

Fertilizing Facts For Home Lawns

Fertilizer is an essential component in maintaining a healthy and attractive lawn. Often, fertilizing is a misunderstood and mismanaged practice that can lead to future turf problems. The purpose of this publication is to educate homeowners about the correct procedure for buying and applying fertilizer and to clear up misconceptions about this important practice of lawn care maintenance. The goal is to produce a high quality lawn, while protecting our natural resources.

Why Fertilize?

The purpose of lawn fertilization is to provide nutrients to encourage healthy active turf growth. Many stresses are placed upon lawns: weekly mowing and foot traffic alone are stressful! Turfgrass needs to out-compete weeds, recover from disease outbreaks, insect infestations, and drought damage. To do this turfgrass needs to be kept actively growing, although cool-season turfgrasses such as turf type tall fescue will recover if allowed to go dormant in the summer. Fertilizer should be applied according to a lawn fertilization schedule (see **Tables 4 and 5**): too little fertilizer results in thin, sometimes yellowing turf that has a higher susceptibility to disease such as, red thread and rust; too much fertilizer also contributes to turf problems. (see box below)

Problems Caused by Overfertilization

- ✓ Increase in maintenance practices, such as mowing and dethatching
- ✓ Lower drought tolerance
- ✓ Increase in insect damage
- ✓ Greater susceptibility to lawn diseases, such as leaf spot diseases
- ✓ Burning of roots and foliage, especially if applied in the summer or applied in excessive amounts
- ✓ Contributes to excess nutrients that filter into and pollute the Chesapeake Bay

Fall vs. Spring Fertilization

All nitrogen fertilizer should be applied to cool season lawns in the fall (except if turf is weak and thin after spring green-up). In the fall, turf directs growth to the root system. The development of a healthy root system is the key to a strong, healthy lawn that can withstand drought and recover from stress. Nitrogen is essential for shoot growth, but fall applications promote root growth as well. Root growth continues up until the ground freezes. Fall fertilization helps lawns recover from summer stress and allows roots to store food that is used in the spring when lawns green-up and begin active growth. Warm season turf (zoysiagrass and bermudagrass) is fertilized in mid-May through July (see **Table 5**).

Plant Nutrients

Macronutrients or Primary Nutrients

Turf needs nitrogen, phosphorus and potassium for proper growth. Nitrogen (N) is required in the greatest amount and fertilizer recommendations are based on the amount of nitrogen needed or lbs. of N per 1000 square feet (the standard recommendation is 1 lb. of nitrogen per 1000 sq. feet applied at each application). Nitrogen helps give turf its green color and promotes both root and shoot growth. Poor color and yellowing can occur if nitrogen is depleted in the soil. Phosphorus (P) is used for root development and potassium (K) promotes disease resistance, winter hardiness and drought and foot tolerance.

Secondary nutrients needed for turf growth include calcium, magnesium and sulfur. Many Maryland soils have sufficient amounts of calcium and magnesium. Sulfur is present in most commercial fertilizer products and additional amounts are usually not recommended.

Micronutrients

These are nutrients that are necessary for plant growth in very small amounts and are sometimes referred to as trace elements. Micronutrients include iron, manganese, zinc, copper, boron, molybdenum, and chlorine. Deficiencies are more likely to occur in sandy soils. With the exception of iron, the addition of micronutrients is usually not necessary or beneficial. In alkaline (high pH) soils, iron binds to soil particles and becomes unavailable to the plant. The result is iron chlorosis, which causes yellowing of grass blades. This is not common in Maryland, as our soils for the most part are acidic. If the soil pH is kept within the proper range for turf (6.0-6.8) there is little chance that a micronutrient deficiency would affect the growth of turf, especially if grass clippings are allowed to break down on turf (see **Grasscycling** on page 6).

Why Test your Soil?

Soil testing provides homeowners with important information regarding the condition of their soil. Unnecessary applications of lime and fertilizer are avoided when lawns are limed and fertilized according to soil test results. A basic soil test should be performed before lawn renovation or on a 2-4 year cycle. A basic soil test provides information such as:

- ❖ pH.
- ❖ Levels of phosphorus, potassium and magnesium.
- ❖ Lbs. of nitrogen*, potassium, and phosphorus per 1000 sq. feet that needs to be applied.
- ❖ Soil texture.
- ❖ Special tests (soluble salts, organic matter, micronutrients, and nitrates) are available, but in most cases are not necessary.

