FERTILIZER **MATH & APPLICATION**

Once you select an appropriate fertilizer, it is important to accurately determine the application rate. Fertilizer nutrients are typically applied at rates of 0.5 to 1.0 lb of nutrient per 1,000 ft^2. To calculate how much fertilizer to apply based on this range, simply follow these steps:

1) Measure the area of the turfgrass in square feet (Area)

2) Select the rate at which you are applying the nutrient in the fertilizer (Application Rate)

3) Determine the analysis of the fertilizer (Analysis)

Multiply these three values together as done below to determine how much fertilizer to apply.

Example: A homeowner wants to apply 1.0 lb of nitrogen per 1,000 ft^2 to a 5,500 ft^2 lawn and is purchasing fertilizer with an analysis of 16-4-8 based on a recent soil test.

Area		Rate		Analysis		Total Amount
5,500 ft^2	x	1 lb of N / 1,000 ft^2	x	1 lb of 16-4-8 / 0.16 lbs of N	=	34 lbs of 16-4-8

Many fertilizer products will also state on their label how many square feet they will cover. This eliminates the need for calculation, but still requires that the area be accurately measured. For example, "This bag covers 5,000 ft^2" means the fertilizer manufacturer has determined how much area this bag will cover by using math similar to that shown above.

Fertilizers are most commonly applied using a rotary or drop spreader. Rotary spreaders cover a larger area and are less prone to error while drop spreaders are great for small areas and areas adjacent to sidewalks, driveways, or other hardscapes. In order to improve the uniformity of coverage using either type, it is often recommended to apply half of the fertilizer in one direction and the other half perpendicular to that direction.

TIPS **FOR SUCCESSFUL FERTILIZATION**

- An accurate measurement of the total turfgrass area being fertilized is essential to determining how much fertilizer to apply.
- Soil tests are the most accurate and reliable way to determine soil nutrient status.
- When applying fertilizer to newly laid sod, nutrients such as phosphorous and potassium can be tilled into the soil during pre-plant soil renovations.
- Sites that receive traffic, athletic play, events, etc. are more likely to benefit from supplemental fertilization.
- Nitrogen is unique from other mineral elements in that over-application can stimulate excess growth.
- Use a combination of quick and slow-release nutrient sources to provide uniform, long-lasting responses.
- Water in fertilizers using moderate irrigation and avoid fertilizing prior to excessive rainfall.
- Avoid applying fertilizer to hardscapes such as driveways, sidewalks, etc. and sweep or blow any fertilizer that may inadvertently contact these areas back into the lawn.
- Consult with University Turfgrass Specialists or other Professionals in your area for tips on developing long-term fertilization programs based on local climate, soil type, turfgrass species, etc.

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For more information on how to care for newly laid sod after establishment, please check out the Lawn Institute Website at http://www.thelawninstitute.org.

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TURFGRASS FERTILIZATION FOR NEW SOD

Perennial turfgrasses, like all plants, obtain their mineral nutrients from the surrounding environment including the soil, air, and water. There are many essential nutrients required for growth and depending upon desired turfgrass use and soil nutrient status, newly planted sod may benefit from supplemental fertilization. This guide contains helpful tips to make sure your newly laid sod remains healthy and ready to enjoy!

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ESSENTIAL **PLANT NUTRIENTS**

Plants, including turfgrasses, require essential nutrients for healthy growth. They are each required in different amounts and play different roles within the plant, but are all obtained from the surrounding soil, air, and water. For example, carbon, hydrogen, and oxygen are all obtained from the air and water around them through natural plant processes such as photosynthesis and respiration. Mineral nutrients such as nitrogen, phosphorous, potassium, and others listed in Table 1 are obtained naturally from the soil.

In addition to the *Basic Nutrients* (carbon, hydrogen, and oxygen), essential plant nutrients are often classified into three categories based on plant requirements. The *Primary Nutrients* (nitrogen, phosphorous, and potassium) are need in the greatest quantity followed by the *Secondary Nutrients* (calcium, magnesium, and sulfur). The remaining essential nutrients are needed in the lowest quantity and are referred to as *Micronutrients*.

