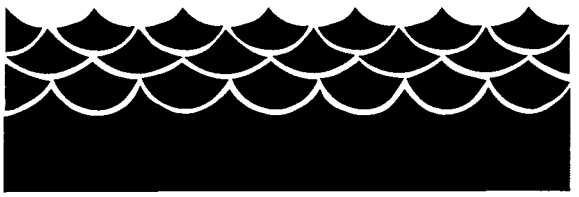
TURFGRASS MANAGEMENT
FOR PROTECTING SURFACE WATER QUALITY



Nitrogen Fertilizer Use for Lawns

Few soils have enough natural nitrogen (N) to maintain desired turfgrass quality and recuperative ability throughout the growing season. Nitrogen shortages can cause slow growth, yellowing of the plants, thinning out of the turf, and increased incidence of some diseases. However, excessively high levels of N can lead to excessive shoot and leaf growth, reduced root growth, low plant carbohydrate (food) reserves, increased susceptibility to environmental stresses, and some diseases. A primary consideration in using N fertilizers responsibly is to match the site conditions and the desired maintenance program with the proper N fertilizer sources.

Nitrogen fertilizer sources

Nitrogen fertilizer sources are often categorized as inorganic types or organic types. A brief description of several N sources is given in Table 1.

MINNESOTA EXTENSION SERVICE
UNIVERSITY OF MINNESOTA
AGRICULTURE

CLEAN WATER

Inorganic fertilizers such as ammonium nitrate and ammonium sulfate are all water soluble or quick release N sources. That is, N becomes available as soon as water is applied to the turf. These ferilizers respond quickly and results are fairly immediate. However, their burn potential is quite high and the effects are rather short lived. On sandy soils, high application rates of these products combined with high irrigation or rainfall amounts may result in higher N losses due to leaching. Leaching is the movement of water and possibly nutrients down into and potentially beyond the turfgrass root zone. Once beyond the root zone, nitrates can continue moving through the soil and may find their way into water sources.

Organic fertilizer products, natural or synthetic, contain carbon (C) in their chemical structure. Nitrogen from natural organic sources becomes available only after the product begins to breakdown due to soil microbial action. These are considered slow-release N sources as N is gradually released to the soil and becomes available for plant use. Soil temperature and moisture are key factors governing the microbial activity and thereby the N release. Compared to quick-release sources, slow-release N sources have a lower leaf-burn potential and can be applied at slightly higher rates without damaging the turf.

The primary synthetic organic fertilizer product is urea. It is considered a quick-release N product with a relatively high leaf burn potential. Urea has been further processed and/or combined with other materials giving organic fertilizer products more or less of a slow-release characteristic. The N released from these slow-release N products depends on soil chemical and/or microbial action, has a fairly low-leaf burn potential, and can be applied at slightly higher rates than quick-release N sources.

Nitrogen fertilizer use

The amount of N required by turfgrass depends on the type of grasses present and the management practices used. High maintenance lawns often contain the more vigorous, improved Kentucky bluegrass and turf-type perennial ryegrass varieties. These lawns will perform better when adequate water and fertilizer are regulary provided. Low maintenance lawns usually consist of common types of bluegrass in combination with a mixture of other grasses. These lawns grow and spread more slowly and usually receive little extra water or N fertilizer. Table 2 describes the annual application of N requirements for these lawn types and how clippings left on the lawn impact yearly N requirements.

On highly leachable soils—sands, and sandy loams, the above recommended N application rates may result in excessive loss of nitrate-N, a mobile form of N in the soil, due to leaching. Where soluble N sources are used on these soil types, reducing the N rates to 1/4 to 1/2 lb. N/ 1,000 ft2 per application may minimize potential nitrate-N leaching. If frequent, lower N rate applications are not practical, slow-release N sources may be a better choice for these soils. This practice is adaptable to late season N fertilization and may be especially true where sandy soils are in close proximity to surface water or groundwater.

