PURDUE TURFGRASS SCIENCE PROGRAM
DEPARTMENT OF AGRONOMY

Fertilizing Established Lawns

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Lawns need to be fertilized to maintain color, density, and vigor. The healthier and more vigorous a lawn is, the better it can withstand stress from heat, drought, traffic, and pets. We often try to achieve a dark green lawn, but the darkest green lawn is not always the healthiest lawn. We should try to achieve a healthy lawn that has moderate growth and good density.

The amount of fertilizer applied annually to a lawn depends on a number of factors. Fertilization programs may need to be adjusted to apply slightly more or slightly less nutrients depending on the following factors:

- Desires of the homeowner: A beautiful, dark green, and dense lawn will require more fertilizer than a thin, lighter color lawn. Applying more fertilizer annually also necessitates more mowing and irrigation.
- Location: Because the growing season is longer in southern Indiana than in northern Indiana, more fertilizer will be needed to maintain the same turf quality in southern Indiana than in northern Indiana.
- Species: Certain species like zoysia, buffalograss, or tall fescue may perform adequately with lower annual fertilizer rates than species such as Kentucky bluegrass or perennial ryegrass.
- Weather: A rainy summer will stimulate growth and will usually necessitate more annual fertilizer than a dry summer. The same holds true for an irrigated lawn versus an unirrigated lawn.
- Soil type: Turf grown on a very sandy or a very heavy clay soil will need more fertilizer than turf grown on a silt loam soil. Soil type and pH will have a large effect on the amount of phosphorus and potassium that needs to be applied.
- Age and quality of existing lawn: A new lawn will need more fertilizer for the first few years to enhance density. Improving a neglected or thin lawn may also require more annual fertilizer for the first few years.
- Clippings: Clippings should always be returned to the lawn; removing clippings for composting or mulch will necessitate more annual applications of fertilizer.

Fertilizers

All fertilizers will have a series of three numbers displayed prominently on the label. These numbers represent the percentage by weight of nitrogen, phosphorus (as P_2O_5), and potassium (as K_20). For instance, a 24-4-8 fertilizer will have 24% N, 4% P_2O_5, and 8% K_2O. A 46-0-0 fertilizer will have 46% N, 0% P_2O_5, and 0% K_2O.

Though all three elements are important in maintaining a healthy turf stand, N will cause the greatest response. Because of this, most fertilizer recommendations for lawns are listed as lb. N per 1000 ft^2. Nitrogen fertilizers come in two basic forms:

Table 1. Nitrogen forms found on fertilizer bags.

Quick Release N	Slow Release N
Urea	Sulfur Coated Urea (SCU)
Ammonical N (NH_4)	Polymer Coated Urea
Ammonium Nitrate (NH_3NO_3)	Methylene Ureas
	Natural Organics

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quick release (soluble) nitrogen and slow release (insoluble) nitrogen. Quick release nitrogen normally causes a response in a week or less, whereas slow release nitrogen will cause a response in three to 10 weeks or more. Quick release nitrogen is inexpensive and may burn leaf blades if applied improperly. Slow release forms tend to be more expensive but will rarely burn leaf blades even when applied at temperatures above 85°. Both N forms can and should be used on lawns. Examples of slow and quick release N forms are listed in Table 1.

Both forms of N are often blended in one fertilizer bag. This is advantageous because the quick release N gives a response shortly after application and the slow release N results in a more gradual and longer response.

Fertilizing with phosphorus and potassium is also important in maintaining a healthy lawn. The best way to determine how much phosphorus and potassium to apply annually is to follow the recommendations of a soil test (refer to AY-18, Soil Testing for Homelawns). In lieu of a soil test, a general recommendation is to apply 1/4 as much phosphorus and 1/2 as much potassium as nitrogen. For instance, if you apply 4 pounds nitrogen per 1000 ft^2 per year, you should apply 1 pound phosphorus and 2 pounds potassium per 1000 ft^2 per year.

