



Lawn Fertilization

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A well-maintained lawn is an important asset for the homeowner, the community, and the environment. Besides providing a safe place for children to play, lawns increase home market value by as much as 15%, have the cooling capacity of a typical home air conditioner, cleanse air of dust and other pollutants, reduce water runoff during intense rainstorms, and create feelings of serenity. For all of these reasons, the investment recovery value of landscape improvement is 100–200%—well above the 40–70% return rate for structural improvements, such as a deck or patio.

Because grass weakens and even dies if it is undernourished, fertilization is vital to a quality nutrient management program. The first step to developing a nutritional program for your lawn is to assess its fertilizer needs. The best tool for this is soil testing. Taking a good soil sample and having it analyzed by a laboratory is a wise investment. For instructions on how to sample your lawn

and where to send the samples for analysis, visit or call your nearest county Extension office and obtain a copy of Extension publication *Sampling Garden Soils and Turf Areas for Testing* (A2166).

What to expect in your soil test report

A report from a Wisconsin Farm Service Agency-certified soil testing laboratory will tell you the nutritional status of your soil and recommend fertilizer to improve and maintain your lawn's nutrition. The report includes information on types of fertilizers to purchase and when to apply them. The rates recommended reflect those in the fertilizer manufacturers' guidelines listed on the bag. These guidelines tell you what setting to use for your brand and model of fertilizer spreader. Following the spreader setting listed on the back of the fertilizer bag will eliminate the need for calibrating your fertilizer spreader. If directions don't appear on the bag, consider selecting a brand that provides this information.

When you submit soil samples for analysis, indicate if you have an established lawn or if you want to establish one. Recommendations for established or new lawns can differ greatly.

The fertilizer and lime recommendations are designed to be environmentally friendly. Nutrient recommendations adopt a gradual buildup approach for soils with inadequate levels of phosphorus and potassium. This means that adding common turf fertilizers at recommended rates will slowly increase phosphorus and potassium levels to an optimum level for good turf growth. The fertilizers required are available in any well-stocked lawn and garden center.



Phosphorus and potassium recommendations

Wisconsin law prohibits applying phosphorus to your lawn unless your soil test indicates a need for phosphorus or you are establishing a new lawn. While organic phosphorus is not necessarily environmentally safer than inorganic, state law permits application of some types of organic phosphorus. However, local ordinances may not permit any phosphorus (including organic sources).

For new lawns or lawns with low phosphorus, apply a starter fertilizer. Starter fertilizers contain a high percentage of phosphate, and their use gradually increases the amount of phosphorus in the soil. When you need to increase soil potassium levels, use the same approach. But in this case, “late season” or “winterizer” turf fertilizers are recommended. These fertilizers generally contain more potassium than turfgrass needs, so applying them gradually increases the amount of potassium in the soil. This potassium remains available for plant use in the future. Despite the name, these fertilizers can be used at any point during the growing season.

In Wisconsin, the levels of phosphorus and potassium are often adequate or high. In these instances, the recommendation is to apply any “normal” turf fertilizer. Such fertilizers typically contain only small amounts of potassium and no phosphorus. Long-term application of these fertilizers eventually reduces soil test levels of these nutrients. Allowing high soil phosphorus levels to decrease is an environmentally sound management practice. However, you do not want the soil phosphorus and potassium levels to decrease too much, so re-testing of lawn soils every 2–3 years is recommended.

Lime recommendations based on soil pH

Soil testing also measures soil pH, an indication of the acidity or alkalinity of your soil. The lower the soil pH, the more acidic it is. If the pH is determined to be too low for quality turf, use lime to neutralize some of the acidity in the soil. Lime applications are only recommended if the pH is extremely low since grasses adapted to Wisconsin survive quite well in moderately acidic soils. In addition, some parts of the state have hard water containing sufficient calcium and magnesium so that lawn irrigation can increase the soil pH. This is why older lawns in many parts of the state often have soil pH values in the range of 7.4–7.8, or even higher. Generally, turf will grow well even if soil pH is high. Therefore, no treatment will be recommended to lower soil pH.

