

Nutrition and Fertilization

Fertilization is an important part of landscape maintenance, particularly in areas where much of the native topsoil is removed during development and construction. In addition, heavy clay soils provide little nutrition, drainage or aeration.

Fertilization is a practice made difficult and confusing by the wide variety of products on the market. General purpose garden fertilizer to specialty products, such as pre-mixed liquid fertilizer concentrates, water-soluble crystals, slow-release fertilizers, azalea/camellia fertilizers, and fruit trees, vegetable and rose specials. Plants do not care what form a fertilizer is; granulated, liquid, encapsulated, pelletized or whatever! Plants simply want nutrients so they can grow and reproduce. It is more about the nutrient value than the label of roses, azaleas or vegetable fertilizer.

Fertilizers differ in nutrient content and release duration. The type of fertilizer selected should be based on the types of plants being fertilized, the existing nutrient content of the soil, and the type of growth response desired. Liquid or water-soluble fertilizers, for instance, are often used on annuals and herbaceous perennials immediately after transplanting because their nutrients can be absorbed readily. Woody ornamentals, on the other hand, store food reserves in their roots and do not have an immediate demand for nutrients after transplanting as short-season annuals do. They benefit from slow-release fertilizers. Sixteen chemical elements are essential for normal plant growth and reproduction. Some of these are non-mineral nutrients (e.g., hydrogen, carbon, oxygen, etc.) that are freely available to all plants. However, several mineral nutrients may need to be supplemented.

Essential nutrients are generally grouped into two categories, macronutrients and micronutrients, based on the concentration of the nutrients found in the plant. The nutrients required in the largest quantities are called macronutrients and are further grouped into primary and secondary nutrients. Primary nutrients are mineral elements that are needed in the highest concentration and that most frequently need to be supplemented. Primary nutrients include nitrogen (N), phosphorus (P) and potassium (K). Secondary nutrients (calcium (Ca), magnesium (Mg), and sulfur (S)) are also needed in high concentrations, but are not as frequently deficient in most soils. Other nutrients are also essential, but are required in smaller quantities. These micronutrients include boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), and zinc (Zn).

Carbon (C), hydrogen (H) and oxygen (O) are also essential and are supplied to the plant thru the air and water.

Many soils often do not contain sufficient concentrations of primary macronutrients. Occasionally, secondary macronutrients and micronutrients are not available in the appropriate concentrations for proper plant growth and the addition of fertilizer (inorganic or organic) may be necessary to correct the

imbalances. However, this lack of nutrient availability (e.g., micronutrient deficiencies) may be because the soil pH has become too low or too high. Even when a deficiency does exist, there are many cases where the addition of the fertilizer may cost more than the value of the increased plant performance. Therefore, the use of soil test based recommendations is critical to the appropriate use of fertilizer.

DEFICIENCIES OF NUTRIENT ELEMENTS											
Symptoms	Suspected Element										
	N	P	K	Mg	Fe	Cu	Zn	B	Mo	Mn	OF
Yellowing of Younger Leaves											
Yellowing of Middle Leaves											
Yellowing of Older Leaves											
Yellowing Between Veins											
Old Leaves Drop											
Leaves Curl Over											
Leaves Curl Under											
Younger Leaf Tips Burn											
Older Leaf Tips Burn											
Young Leaves Wrinkle/Curl											
Necrosis											
Leaf Growth Stunted											
Dark Green/Purple Leaf & Stems											
Pale Green Leaf Color											
Molting											
Spindly											
Soft Stems											

Nitrogen (N)

Nitrogen is necessary for rapid growth and high yields, and is an essential component of plant proteins. The amount of N fertilizer needed and the correct timing of applications varies. Application rates for N fertilizer will typically be higher for turf than trees and shrubs. The amount of N available from the soil is typically much less than other elements because it is extremely mobile and moves thru the soil. Thus, is typically required in larger amounts.

Nitrogen-deficient plants will be light green or slightly yellow, especially in the lower (older) leaves, and will be much less vigorous.

Phosphorus (P)

Phosphorus is an essential plant element that plays a key role in many vital plant processes such as root development, reproduction, and energy transfer. This element does not readily leach from most soils, and one application per year is sufficient.