**Available nitrogen is variable due to temperature, moisture, and microbial activity. Since nitrogen values fluctuate they are not tested for in a basic soil test: soil test recommendations are based on the amount of nitrogen needed for optimum turf growth for the year.*

Refer to publications [HG# 110 Selecting and Using a Soil Testing Lab](#) and [HG#110a Comparison Chart of Regional Soil Testing Laboratories](#) for information on soil testing. When interpreting your soil test results focus on three important points: soil pH, liming recommendation and fertilizer recommendation. Also keep in mind that fertilizer recommendations may differ from the University of Maryland recommendations. Compare results with the fertilizer schedule in **Tables 4 and 5**. When selecting a fertilizer, try to find one that most closely supplies the amounts of nitrogen, phosphorus and potassium given in the soil test results. In many cases, only nitrogen is recommended. The difficulty lies in finding a fertilizer grade that contains nitrogen only (e.g. 21-0-0). Most turf fertilizers are complete fertilizers, which means they supply nitrogen, phosphorous and potassium (e.g. 10-10-10), although the trend in lawn fertilizers is to manufacture fertilizers lower in phosphorus and potassium. If a single source of nitrogen cannot be found, use one that is low in phosphorus and potassium.

Lawn Care Companies, Soil Tests and Fertilizer Applications

The *Water Quality Improvement Act of 1998* authorizes the Maryland Department of Agriculture to regulate the commercial application of fertilizer on a homeowner's property. Commercial companies that apply fertilizer are required to perform a soil test and maintain records of their fertilizing practices. A soil test must be performed within one year of beginning service and then again every three years. Questions or concerns should be directed to the Maryland Department of Agriculture, Nutrient Management Program, 50 Harry S. Truman Parkway, Annapolis Maryland, 21401, www.mda.state.md.us

It is not mandated that homeowners applying their own nutrients need to perform a test, but it is recommended. Everyone needs to take responsibility in protecting the Bay!

Role of pH

Soil pH is the measure of how acidic or alkaline the soil is. Any value above 7.0 is alkaline and any value below is acidic. Turf grows best in slightly acidic soil (6.0-6.8). Lime should only be applied according to soil test results. Fertilizer and lime can be applied at the same time in two separate applications.

The Importance of Amending Soil with Organic Matter

Your turfgrass is as healthy as the soil that it grows in. Soils that contain the proper ratio of water, air, minerals and organic matter will promote the growth of a deep root system, resulting in a healthy, dense lawn.

Adding organic matter is the best way to improve poor soil types. Sources of organic matter include: well-rotted manure, compost, leaf mold, grassclippings or processed sewer sludge. The incorporation of organic matter into sandy soil improves water and nutrient retention. It also improves the soil structure of clay soil, thus allowing better drainage and improved aeration of plant roots. Organic matter should be added before a lawn establishment or renovation project (refer to [HG# 102 Lawn Establishment, Renovation and Overseeding](#)). Organic Matter can be added to lawns in small amounts each year, after core aeration or as a light topdressing (1/4" - 1/2"). For additional information on soil amendments refer to [HG# 42 Soil Amendments and Fertilizers](#).

No amount of fertilizing is going to overcome poor soil or poor growing conditions. Examples of poor growing conditions include: areas of poor drainage, growing a species of grass not suited for site conditions, compacted soil, or turf with an excessive thatch build-up (which prevents fertilizer and water from reaching the soil).

Choosing Lawn Fertilizer

The three prominent numbers found on every bag of fertilizer is the guaranteed analysis. These numbers represent the percentage of nutrients by weight contained in the fertilizer. The first number represents the percentage of nitrogen. For example, a 32-3-4 fertilizer is a complete fertilizer that contains 32% nitrogen, 3% phosphate and 4% potash. You should apply approximately 1 lb. of nitrogen per 1000 sq. feet at each application. An example of how to calculate the pounds of nitrogen contained in the bag and how many pounds of nitrogen will be applied per thousand square feet is illustrated in **Table 1**. If soil test results show that your soil is sufficient in phosphorus or you haven't performed a soil test, look for a fertilizer low in phosphorus, e.g. 32-3-4, 18-0-3 or 26-4-12 or a fertilizer with a 2-1-1, 3-1-2, or a 4-1-2 ratio. Greenview (Lebanon-Seaboard), Espoma, and Lesco manufacture turf fertilizers with a low percentage of phosphorus or no phosphorus at all.

