"General Fertilizers and Nutrients for Lawn and Landscape"

Cultivating plants for 'domestic' applications, whether agricultural or ornamental, requires us to consider the fertility and structure of the soil (*or any medium for that matter*) in which we plant. Supplemental feeding of plant material with essential nutrients like Nitrogen, Phosphorus, and Potassium can allow us to grow plants in our landscapes and recreational environments that would not otherwise be possible.

Major Nutrients

- Nitrogen
  - Nitrogen (N) is a necessary part of all proteins, enzymes and metabolic processes involved in the synthesis and transfer of energy
  - Nitrogen is a part of chlorophyll, the green pigment of the plant that is responsible for photosynthesis
  - Helps plants with rapid growth, increasing seed and fruit production and improving the quality of leaf and forage crops
  - Nitrogen often comes from fertilizer application and from the air (*legumes get their N from the atmosphere*)
- Phosphorus
  - Like nitrogen, phosphorus (P) is an essential part of the process of photosynthesis
  - Encourages blooming and root growth
  - Helps with the transformation of solar energy into chemical energy; proper plant maturation; withstanding stress
  - Usually applied at time of seeding or sod installation
- Potassium
  - Potassium (K) is absorbed by plants in larger amounts than any other mineral element except nitrogen and, in some cases, calcium
  - Helps in the building of protein, photosynthesis, and reduction of diseases
  - Promotes strong cellular walls to resist heat, drought, and cold stresses

Secondary Nutrients

- Calcium
  - Calcium, an essential part of plant cell wall structure, provides for normal transport and retention of other elements as well as strength in the
- Sulfur
  - Essential plant food for production of protein
  - Promotes activity and development of enzymes and vitamins
  - Helps in chlorophyll formation
  - Improves root growth and seed production
  - Helps with vigorous plant growth and resistance to cold
- Magnesium
  - Magnesium is part of the chlorophyll in all green plants and essential for photosynthesis
  - It also helps activate many plant enzymes needed for growth

Micro Nutrients

- Iron
  - Essential for formation of chlorophyll, maintains dark green vegetation
- Manganese, Zinc, Copper, Molybdenum, Sodium, Silicon, Cobalt, and more
  - Usually available from native soil; each is responsible for

Organic Soil Treatment –

- Apply "live" organic amendments and humates along with fertilization in order to increase the uptake and efficiency of nutrients
- Use organic treatments to improve water penetration and plant usage and to protect the turf against disease, drought and wear stress
- Beneficial microbes help oxidize soil contaminants and remediate soil problems
- Earthworms are exceptional aerators who work for scraps!

Fertilizer Guidelines:

General Landscape

- N – P – K ratio is more important than number values; 4 – 1 – 2 is often ideal
- Quality, slow release nutrients result in healthy 'sustainable' growth
- Use high performance slow release N sources such as Methylene Urea and IBDU or natural organics to promote steady, non-damaging growth
- Excessive fertilizer application will weaken, injure, retard, and kill plants
- Organic nutrients are usually slow acting and cost more, but yield better long-term results
- Organic / Synthetic blends are generally the best of both worlds

Turfgrass:

- Apply 1-1½ lbs of N per 1000ft² every 60-90 days throughout the growing season
- Avoid high salt indexes (*ammonium nitrate*) and "weed-n-feed" type combos if possible
- Fall feeding (*just after first frost*) may be the most critical- SLOW RELEASE

Hodgkin Huxley Equation for osmotic potential (cell uptake of nutrients):

$$V_m = \frac{RT}{F} \ln \frac{P_k[K^+]_0 + P_{Na}[Na^+]_0 + P_{Cl}[Cl^-]_i}{P_k[K^+]_i + P_{Na}[Na^+]_i + P_{Cl}[Cl^-]_0}$$

As you can tell, the science behind plant nutrition is VERY complicated and as yet incomplete. Often the best practices still rely heavily on the expertise of Nature.