

## LAWN FERTILIZATION

**Why fertilize?:** Fertilizing a lawn can accomplish several goals. Well-fertilized lawns are greener, denser, and healthier than unfertilized lawns. Fertilizer enables a lawn to withstand the problems of drought, insects and diseases better, and increases the chances that the good lawn grasses (also called “turfgrasses”) will crowd out both annual and perennial weeds. If you want to use fewer or no pesticides on your lawn but still have a thick, dense turf, then proper fertilization is the most important thing you can do. In fact, the principles of both “organic” and “traditional” lawn care depend largely on providing the lawn with adequate fertilizer.

Thirteen mineral nutrients are known to be essential to turfgrasses. The quantity of most of these nutrients contained in the soil is high compared with the requirements of the turfgrass plants. However, the demands for nitrogen, phosphorus, and potassium often exceed the supply in the soil. Thus, it becomes necessary to add these three elements through fertilization.

Turfgrasses require nitrogen in the largest amount of any of the essential nutrients. For this reason, nitrogen is applied in largest amounts with fertilization. Nitrogen nutrition is important to turfgrasses because it can affect shoot growth and density, root growth and susceptibility to damage from disease, heat, cold, and drought. Turfgrasses require potassium in relatively large amounts, second only to nitrogen. Potassium influences turfgrass rooting, disease susceptibility and drought, heat and cold hardiness. Phosphorus is required by turfgrass plants in smaller amounts than nitrogen and potassium. Phosphorus is important in the establishment and rooting of turfgrasses. Fertilizer used when a new lawn is planted (commonly called “starter fertilizer”) has a high phosphorus content to improve germination and establishment.

The best means of determining the fertilizer requirement for an area is to have the soil tested. Soil tests provide valuable information on the phosphorus and potassium requirements of a soil at a nominal cost. Contact Cornell Cooperative Extension for soil testing information. If you haven’t done a soil test for your lawn, you can follow general guidelines based on plant need and “average” New York soils as discussed later in this fact sheet.

**What's in a fertilizer bag?:** Fertilizer companies are required by law to list on a fertilizer bag the amounts of elements contained in the fertilizer. This is referred to as a guaranteed analysis. Also listed on the bag is the fertilizer grade. A fertilizer grade designates the percentage of nitrogen, available phosphate and water soluble potash (potassium) in the product. A 10-6-4 grade fertilizer contains 10 percent nitrogen, 6 percent available phosphate, and 4 percent water soluble potash. Thus, a 40 pound bag of 10-6-4 contains 4 pounds of nitrogen, (10 percent of 40 lbs.), 2.4 pounds of available phosphate (6 percent of 40 lbs.) and 1.6 pounds of water soluble potash (4 percent of 40 lbs.). Fertilizer recommendations are often made using fertilizer ratios. A fertilizer ratio refers to the relationship between the percentages of nitrogen, phosphate and potash. A 16-8-8 grade fertilizer contains twice as much nitrogen as phosphate or potash, Thus, it would have a 2-1-1 ratio. Grades of 10-5-5 and 20-10-10 also have 2-1-1 ratios. A grade of 20-5-10 would have a 4-1-2 ratio. The easiest way to determine ratio is to divide each number in the grade by the smallest number in the grade, or by the highest whole number divisible into all three numbers of the grade.

A turf grade fertilizer is normally defined as a complete fertilizer (contains nitrogen, phosphate and potash) having an approximate 2-1-1 or 3-1-2 ratio, and having at least 35 percent of the total nitrogen as slow-release or water insoluble nitrogen (WIN). Slow-release or water insoluble nitrogen is not immediately available to the plant. Instead, the nitrogen is released slowly over relatively long periods of time. Slow-release and fast-release forms of nitrogen are discussed more fully in the next section. Fertilizers with at least 35 percent WIN can be applied at higher rates than quick releasing fertilizers (water soluble nitrogen) with little risk of burning the turf. A fertilizer bag may have the following label:

### 20-5-10 Guaranteed Analysis

Total Nitrogen	20%	[8% Water Insoluble Nitrogen (WIN)]
Available Phosphate	5%	
Water Soluble Potash	10%	

On the label, the 20 percent represents the total percentage of nitrogen in the bag. The percentage of the total nitrogen that is water insoluble (WIN) may now be determined. Divide the percent water insoluble nitrogen by the percent total nitrogen, and multiply by 100. In this case 8% divided by 20% = 0.4, multiplied by 100 = 40 or 40 percent of the total nitrogen is water insoluble. The fertilizer contains more

than 35 percent WIN so it is considered a turf grade fertilizer.

**What is fertilizer composed of?** The ideal fertilizer program provides uniform growth throughout the growing season. Nitrogen sources are divided into two broad groups: fast-release (water soluble) and slow-release (water insoluble).