Fertilization Programs

It is best to fertilize lightly in spring and early summer, little to none in summer, and heavy in fall. A heavy fall fertilization program will produce the healthiest turf throughout the year. Applying high rates of N in spring and summer stimulates excess leaf growth at the expense of root growth. Not only does this force you to mow more often, it reduces turf quality during the summer. High rates of spring and summer N can also stimulate disease, weed, and insect activity.

Table 2 lists the Purdue recommendations for lawn fertilization programs. The maximum program is for homeowners who want the greenest lawn, and are also willing to devote considerable time to mowing and irrigation. The minimum program is for those who are satisfied with a less attractive lawn. Keep in mind that the initial seven points in this publication will affect your fertilization program and the rates may need adjusting. The dates listed are for central Indiana, so adjust 10-15 days sooner in spring and later in the fall for southern Indiana, and later in spring and earlier in fall for northern Indiana.

In addition to the applications listed in Table 2, an April application of 0.75 lb. N/ 1000 ft^2 is recommended where no previous November application was made. Preemergence herbicides applied in April are often combined with nitrogen. If you apply a preemergence herbicide that is combined with fertilizer in April, the May fertilizer application should be skipped. Professional lawn care companies may increase the number of applications while decreasing the rate of nitrogen per application. This can give a more gradual feeding of the grass plants and produce a high quality lawn.

How Much Fertilizer to Apply?

It is very important to apply the proper amount of fertilizer to your lawn. The following example explains how to

Table 2. Purdue recommendations for lawn fertilization programs

		Program			Nitrogen Release
Date	lb. N/1000 $ft.^2$	Maximum	Standard	Minimum	Form
September (fall)	1.0	X	X	X	Slow/Quick
November 1-15 (late fall)	1.0-1.5	X	X		Quick
May 15-June 1	1.0	X	X		Slow
July 15-30	0.75	X			Slow

Calculating the pounds of fertilizer to apply

Determining the amount of fertilizer to apply when you are given the fertilizer rate in lbs N/1000 ft^2:

Desired rate in lbs N/1000 ft^2	÷	% nutrient	=	Total fertilizer needed/1000 ft^2
Total fertilizer needed/1000 ft^2	X	Area to be treated in ft^2	=	lbs fertilizer needed to treat the area

For example, how much fertilizer do you need to apply a 16-8-8 fertilizer at 1.25 lbs N/1000 ft^2 to a 5000 ft^2 lawn?

1.25 lbs N/1000 ft^2	÷	.16	=	7.8 lbs 16-8-8/1000 ft^2
7.8 lbs 16-8-8/1000 ft^2	X	5000 ft^2	=	39 lbs 16-8-8 to treat a 5000 ft^2 lawn at 1.25 lb N/1000 ft^2

calculate the proper amount of fertilizer to apply. Additionally, the fertilizer bag will often list the proper spreader setting for your spreader. If the setting is not listed, refer to the later section on "Calibrating a Fertilizer Spreader." Even if your settings are listed, you should calibrate your spreader to make sure it is still accurate. As spreaders get older, settings gradually change because of wear and tear. Regular cleaning and lubrication of the spreader will help it last longer.