Table 1. Naturally Occurring Essential Plant Nutrients

Nutrient	Symbol	Form of Uptake	Leaf Tissue Concentration
Basic Nutrients			
Carbon	C	CO_2	45%
Oxygen	O	CO_2, O_2	45%
Hydrogen	H	H_2O	6%
Primary Nutrients			
Nitrogen	N	NH_4^+, NO_3^-	1.5%
Potassium	K	K^+	1.0%
Phosphorous	P	$H_2PO_4^-$, HPO_4^{2-}	0.2%
Secondary Nutrients			
Calcium	Ca	Ca^{2+}	0.5%
Magnesium	Mg	Mg^{2+}	0.2%
Sulfur	S	SO_4^{2-}	0.1%
Micronutrients			
Chlorine	Cl	Cl^-	100 ppm
Iron	Fe	Fe^{2+}, Fe^{3+}	100 ppm
Manganese	Mn	Mn^{2+}	50 ppm
Boron	B	H_3BO_3, BO_3^{3-}	20 ppm
Zinc	Zn	Zn^{2+}, $ZnOH^+$	20 ppm
Copper	Cu	Cu^{2+}	6 ppm
Molybdenum	Mo	MoO_4^{2-}, $HMoO_4^-$	0.1 ppm
Nickel	Ni	Ni^{2+}	0.1 ppm

SOIL **TESTING**

The best way to determine the presence of naturally occurring mineral elements is through soil testing. There are many accredited private, university, and governmental soil testing labs available and sending in a soil sample for testing is an inexpensive, yet effective way to determine a soil's fertility status and potential need for supplemental fertilization.

If soil tests have determined that supplemental fertilization is recommended, then selecting the appropriate fertilizer is the next step. Fertilizers are required by law to state their contents and do so on the label (Figure 1). The three numbers in the fertilizer analysis indicate the percentage of nitrogen, phosphorous, and potassium that are present. For example, a fertilizer with an analysis of 16-4-8 has 16% N, 4% P, and 8% K.

FERTILIZER **ANALYSIS**

Nitrogen is the mineral nutrient that plants need in the largest quantity. Regardless of whether nitrogen is applied as plant material, manure, waste by-products, etc. (organic) or as synthetic fertilizers (inorganic), the nitrogen in these products must be converted into an inorganic form (NH_4^+ or NO_3^-) before it can be taken up by the plant.

The fertilizer label also provides information on the presence of quick-release or slow-release nutrients, secondary nutrients, and micronutrients. Slow-release nitrogen sources such as sulfur coated urea (SCU), polymer coated urea (PCU), methylene urea, organic products, etc. provide a much slower, long-term response and are important in avoiding growth surges. These products are often combined with quick-release sources to provide an immediate impact combined with a long-term response as well.

FERTILIZER
16-4-8

GUARANTEED ANALYSIS

Total Nitrogen (N) 16%
- 11.2% Ammoniacal Nitrogen
- 1.2% Water Insoluble Nitrogen
- 1.2% Urea Nitrogen
- 2.4% Other Water Soluble Nitrogen*

Available Phosphate (P_2O_5).....4%

Soluble Potash (K_2O) 8%

Magnesium (Mg) 0.8%
- 0.8% Water Soluble Magnesium (Mg)

Sulfur (S) 15%
- 15.0% Combined Sulfur (S)

Iron (Fe) 1.6%
- 1.6% Water Soluble Iron (Fe)

Manganese (Mn) 0.5%
- 0.5% Water Soluble Manganese (Mn)

Derived from: Ammonium Sulfate, Ammonium Phosphate, Methylene Ureas, Urea, Sulfate of Potash, Kelp Meal, Sulfate of Potash Magnesia, Ferric Oxide, Ferrous Sulfate, Manganese Sulfate

*2.8% Slowly Available Nitrogen from Methylene Urea