Fast-release nitrogen sources include *urea*, *ammonium nitrate*, *ammonium sulfate*, *diammonium phosphate*, and others. Most fast-release fertilizers are generally considered to be “in-organic” by those who wish to use only “organic” or naturally-occurring sources of fertilizer. Since these materials are water soluble, the nitrogen is immediately available for plant uptake. Fertilization with water soluble nitrogen sources results in a rush of growth and rapid depletion of available nitrogen. On Long Island and areas with fast-draining, sandy soils it is recommended that lawns NOT be fertilized with high percentages of water soluble nitrogen sources. High rates of these fertilizers should not be used in areas of the Capital District with sandy soils, very shallow wells, or lawns near lakes, streams and other bodies of water. Use of a fertilizer containing only fast-release nitrogen is generally not a good idea for most home lawns.

Slow-release fertilizers include natural organics, synthetic organics, and coated nitrogen materials. Examples of synthetic organics and coated nitrogen materials include *sulfur-coated urea*, *ureaformaldehyde*, *isobutylideneurea*, and *polymer-coated urea*. These are all “man-made” forms of fertilizer. The release of fertilizer to the soil (and then grass plant) is dependent on a combination of factors, including temperature and moisture. Examples of natural organics include animal manures, sewage sludges, seed meal, various composts and wastes from food processing. The release of nitrogen from these materials may be due to microbial decomposition alone, or in combination with chemical and physical processes. Since the activity of microorganisms is dependent on soil temperature and moisture, nitrogen availability from slow-release fertilizers will vary with the time of the year and weather. Using only slow-release nitrogen on a lawn may produce a very slow green-up in spring and slow growth rates.

Many turfgrass fertilizers contain both slow release and fast-release nitrogen sources in the same formulation (product). Such fertilizers would have the advantage of containing nitrogen in a quickly available form, as well as the long-term benefits of slow-released nitrogen, and these are perhaps the best lawn fertilizers. To determine how much fast and slow release fertilizer a given product contains, look at the fine print on the label for the percentages of each source listed in the paragraphs above in italics, and also see the Table 1 for examples.

It is possible to use only natural organics to fertilize a lawn, if one can accept a slower response to the fertilizer. Additionally, organic fertilizers tend to be more expensive, pound for pound, than in-organic fertilizers, and more material is needed per application, since organics tend to contain less nitrogen per pound than in-organic fertilizers. There is some evidence that organic fertilizers can reduce the incidence of lawn diseases, but more research is needed.

**How much fertilizer should be applied, and when?** As stated previously, a soil test is the best way to determine exactly how much fertilizer a lawn needs. When a soil test is not used, the general recommendation is to apply 1 pound of nitrogen per 1,000 square feet of lawn per application. One to three applications should be made each year. If making one application (for what we would call a “low-maintenance lawn”), make it in late August or early September (about Labor Day). When fertilizing a lawn two times per season, applications should be made in mid to late May (Memorial Day) and Labor Day. When fertilizing a lawn three times per season, the approximate dates are Memorial Day, Labor Day, and Halloween, or about the time of the last mowing.

Avoid early spring and mid-summer applications of fertilizer. Lawns strengthened with fall fertilizing will grow very well in spring without additional fertilizer in April. Pushing extra growth in early spring, when grass growth is already rapid, should be avoided. Research has shown that grasses given too much fertilizer in early spring sometimes show greater disease problems later in the season. In mid-summer, grass growth often slows naturally, and extra fertilizer will produce few positive results.

**How big is my lawn?** Recommendations for fertilizing a lawn are usually given based on one thousand square foot (1,000 sq. ft.) increments. For example, a recommendation for a 20-5-10 fertilizer might be to use it at 5 pounds per 1,000 sq. ft.

It is therefore important to determine the square footage of your lawn area accurately, using a long tape measure, measuring wheel, or other device. Write this number down in the area where you store your fertilizer for future reference.

**How much fertilizer do I need to apply to supply 1 pound of nitrogen per 1,000 sq. ft., given a 10-6-4 fertilizer?**

Fertilizer math can be confusing! The formula below can be used to figure out how you can apply 1 pound of nitrogen per 1,000 sq. ft. using any lawn fertilizer.

**Example 1**

Pounds of fertilizer to apply to 1,000 sq. ft. =  $\frac{1 \text{ pound of N desired}}{\text{Percentage of N in fertilizer}}$

$$X = \frac{1}{0.10}$$

X = 10 pounds of 10-6-4 fertilizer is needed to supply 1 pound of nitrogen per one thousand square feet

**What equipment do I use to apply lawn fertilizer?** Lawn fertilizer is usually applied using either a broadcast or drop spreader. Many fertilizer bags will give you a number to set the spreader gauge to in order to apply the desired amount of fertilizer. However, many spreaders, even brand-new ones, are not calibrated correctly! Applying too little fertilizer will not give optimal results, while applying an excess is wasteful, is more likely to lead to water pollution, and can burn the grass. While a little time and effort is needed to calibrate a spreader, the increased accuracy will result in a job done correctly. Below are steps to follow to calibrate a spreader.