An incomplete fertilizer contains one or two primary nutrients (e.g. ammonium sulfate 21-0-0, or triple super phosphate 0-46-0).

Table 1. Calculating lbs. of nitrogen and lbs. of N per 1000 sq. ft.

In order to follow the fertilizer schedule on page 7, it is necessary to determine the amount of nitrogen contained in a bag of fertilizer and how many square feet it covers. The guaranteed analysis is **32-3-4**, the bag weighs 15.5 lbs, and it covers 5000 sq. ft:

To calculate the lbs. of nitrogen in the bag of fertilizer, multiply the weight of the bag by the percent of nitrogen. To calculate the lbs. of nitrogen per 1000 sq. ft. divide this by the thousands of sq. ft. listed on the label that the bag will cover and multiply by 1000.

$$15.5 \times .32 = 5.0 \text{ lbs. of nitrogen contained in the bag.}$$

$$5 \div 5000 \text{ sq. ft.} \times 1000 = 1 \text{ lb. of N per 1000 sq.ft.}$$

This bag of fertilizer will supply 1 lb. of N per 1000 sq.ft.

Fertilizer Ratio

The fertilizer ratio is the comparison of the N (nitrogen), P_2O_5 (phosphate) and K_2O (potash) in a fertilizer. Some common ratios for turf fertilizers are 2-1-1, 3-1-2 or 4-1-2. The ratio is determined by dividing all three numbers by the lowest number (a 16-4-8 fertilizer has a 4-1-2 ratio.) Fertilizers with similar ratios can be substituted for one another, provided the rate of application is adjusted so the correct amount of fertilizer is applied.

Types of Nitrogen

It is very important to determine the source of nitrogen in the fertilizer you are purchasing. Nitrogen sources fall into two categories: quickly available or water soluble and slowly available or water insoluble (WIN). There is also a category of slow release fertilizers that are naturally derived from organic sources, these include different types of organic materials.

When applying fertilizer according to soil test results, multiple applications of fertilizer can be combined if using a fertilizer that contains more than 40% slowly available nitrogen or water insoluble nitrogen (WIN) and when applied in the fall. If this is done with quickly available fertilizer, damage to your lawn may occur. It is important to calculate the WIN. Do not assume that a fertilizer has a high WIN, even if the bag says it contains slow release fertilizer. It is possible only a small percentage of the product contains a source of slow release nitrogen. Refer to **Table 2** to determine the percentage of water insoluble nitrogen (WIN). A high quality slow release turf fertilizer should contain at least 40% of the nitrogen in a slow release form. Many fertilizers formulated today are a combination of slow release and quick release sources of nitrogen. This promotes extended, uniform green-up without producing excessive growth.

Table 2. Examples of Fertilizer Labels and the Methodology for Determining the % of Water Insoluble Nitrogen (WIN)