Phosphorus deficiencies are quite problematic when they occur. Plants that are deficient in P will be stunted, but may be relatively dark green. In grasses, the base of the tiller is often dark purple. In many plants, the leaves will be much smaller than normal and older leaves may be dark green or purple.

Potassium (K)

Potassium is second only to nitrogen in the concentration found in plants, and is essential for producing growth yields (especially when stress conditions occur). It is also critical to maintaining thick, persistent stands of turf. It is essential in flower and fruit development, and affects plant vigor, disease resistance, and winter survival.

Sulfur (S)

Sulfur is critical to protein formation, and maintaining root growth. In Georgia, the need for S varies considerably. Deficiencies do occasionally occur, especially on soils in the Coastal Plain Region that are deep sands. Deficiencies are often confused with N deficiency since the two share symptoms of yellowing and stunted appearance. They can be differentiated based on where the symptoms occur on the plant. Sulfur is less mobile than N and deficiency symptoms tend to first appear in younger leaves, in contrast to N deficiency, which tends to appear first in older leaves.

Calcium (Ca)

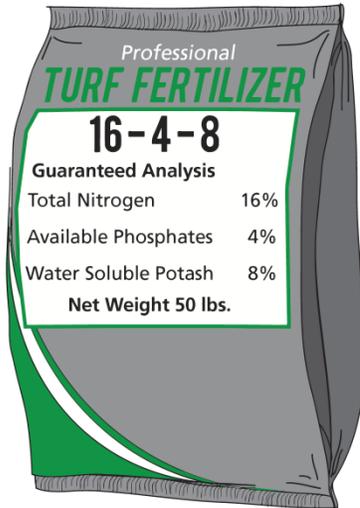
Calcium is critical for several basic plant functions (cell growth, stress detection, signaling, cell division, etc.). Fortunately, Ca deficiencies are rare in Georgia, especially if the soil has been limed.

Magnesium (Mg)

Magnesium is a critical element of chlorophyll, the green pigment in plants that enables photosynthesis. It is common for Mg to be deficient in Georgia, especially on acid, sandy soils in the Coastal Plain region. Magnesium deficiency causes yellowing between the veins of the leaf and will be found first in the lower or older leaves of the plant. Dolomitic limestone can be used to increase soil Mg and reduce deficiencies.

Micronutrients

In general, landscapes in Georgia and the Carolinas rarely need to be supplemented with micronutrients. Occasionally, studies have shown a yield increase as a result of fertilizing with micronutrients (usually a foliar spray). However, these applications are expensive and rarely cost-effective. Usually, micronutrient deficiencies are a symptom of a soil that is too acidic or basic. Check soil pH and adjust pH accordingly.



NUTRIENTS

Primary Nutrients

Nitrogen (N)

- Key element in turf grass nutrition
- Promotes vigorous leaf and stem growth to improve the overall quality of the turf
- Essential component of the chlorophyll molecule which gives turf its dark green color
- Involved in regulating the uptake of other key nutrients

Phosphorus (P)

- Used in the formation and transfer of energy within the plant
- Influences early root development and growth
- Encourages plant establishment

Potassium (K)

- Used by the plant in large quantities, second only to nitrogen
- Key component in the formation of carbohydrates, or food for the plant
- Encourages rooting and wear tolerance
- Enhances drought and cold tolerance
- Key component in cell wall strength and resistance to disease.

Secondary Nutrients

Calcium (Ca)

- Strongly influences proper soil pH
- Essential to strong cell wall structure and cell division
- Can improve soil structure, water retention, and infiltration

Magnesium (Mg)

- Plays an important role in photosynthesis and chlorophyll production
- A necessary component in many essential enzyme systems within the plant
- Important in aiding the translocation of phosphorus

Sulfur (S)

- Works with nitrogen to produce new protein for plant growth
- Plays an important role in the utilization of oxygen by the plant
- Influences the level of activity of soil microorganisms

Iron (Fe)

- Improves green color
- Improves shoot growth and density,
- Helps with root development
- Helps develop heat, cold, drought hardiness
- Improves wear tolerance

Images Courtesy of Georgia Cooperative Extension Service