1. Set your spreader's gauge to the number prescribed on the fertilizer bag for a given rate of fertilizer. If no prescribed number is available, choose a setting somewhere in the middle of the choices given by the gauge.
2. Weigh a quantity of fertilizer and put it in the spreader
3. Lay a tarp on the ground and measure it's length. While 10 feet is ideal, any length will do.
4. Apply fertilizer to the tarp by pushing the spreader across it. Make sure to open and close the hopper precisely as you cross onto and off of the tarp.
5. Determine the width of the application for a drop spreader by measuring the width of the spreader itself. For a broadcast spreader, measure how far the fertilizer was thrown.
6. By multiplying length by width, you have the area to which fertilizer was applied.
7. Weigh the quantity of fertilizer left in the spreader. Subtract your second weight from the first to get the amount applied.

**Example 2**

Tarp length = 10 feet

Spreader width = 3 feet

Area to which fertilizer was applied = 30 square ft.

Amount of fertilizer collected from the tarp = 0.45 lb.

To find out how much fertilizer would be applied in 1,000 square feet, use the following formula, solving it for X.

$\frac{\text{Amount of fertilizer collected (lbs.)}}{\text{Area to which fertilizer was applied (sq. ft.)}} = \frac{\text{X pounds will be applied}}{1,000 \text{ sq. ft.}}$

$$\frac{0.45 \text{ lbs.}}{30 \text{ sq. ft.}} = \frac{X}{1,000 \text{ sq. ft.}}$$

X = 15 pounds

If this spreader was applying the 10-6-4 fertilizer from Example 1, it would be applying too much fertilizer!  
**What types of fertilizer are sold in the Capital District?** There are many acceptable ways to fertilize a lawn. The products you choose should fit into your goals for the lawn, as well as your budget. The chart below was compiled in 2002 from lawn fertilizers commonly available in the Capital District. It is presented here not to endorse any particular product, but just to give you an idea of a few of the fertilizers available.

**Table 1: Some lawn fertilizers found in the Capital District**

Product Name and Manufacturer	Analysis N-P-K	Fast release/slow release	Rate (lbs.) applied per 1,000 square feet (established turf)	Amount of N supplied at this rate per 1,000 square ft.	Price per pound of N
<b><i>ORGANICS</i></b>					
Milorganite, MMSD, Milwaukee, Wisconsin	6.3-2.6-0.3	0.6% water soluble N/5.7% water insoluble N	15	0.9	A 40 lb. bag contains 2.52 lbs. of N, so \$12.99/2.52 = <b>\$5.15</b>
Plant-tone, Espoma, Millville, NJ	5-3-3	0.5% ammoniacal nitrogen plus 0.5% other water soluble nitrogen/4% water insoluble nitrogen	20	1.0	A 25 lb. bag contains 1.25 lbs. of N, so \$12.99/1.25= <b>\$10.39</b>
North Country Organics Pro-Gro, Bradford, VT	5-3-4	1.5% water soluble nitrogen/ 3.5% water insoluble nitrogen	20	1.0	A 25 lb. bag contains 1.25 lbs. of N, so \$9.99/1.25 = <b>\$7.99</b>
<b><i>INORGANICS</i></b>					
Lebanon Lawn, Tree and Shrub	10-6-4	10% ammoniacal nitrogen/ No slow release	10	1.0	A 40 lb. bag contains 4 lbs. of N, so \$8.99/4 = <b>\$2.24</b>
All American Lawn and Garden Fertilizer	10-6-4	2.35% ammoniacal nitrogen, 7.65% urea nitrogen /No slow release	10	1.0	A 40 lb. bag contains 4 lbs. of N, so \$6.99/4 = <b>\$1.75</b>
Super Turf, United Horticultural Supply	26-4-6	1.56% ammoniacal nitrogen and 18.44% urea nitrogen/ 6% sulphur coated urea	3.4	0.88	A 17 lb. bag contains 4.4 lbs. of N, so \$6.99/4.4 = <b>\$1.58</b>

**Precautions:** Most fertilizers are salts, and they will burn grass if improperly applied. Water soluble or fast-release fertilizers will burn more severely than fertilizers containing slow-release nitrogen. Apply fertilizer only when the grass blades are dry (unless directed differently by product labels) and water thoroughly immediately after applications where directed to do so. Do not apply fertilizer to paved or impervious surfaces, such as driveways and sidewalks. Runoff from these areas can go directly to streams, rivers and other bodies of water and cause pollution.

Adapted from "Lawn Fertilization" by Dr. Norman Hummel Jr. (Cornell University, August 1990) by David Chinery, Cornell Cooperative Extension of Rensselaer County, April 2004.