

The purpose of a soil test is to determine the level of fertility of your garden soil. A standard soil test provides measurements of the pH, percent organic matter, and the available levels of phosphorus (P), potassium (K), calcium (Ca), and magnesium (Mg) in your garden soil. These measurements can be used to determine the kind and amount of fertilizer and lime you should use.

Soil pH is a measurement of the acidity or alkalinity of your soil. This measurement and the measurements of Ca and Mg determines if you need to lime your garden soil, and if so, how much and what kind to use.

The percent of organic matter and the measurements for P and K from your soil test are used to determine the ratio of nitrogen (N), phosphate ( $P_2O_5$ ), and potash ( $K_2O$ ) respectively, in the fertilizer you purchase. These measurements are also used to determine how much fertilizer to apply.

### Nitrogen (N)

See the chart on the top of page 2 for a list of fertilizers from which to choose for best fitting the needs for your soil. All of these fertilizers contain three (or more) nutrients: N (nitrogen),  $P_2O_5$  (phosphate), and  $K_2O$  (potash). Most gardens generally need all three and sometimes others (of the 16 essential plant nutrients).

For most garden soils, the amount of N in the commercial fertilizer suggested on page 2 will probably be sufficient for the crop. Soils with an organic matter content below 4% or soils to which large quantities of organic matter have recently been added may need additional N. Slower than normal plant growth and pale or yellow-green foliage are indications of a need for more N. If needed, N fertilizers can be applied as a side dressing (i.e., spread in a band beside the garden row) every 3 to 6 weeks.

Sources of N	Analysis	Amount to apply per 1,000 sq ft (Yields 1 lb N)
Ammonium sulfate	21-0-0	5 lb
Ammonium nitrate	33-0-0	3 lb
Urea	45-0-0	2 lb

### Phosphorus (P) and Potassium (K)

To determine the relative nutrient level of P and K in your soil, look at your soil test report and see in which category the nutrient levels fit in the chart below:

Soil test levels	P	K
Very high	Above 12 ppm	Above 250 ppm
High	9-12 ppm	150-250 ppm
Medium	5-9 ppm	75-150 ppm
Low	Below 5 ppm	Below 75 ppm

The first column in the following chart lists the various combinations of high, medium, and low levels of P and K. The middle column lists two examples of commercial fertilizer and the number of pounds to use to supply the indicated amounts of N,  $P_2O_5$ , and  $K_2O$ .

Soil test levels		Example of amount fertilizer/1,000 sq ft broadcast application*	These fertilizers supply this amount of actual nutrient per 1,000 sq ft		
P	K		N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
Very high	Very high	Nitrogen only if needed (see previous chart in N section)		0	0
High	High	5 lb 10-20-20 or 10 lb 5-10-10	1/2	1	1
High	Medium	10 lb 10-10-10 plus 2 lb 0-0-60 or 8 lb 12-12-12 plus 15 lb wood ashes	1	1	2
High	Low	10 lb 10-10-10 plus 5 lb 0-0-60 or 8 lb 12-12-12 plus 5 lb 0-0-60	1	1	4
Medium	High	10 lb 10-20-20 or 20 lb 6-10-4	1	2	1
Medium	Medium	10 lb 10-20-20 or 20 lb 5-10-10	1	2	2
Medium	Low	10 lb 10-20-20 plus 3 lb 0-0-60 or 20 lb 5-10-10 plus 20 lb wood ashes	1	2	4
Low	High	10 lb 10-10-10 plus 6 lb 0-45-0 or 13 lb 8-8-8 plus 15 lb 0-21-0	1	4	1
Low	Medium	10 lb 10-20-20 plus 5 lb 0-45-0 or 20 lb 5-10-10 plus 10 lb 0-21-0	1	4	2
Low	Low	20 lb 10-20-20 or 40 lb 5-10-10	2	4	4

\* Broadcast and work fertilizer into the ground thoroughly before seeding, or band fertilizer 2 to 3 inches deeper and 2 to 3 inches to the side of the seed. When you band the fertilizer, use one-half to three-fourths the amount listed for the broadcast rate. Banding the phosphate (P<sub>2</sub>O<sub>5</sub>) is especially helpful.

### Do You Need Lime?

Lime is used for two purposes—to increase the soil pH and to supply Ca and Mg in the soil. Most vegetables and flowers grow best in a moderately acid to neutral soil. Soils which have a pH value of 6.0 or higher, do not need lime to raise the pH. If your garden soil tests lower than pH 6.0, use the following table to determine the quantity of lime to use to raise the pH level:

pH Value from Soil Test	Amount of lime/1,000 sq ft
Below 5.0	100 lb agricultural lime
5.0-6.0	50 lb agricultural lime
Above 6.0	Do not use lime

### Calcium (Ca) and Magnesium (Mg)

Ca and Mg are secondary nutrients and can be added to the soil, if needed, by applying lime, gypsum, and/or epsom salts. If your soil test report indicates a Ca value of 5.0, or higher, the Ca level is adequate. If the Mg value is .75, the Mg level is adequate. If either or both of these elements fall below the levels indicated above, you should add the following amendments:

	<b>Amount to apply per 1,000 sq ft*</b>
Both Ca and Mg needed	50 lb dolomite lime or 50 lb of gypsum + 20 lb of epsom salts
Only Ca needed	50 lb of agricultural lime or 50 lb of gypsum
Only Mg needed	20 lb epsom salts

Note: Lime, either agricultural or dolomite, will raise the pH of the soil. Gypsum and/or epsom salts do not alter the pH of the soil.

\*This quantity of soil amendment should supply sufficient Ca and/or Mg to last 4 to 5 years.

If your soil needs lime for both pH correction and to supply Ca or Mg, apply both amounts indicated above. It is best not to apply lime and fertilizer at the same time unless they are to be tilled into the soil immediately. Lime requires time to react in the soil, so it is recommended to apply lime in the fall and fertilize in the spring.

### **Salinity—Salts in millimhos per centimeter (mmhos/cm)**

The salinity test measures the total soluble salts in the soil. Excessive use of manure or fertilizer can result in an excess of soluble salts. As a result, plant growth may be reduced. The following table shows how to interpret a salinity test.

#### **Salts in mmhos/cm**

4 or above	Severe accumulation of total salts in the soil which may restrict growth of many garden plants. Salt level should be reduced by leaching.
2-4	Moderate accumulation of salts. Will not restrict the growth of garden plants, but may require more frequent irrigation to prevent wilting.
2 or less	Low salt accumulation. Well below the tolerance of all garden plants.

Leaching is the practice of applying irrigation water in excess of the water-holding capacity of the soil. This excess water must drain downward through the soil, and in so doing it carries with it the excess soluble salts in a soil. Five inches of excess water going through the root zone will remove approximately 90% of the excess salt.

When leaching, the water must be applied at a rate which does not exceed the permeability of the sub-soil.

A. R. Halvorson, Extension soil scientist. Publication originally prepared by E. Blair Adams, Extension horticulturist (deceased), and Brent G. Hallock, former Extension forest soils specialist, Western Washington Research and Extension Center, Puyallup. Extension programs and employment are available to all without discrimination.