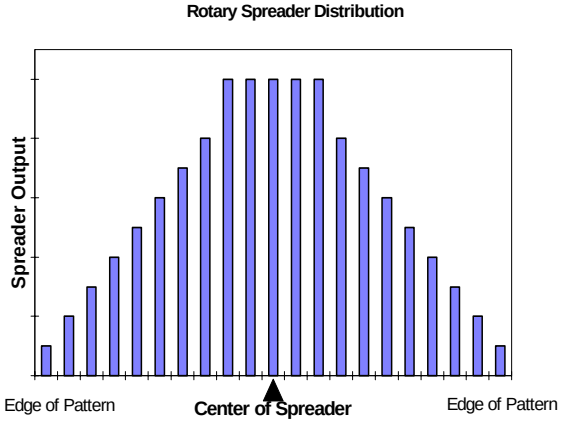
Fertilizer Application

Apply fertilizer uniformly over the lawn. Overlap wheel tracks for drop-type spreaders. For rotary spreaders, apply the fertilizer so the wheel is at the edge of the pattern from the previous pass. Improper spreading of fertilizer will result in "streaking", the alternate dark- and light-green stripes in a lawn. Agricultural type fertilizers (10-10-10, 15-15-15, etc.) that have large particle sizes should not be applied with a drop-type spreader; a rotary spreader should be used. Irrigation or rain following fertilization is important to move nitrogen off the leaf blades and into the soil. Some fertilizer/herbicide combination products cannot be watered-in, so be sure to read the label instructions. Avoid applying fertilizer to drought-stressed or dormant turf, or when temperatures are over 80°F.

Fate of Nitrogen

There is some concern about nitrogen leaching into groundwater or running off into surface water. Research shows that when applied correctly and accurately, nitrogen remains where it is applied. A dense turf canopy prevents water run-off and thus prevents nitrogen from moving across a lawn. The thatch and dense rooting of grass plants absorbs nitrogen and prevents it from moving through the root zone. Be sure to calibrate your spreader, and follow all label instructions on the fertilizer bag to reduce the risk of nitrogen moving away from the target.

More information and mentioned publications are available at www.agry.purdue.edu/turf



The Effective Pattern of a Rotary Spreader

A rotary spreader is different than a drop spreader in that the distribution is not uniform across the width of the pattern. More product lands near the spreader and less product lands near the edge of the pattern. To compensate for this, the spreader must be run so the edge of the pattern is just touching the wheel tracks from the previous pattern. The "effective pattern" is the distance from one edge of the spreader pattern to the center of the spreader. All products and spreaders have a specific effective pattern.

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Calibrating a Rotary Fertilizer Spreader

1. Measure the width of the effective pattern of the spreader: _____ft.
   This is simply the distance from the center of the spreader to the edge of one side of the pattern. See "Effective Pattern of a Rotary Spreader" on the previous page.
2. Measure off a convenient distance to run the spreader: the longer the distance, the more accurate the calibration: _____ft.
3. Multiply number in step 1 by the number in step 2 to calculate the area covered by the spreader: _____ft^2
4. Weigh a portion of the product and dump into spreader: _____lb.
5. Push the spreader over the area previously measured in step 3, being careful to shut the spreader on and off precisely at the beginning and end of the course.
6. Weigh the amount of product left in the spreader: _____lb.
7. Subtract the number in step 6 from the number in step 4. This is the amount of product applied to the area you have measured: _____lb.
8. Divide the number in step 7 by the number in step 3 to gives lb. product per square foot. _____$lb./ft.^2$
9. Multiply the number in step 8 by 1000 to give lb. product/1000 ft^2. _____$lb./1000ft^2$
10. Is this number close to the recommended rate listed on the bag? Adjust the spreader setting and repeat the process until the spreader is applying the recommended rate listed on the bag.

Calibrating a Drop-Type Fertilizer Spreader

1. Measure the distance between the outside holes of the spreader: _____in.
2. Convert this to feet by dividing by 12: _____ft.
3. Measure off a convenient distance to run the spreader: the longer the distance, the more accurate the calibration: _____ft.
4. Multiply the number in step 2 by the number in step 3 to calculate the area covered by the spreader: _____ft^2
5. Weigh a portion of the product and dump into spreader: _____lb.
6. Run the spreader over the area previously measured in step 3, being careful to shut the spreader on and off precisely at the beginning and end of the course.
7. Weigh the amount of product left in the spreader: _____lb.
8. Subtract the number in step 7 from the number in step 5. This is the amount of product applied to the area you have measured: _____lb.
9. Divide the number in step 8 by the number in step 4 to give lb. product per square foot. _____$lb./ft^2$
10. Multiply the number in step 9 by 1000 to give lb. product/1000 $ft.^2$. _____$lb./1000ft^2$
11. Is this number close to the recommended rate listed on the bag? Adjust the spreader setting and repeat the process until the spreader is applying the recommended rate listed on the bag.

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