<p style="text-align: center;">32-3-4</p> <p>Total nitrogen (N) * 32%</p> <p>5 % ammoniacal nitrogen*</p> <p>12 % urea nitrogen*</p> <p>4 % ammonium sulfate*</p> <p>9.8 % water soluble organic nitrogen*</p> <p>1.2 % water insoluble nitrogen (WIN)*#</p> <p>Available phosphate (P₂O₅%) 3%</p> <p>Soluble potash (K₂O) 4%</p> <p>Sulfur (S)+ 3%</p> <p>Iron (Fe)+ 1%</p> <p>Manganese (Mn)+ 0.5%</p> <p>Derived from: monoammonium phosphate, urea, muriate of potash, ferrous sulfate, managanese oxide, manganese sulfate, ammoniacal nitrogen, ammonium sulfate, sulfur coated urea</p> <p>+Certain manufacturers include sources of iron or sulfur and manganese.</p> <p><u>Calculating WIN</u></p> <p>WIN is calculated by dividing the percentage of water insoluble nitrogen by the total percentage of nitrogen in the bag and multiply by 100.</p> <p>$1.2 \div 32 = .0375 \times 100 = 3.75\% \text{ WIN}$</p>	<p>*It is common to blend a number of nitrogen sources, which can include quick release and slow release sources.</p> <p>*#Other terms used to indicate WIN are slow release nitrogen, slowly available nitrogen and controlled-release nitrogen. N sources to look for include: IBDU, sulfur coated urea, and ureaformaldehyde.</p>	<p style="text-align: center;">18-0-3</p> <p>Total nitrogen* 18%</p> <p>4.7% Ammoniacal nitrogen*</p> <p>6.3% Other water soluble nitrogen*</p> <p>7.0% Water insoluble nitrogen*#</p> <p>Soluble Potash (K₂O) 3%</p> <p>Derived from: dehydrated manure, feather meal, kelp meal, iron humate, ureaform, ammonium sulfate and sulfate of potash</p> <p><u>Calculating WIN</u></p> <p>Win is calculated by dividing the percentage of water insoluble nitrogen by the total percentage of nitrogen in the bag and multiply by 100.</p> <p>$7 \div 18 = .39 \times 100 = 39\% \text{ WIN}$</p>
--	--	---

Nitrogen Sources

Quick release nitrogen

Quick release or water-soluble nitrogen sources are ammonium nitrate, ammonium sulfate, and urea. Their major characteristics are:

- ✓ Rapid release of nitrogen, providing immediate green-up
- ✓ Less expensive
- ✓ Water-soluble
- ✓ Greater tendency to burn lawn
- ✓ Short term effects
- ✓ High potential to leach causing nutrient pollution

Slow release nitrogen

Slow release or water insoluble nitrogen sources include IBDU, sulfur coated urea, and ureaformaldehyde (also known as ureaform) Turf roots do not absorb these materials immediately; the nitrogen needs to go through a longer conversion process before the nitrogen is available to the plant. This process is dependent on a number of factors such as, microbial activity, pH, soil moisture, and soil temperature.

Microbial activity is higher when there is sufficient soil moisture and temperatures are warm. Their major characteristics are:

- ✓ Slow release of nitrogen
- ✓ More expensive
- ✓ Water insoluble
- ✓ Less likely to damage lawn
- ✓ Effects last over a longer period of time
- ✓ Less likely to leach and cause nutrient pollution

Slow release natural organic fertilizers

Natural organic fertilizers include materials such as processed sewer sludge, composted manures, poultry meal, bone meal, dried blood, soybean meal and greensand rock. These fertilizers have similar characteristics listed under slow release nitrogen and also:

- ✓ Help to improve soil structure
- ✓ Help to reduce thatch build up
- ✓ Are more expensive per lb. of nutrient

Liquid Fertilizer or Water Soluble Fertilizer

Lawn fertilizers can also be purchased in liquid form. There is no significant difference in the nutrients in liquid or granular fertilizers. The only difference is the method of application. Liquid fertilizers are applied directly to the lawn using a sprayer and are used to supplement soil applications of nitrogen, phosphorus and potassium. If the fertilizer schedule is followed (Table 4 or 5), these applications are not necessary. If soil pH is high making iron unavailable to grass roots, and iron chlorosis symptoms are observed, a foliar application of iron can be beneficial. However, exercise caution when applying iron sulfate fertilizers since hard surfaces such as sidewalks and patios may be stained.

Starter Fertilizers

These are commonly used when starting a new lawn or when renovating an existing lawn. The nitrogen applied should be included in the total amount of nitrogen you are applying for

the year. After 2-3 mowings additional nitrogen can be applied to new turf according to the fertilizer schedule in **Table 4**. It is advisable to begin lawn renovation projects in late summer so there is ample time to apply the recommended nitrogen to the turf in the fall (refer to [*HG# 102 Lawn Establishment, Renovation and Overseeding*](#)).

Measuring Lawn Size

The square footage of your lawn needs to be calculated before you can purchase the correct amount of fertilizer. For rectangular and square lawns multiply the length times the width (sq. ft. = l x w). For triangular shaped areas, multiply the base times the height and divide by two (sq. ft = b x h÷2). For irregular shaped lawns, calculate the areas separately and add them together (refer to [*HG#306 How to Measure Your Yard*](#)).

