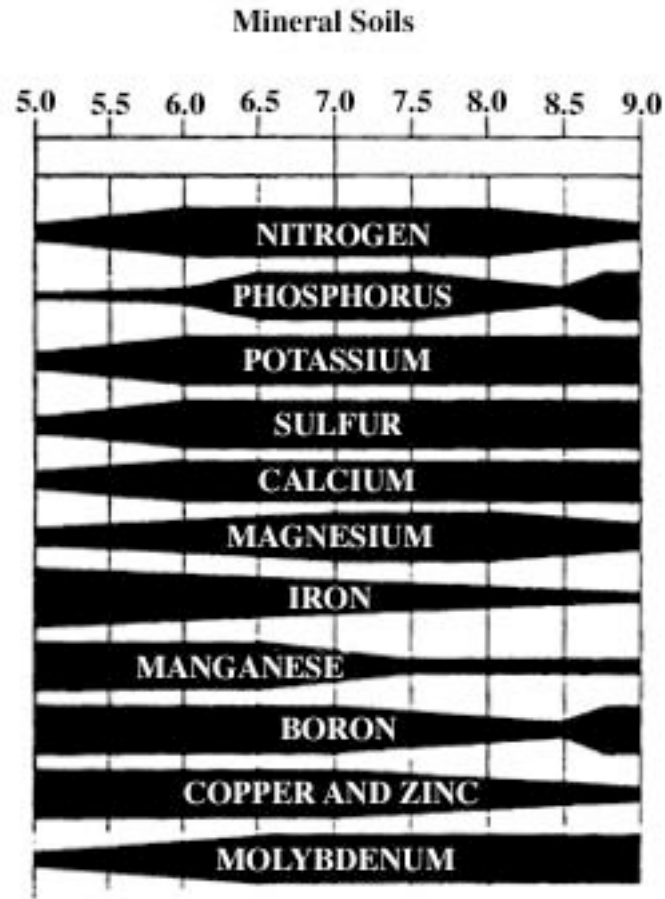


Figure 2. The relative availability of elements essential to plant growth at different pH levels for mineral soils. (From Ohio State University Extension Fact Sheet ANR-5-99).