Watering practices that result in water movement beyond the root zone may increase potential nitrate-N leaching. Frequent, daily irrigation during cool moist periods increases the potential for leaching. Irrigation practices that take into consideration the grass plant's needs during any particular climate condition are more effective. Adding enough water to compensate for that removed by plant uptake and evaporation minimizes potential N pollution problems from leaching. Sloped areas may require more frequent but smaller amounts of water per application. They are more vulnerable to runoff before ample water has infiltrated into the soil.

Irrigation of 1/4 to 1/2 inch of water immediately after applying a quick-release N source helps move the N into the surface soil where it can be used by the grass plant. Also, the N will be protected from runoff and possible volatilization back to the atmosphere.

Table 1

Characteristics of Common Turfgrass N Sources

Fertilizer Source	N content %	Leaching potentiial	Burn potential	Low temp. repsonse	Residual effect
Inorganic					
Ammonium nitrate	33–34	High	High	Rapid	Short
Calcium nitrate	16	High	High	Rapid	Short
Ammonium sulfate	21	High	High	Rapid	Short
Organic – Natural					
Activated sewage sludge	6	Very low	Very low	Very low	Long
Manures	3–10	Very low	Very low	Very low	Long
Other natural products	3–10	Very low	Very low	Very low	Long
Organic – Synthetic					
Urea	45–46	Moderate	High	Rapid	Short
Urea solutions	12–14	Moderate	High	Rapid	Short
Sulfur-coated urea	22–37	Low	Low	Moderate	Moderate
Resin-coated urea	24–35	Low	Low	Moderate	Med-Long
Isobutylidene diurea (IBDU)	31	Mod. Low	Low	Moderate	Moderate
Methylene ureas & Ureaformaldehyde *	38	Low	Low	Very Low	Moderate to long

* Some products may contain urea in addition to the ureaformaldehyde component.

Grass clippings should be left on the lawn area to decompose and recycle nutrients back to the turf area. They should not be blown or raked into street gutters or onto sidewalks and driveways where they may be carried with runoff water to surface water. Nutrients released in water through decomposition may cause undesirable algae and vegetative growth.

NEVER apply N fertilizers to water resources directly or apply them to frozen ground.

Nitrogen fertilizer product knowledge and being familiar with the site may minimize or even eliminate potential adverse impacts on water quality. In addition, always follow manufacturer guidelines or consult with local extension turf specialists for appropriate application rates.

Table 2

Annual Nitrogen Requirements and Application Timing for Lawns in the Upper Midwest

Maintenance Practices	Nitrogen (N) to apply lbs. N/1000 ft²	Timing of Applications*
High maintenance lawn		
(Irrigation, clippings removed)	4	May – June, Aug., Sept., Oct.– Nov.
(Irrigation, clippings not removed)	3	May–June, Aug., Oct. – Nov.
Low maintenance lawn		
(No irrigation, clippings removed)	2	Aug., Oct. – Nov.
(No irrigation, clippings not removed)	1	September

* Assume 1 lb. N/1000 ft² of a soluble, quick-release N source applied at each application.

Note: Lower, more frequent rates of a quick-release N fertilizer can be used on sandy to sandy loam soil. Slow-release N fertilizers could also be substituted for the quick-release types. Follow manufacturers' and/or Extension suggestions for proper application rates.

For additional information regarding the responsible use of lawn fertilizers and pesticides to protect surface water quality, see the following publications, available at county extension offices.

Turfgrass Management Practices for Protecting Surface Water Quality, AG-BU-5726-E
Lawn Care Practices to Reduce the Need for Fertilizers and Pesticides, AG-FO-5890-B.
Using Lawn Fertilizers and Pesticides Responsibly, AG-FO-5889-B.
Responsible Use of Lawn Care Pesticides, AG-FO-5891-B
Phosphorus Management Practices for Lawns, AG-FO-5892-B

Printed on recycled paper with agribased inks

A joint publication of the Minnesota Extension Service, University of Minnesota, and Iowa State University Extension.

Prepared by Robert J. Mugaas, Hennepin County Extension horticulturist, University of Minnesota; Michael L. Agnew, Extension horticulturist-turf; and Nick E. Christians, professor of horticulture, Iowa State University.

This material is based upon work supported by the U.S. Department of Agriculture, Extension Service, under special project number 91-EWQI-1-9265.