Guidelines for purchasing lime and fertilizer

Types of lime

Lime is ground limestone. Its solubility in water is very low. To speed up its reaction with soil acidity, the lime needs to be finely ground. The fineness of grind is indicated by its “neutralizing index”; the higher the index, the finer the grind. Lime with a neutralizing index of 60–69 is too coarse for turf. Try to purchase a lime with a neutralizing index of 80–89 or higher.

Types of fertilizers

Nitrogen is the key nutrient for maintaining quality lawns once phosphorus and potassium are at optimum levels. Effective use of nitrogen involves four considerations: the type of fertilizer nitrogen to be applied, the amount applied at any one time, the time of application, and the number of applications per season.

Nitrogen fertilizers are divided into two groups—those that dissolve in water (soluble) and those that do not dissolve in water (insoluble). Urea and ammonium sulfate are examples of water-soluble nitrogen fertilizers. These fertilizers completely dissolve in water and move quickly into the root zone of grass, where the nitrogen is rapidly taken up by the plants. This results in a quick greening of turf and a spurt of growth that lasts 3–4 weeks.

With water-insoluble fertilizers, the nitrogen is slowly released to the grass over time rather than all at once. These slow-release or timed-release nitrogen fertilizers take longer to green up grass, but the grass growth rate is more uniform and the response to the fertilizer can be seen for 8 weeks or more.

Most fertilizers contain a combination of water-soluble and water-insoluble nitrogen. Law requires that the percentages of the two forms of nitrogen be listed on the fertilizer bag. Look for a fertilizer in which about $\frac{1}{4}$ – $\frac{1}{2}$ of the nitrogen is water insoluble. These fertilizers contain enough water-soluble nitrogen to give rapid color improvement and enough water-insoluble nitrogen to provide reasonably uniform growth over a period of several weeks.

Avoid using turf fertilizers containing only water-soluble nitrogen. While these fertilizers are inexpensive because of low manufacturing cost, they cause excessive and relatively short-term growth, and they temporarily load up soil with nitrate-nitrogen. Heavy rains can cause nitrate-nitrogen to leach from coarse texture soils, potentially reaching groundwater. Use of slow-release nitrogen minimizes contamination of groundwater.

One of the selling points for some turf fertilizers is that they contain iron and other micronutrients. There have been no confirmed instances of iron or micronutrient deficiencies in Wisconsin lawns. The presence or absence of these nutrients in a turf fertilizer should not be the deciding factor in the kind of fertilizer purchased.

Applying lime and fertilizer

New lawn establishment

The ideal time for liming lawns is at the time of establishment. This allows for a one-time application of the full amount of lime recommended and for mixing of the lime with the soil. Mixing lime with soil at the time of turf establishment greatly speeds up reaction of the lime with soil acidity. After only 1 or 2 years, most of the turfgrass rooting zone will reach its optimum pH. By contrast, lime must be applied to the surface of established lawns. This limits soil contact and considerably increases the time it takes to achieve the same pH change. You must calibrate your spreader to ensure the proper rate of lime application. For instructions, see Extension publication *Calibrating and Using Lawn Fertilizer and Lime Spreaders* (A2306).

Once the lime is spread, thoroughly mix it with the top 4–6 inches of soil. This is best accomplished with a rototiller. Level the soil with a rake and apply lawn “starter” fertilizer according to the instructions on your soil test report. Rake the starter fertilizer into the top 1/2 inch of soil and smooth the soil surface in preparation for seeding or sodding.

Newly established lawns should be started on a maintenance fertilization program as soon as they are ready. For lawns established from seed, the transition should begin after the grass is mowed 2–3 times at the height at which it will be maintained. The recommended cutting height is 3 inches. Mow grass seedlings as soon as they reach this

height. Sodded lawns should be placed on a regular maintenance fertilization program within 3–4 weeks after the sod is laid. As with seeded lawns, sodded lawns should be mowed as soon as the grass exceeds 3 inches.

Maintenance of established lawns

Lime should be applied to established turf only if recommended on the soil test report. Apply no more than 50 lb of lime per 1,000 sq ft at any one time to established lawns. If your soil test report recommends more than this amount, split the recommended amount into two or more applications that do not exceed the 50-lb rate. Applying lime at a higher rate may burn the grass. You can also minimize the risk of injury to the grass by applying the lime in early spring or late fall when the grass is dormant or by watering the lawn for 30 minutes following application to wash the lime off the grass blades.