Table 3.

Calculating the correct amount of fertilizer

Three numbers are important: 1) pounds of nitrogen desired per 1000 sq. ft. (see fertilizer schedule page 6), 2) percentage of nitrogen in guaranteed analysis, and 3) square footage of lawn. Use the following formula:

$$\frac{\text{Lbs. of nitrogen desired to apply per 1000 sq. ft.} \times \text{sq. footage of lawn}}{\% \text{ of nitrogen in guaranteed analysis} \times 1,000} = \text{amount of fertilizer needed to apply}$$

Example:

A lawn measures 8,000 sq. ft. and 1.0 lb. of nitrogen is needed per 1,000 sq. ft. The guaranteed analysis of the fertilizer is **26-3-3**.

$$1.0 \div .26 \times 8000 \div 1000 = 31 \text{ lbs. of fertilizer is needed}$$

If the lawn area is more than an acre, convert area to square feet. There are 43,560 square feet in an acre.

Always use the calculated amount of fertilizer. Excess fertilizer should be tightly closed and stored in a dry environment and used as soon as possible (long term storage is not advisable). Calculate how much fertilizer is needed before purchasing.

The Importance of Grasscycling

Grasscycling benefits both your lawn and the environment. If lawns are mowed on a regular basis, grass clippings quickly decompose providing free fertilizer for your lawn. It is a misconception that grasscycling contributes to a thatch build-up or spreads lawn disease. Thatch is an accumulation of partly decomposed grass roots and stems that develops below the actively growing turf. Grass clippings are largely composed of water and decompose rapidly.

Grasscycling has many positive attributes:

- ❖ It encourages a healthier lawn by returning nutrients to the soil, in a slow release form.
- ❖ Saves time by eliminating the need to bag or rake grass clippings.
- ❖ Helps protect the environment by reducing the amount of lawn clippings in the landfill.
- ❖ 25% less fertilizer needs to be applied saving money and reducing the amount of runoff into the Chesapeake Bay.

Tips on Grasscycling

- ❖ Mow with sharp blades.
- ❖ Mow lawn when dry. After a rainy period, large clumps of grass can be raked and removed.
- ❖ Mow on a regular basis. Remove no more than 1/3rd of the leaf blade at each cutting. During the spring it may be necessary to mow twice a week.
- ❖ Mulching mowers hasten the decomposition process, but are not necessary. Check availability of mulching “kits” which can be purchased for some models of lawn mowers. Kits include a plate that blocks discharge shoots, forcing clippings back through the blades. Check your lawn mower manual for information on mulching.
- ❖ Avoid the overuse of fertilizer.

Maintaining Turf Organically*

- ❖ Plant proper turfgrass species for site. Turf-type tall fescue is the #1 recommended grass for sunny or partially sunny lawns
- ❖ Concentrate on building healthy soil by broadcasting a thin (¼” - ½”) layer of screened organic matter on top of turf on a regular basis
- ❖ Fertilize in the fall according to soil test results
- ❖ Fertilize using slow release natural organic fertilizers
- ❖ Maintain proper pH (6.0-6.8) by applying lime according to soil test results
- ❖ Grasscycle
- ❖ Mow turf to recommended height (2 ½ - 3 ½ inches for tall fescue) on a regular basis
- ❖ Core aerate and overseed lawns in the fall
- ❖ Hand pull weeds in the early spring and fall or use a corn gluten based herbicide in early spring
- ❖ Do not irrigate turf; allow it to go dormant in the summer

**without chemical fertilizers or pesticides; this is a working definition used by most organic gardeners.*

Nitrogen Fertilizer Schedule for Maryland Lawns*

Fertilizer schedules should be used as a guideline. In some years your lawn may need the maximum total amount of nitrogen, while in others lesser amounts would be sufficient. Nitrogen requirements change depending on the weather conditions (e.g. drought), the age of your lawn (newly established lawns require more nitrogen than older lawns), how much nitrogen was applied the previous season, conditions of the turf, grasscycling and other factors. The key is to be flexible and never use more than the recommended amount of nitrogen fertilizer.