For best results, use a mulching mower to return the clippings to your lawn. This practice reduces the nitrogen fertilizer requirement by at least 25%. If you elect to bag clippings, you will likely need to fertilize more often to get the same results. You will achieve the best results with mulch-mowed lawns by fertilizing in late May (Memorial Day), early July (Independence Day), and early September (Labor Day). An organic-based fertilizer, or a fertilizer with a high percentage of slow-release nitrogen, is a good choice for July when conditions can be too hot or too dry for a primarily soluble fertilizer. Make sure to always follow the application instructions on the bag. In following these recommendations you will be applying approximately 3 lb of nitrogen per 1,000 sq ft. For most lawns, this is the amount of nitrogen required to maintain quality turf. However, some situations do not require this amount of nitrogen.

Shaded lawns

The first situation calling for reduced nitrogen rates arises in heavily shaded lawns or shaded parts of lawns. The turfgrasses of choice for shaded areas are the fine-leaved fescues. Of all the turfgrasses adapted to Wisconsin, these are the most shade-tolerant. Fine-leaved fescues not only require less nitrogen than grasses such as Kentucky bluegrass, but actually decline in quality if too much nitrogen is applied.

Where fine-leaved fescues are being grown, the annual rate of nitrogen application should not exceed 2 lb per 1,000 sq ft. This reduction in nitrogen can be accomplished two ways. One is to apply nitrogen four times per year, but calibrate the spreader to apply only half of the recommended rate for each application. An equally effective approach is to eliminate the July fertilizer application.

Older lawns

Lawns that have been consistently fertilized for 10–15 years have a reduced requirement for nitrogen fertilizer. Research has shown that these lawns are likely to contain enough organic nitrogen in the soil to sustain high quality lawns with only half the amount of fertilizer. If your lawn falls under this category, consider fertilizing in May and September only.

Lawns where clippings are collected

A situation that calls for more than 3 lb of nitrogen per season is where the grass clippings are removed from the lawn. In this case, an extra fertilizer application in early October may be necessary to replace the nitrogen lost by removing the grass clippings. Bagging clippings is not a recommended practice, especially since newer mulch mowers so finely chop grass blades that they are unnoticeable even immediately after mowing.

Unless a rain shower is likely to occur shortly after fertilization or you've elected to apply a weed-and-feed fertilizer containing herbicide, irrigate your lawn for 30 minutes or more after the fertilizer is applied. This practice increases the effectiveness of the fertilizer, minimizes the chance for fertilizer burn, and dramatically reduces the potential for runoff or leaching loss of the fertilizer should an intense storm occur within 1–2 days after fertilization.

Other management practices

Fertilization is but one element of a total management package. Failure to use proper mowing practices; to keep weeds, insects or diseases in check; or to water your lawn wisely negates many of fertilization's benefits. For advice on these practices, see Extension publications *Lawn Establishment and Renovation* (A3434), *Lawn Maintenance* (A3435), and *Lawn Weed Prevention and Control* (A1990).

Lawn fertilization and the environment

Home lawns account for some 70% of the more than 350,000 acres of managed turfgrass in Wisconsin. These numbers suggest that home lawns may contribute to nitrogen and phosphorus in our lakes and streams and to nitrate-nitrogen in groundwater. Years of university research have demonstrated that properly fertilized lawns have considerably less water runoff and nutrient loss than many fields planted with agricultural crops. However, precautionary measures need to be taken to make sure that the nutrient loss from home lawns remains low.

Here are some simple steps to minimize nutrient runoff from your lawn:

1. Fertilize your lawn every year.

University of Wisconsin research shows that even a single season without fertilization can reduce grass stand density, increasing water runoff by as much as 70%.

2. Select fertilizers with at least 25-50% of slow-release nitrogen.

This reduces the amount of soluble nitrogen in the soil that is available for runoff and leaching.

3. Sweep up spilled fertilizer. No matter how much care is taken when fertilizing lawns, some inevitably lands on sidewalks, driveways, or in the street. Failure to sweep up spilled fertilizer guarantees that much of it will eventually enter lakes and streams via storm water.

4. Water lawns after applying fertilizer. This practice increases the fertilizer's effectiveness and greatly reduces the potential for nutrient losses during the time of year when short-duration, intense rainstorms are common.



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