**Nitrogen recommendations vary from state-to-state. Check with your local cooperative extensions service if you live outside of Maryland.*

If grasscycling is performed, reduce the nitrogen amounts listed below by 25%.

Table 4.

COOL SEASON TURF

	Sept.	Oct. thru mid-Nov.	Mid-Nov. thru mid-Dec.	Mid-May thru June+	July thru August	Total
Turf-type tall fescue 1 lb.++		1 lb.++	.5 lb.++	.5 lb.*	0	2 ½ - 3 lbs.
Fine fescues 0		1 lb.++	.5-1 lb.++	0	0	1 ½ - 2 lbs.
Kentucky bluegrass 1 lb.++		1 lb.++	1 lb.++	.5-1 lb.*	0	3 ½ - 4 lbs.

+Nitrogen should be applied to cool season turf before the end of May.

++Applications can be combined if fertilizer contains 40% WIN (water insoluble nitrogen).

*Omit this application if turf color and density are acceptable.

Table 5.

WARM SEASON TURF

	Sept.	Oct. thru mid-Nov.	Mid-Nov. thru mid-Dec.	Mid-May thru June+	July thru August	Total
Zoysiagrass	0	0	0	1 lb.	1lb.*	2 lbs.
Bermudagrass	0	0	0	1 lb.	1 lb.	2 lbs.

*Omit this application if turf color and density are acceptable.

Fertilizer Application Methods

Use a spreader for even application of fertilizer. Never apply by hand. A drop type or rotary spreader can be used. Minimize streaking by overlapping wheel tracks when using a drop spreader. Streaking can also be reduced by spreading one-half of the fertilizer in a north-south direction and the remaining half in an east-west direction.

Most brand name fertilizers will list the proper setting for your spreader. Follow label directions. Refer to [FS# 702 Lawns and the Chesapeake Bay](#) for additional information on spreader calibration.

Combination Fertilizers

It is common for homeowners to find "weed and feed" products or fertilizer combined with an herbicide. While they are convenient, they often lead to over-fertilization and fertilizer applied at the wrong time of the year. You should be aware of the potential problems that could occur when using these types of products. Certain herbicides can injure nearby trees and shrubs. It is best to treat weeds or insects, such as white grubs separately using products specific for the problem. For information on weed control refer to [HG# 101 Guide to Controlling Weeds in Cool Season Turf](#). Information on grub control can be found in [HG# 78 The Japanese Beetle](#).

Additional Reminders

- ❖ Sweep excess fertilizer off paved surfaces
- ❖ Fill and wash spreaders over grassy areas, not hard surfaces such as driveways or sidewalks
- ❖ Fertilize at appropriate times, never when soil is frozen or turf is dormant
- ❖ Use a drop spreader around waterways or areas of natural drainage. Also maintain a natural buffer zone between the lawn and water to prevent erosion and to filter nutrients from runoff

References

Home and Garden Information Center. 1996. **Maryland Master Gardener Handbook**. Ag. Duplication, Communications and Information Technology Office, College of Agriculture and Natural Resources, University of Maryland.

Turgeon, A.J. 2002 **Turfgrass Management**. Prentice Hall, Inc. Englewood Cliffs, NJ

Ricciuti, P., Clement D., Malinoski, M.K., **HG 63 IPM Series: Turf**, Maryland Cooperative Extension, Home and Garden Information Center, Ellicott City, MD.

Turner, T.R., Ricciuti, P., Revised by MacLachlan, W., **FS 702 Lawns and the Chesapeake Bay**. Maryland Cooperative Extension, University of Maryland, College Park.

Author: Debra Ricigliano, Horticultural Consultant, Home and Garden Information Center. 5/2004

Reviewed by: Jon Traunfeld, Regional Specialist, Home and Garden Information Center., Kevin Mathias, Ph.D., Institute of Applied Agriculture, University of Maryland, David Clement, Ph.D., Director, University of Maryland Home and Garden Information Center.

Trade names mentioned in this publication are for identification purposes only. Endorsement of any product is not intended or implied.

PROTECT THE BAY. USE PESTICIDES AND FERTILIZERS WISELY

Have a pest or gardening question?

Call The Home and Garden Information Center

1-800-342-2507

www.hgic.umd.edu