Late fall fertilizing and groundwater quality

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The late fall period is becoming both an extremely popular and important time to apply a nitrogen fertilizer to cool-season turfgrass. Considerable research has been done at Ohio State University (see Feb. 1988 LANDSCAPE MANAGEMENT) on the response of turfgrass to late fall-applied N.

In general, it has been shown that there is improved late fall, winter and spring color over spring and summer N application. Also, spring root growth is enhanced by late fall N applications.

To date, the only negative aspect is a slightly higher potential for thatch development. This is thought to be a result of the increased rooting associated with late fall N application.

When one considers the environmental impact of late fall-applied N, there is one major point to consider. Potentially, this could be the worst time of the year to fertilize in terms of having a negative impact on groundwater quality. That is, if the following factors are true.

1. For your location, does the greatest amount of water reaching groundwater (referred to as recharge) occur from precipitation in late fall, winter or early spring?

2. Cool and cold temperatures of this period related to limited plant uptake of N.

3. With cool soil temperatures, there is little chance of gaseous N loss by either ammonium volatilization or denitrification.

When all three conditions are found, nitrate leaching potential is very high. There are areas of the country where these conditions naturally occur, such as the cool-season zone of the Atlantic Coastal Plains.

Also, any inland site on sandy soils could potentially be considered part of the problem areas. A perfect example of a location with these conditions is Long Island, N.Y.

Research continues

A research project was initiated in the fall of 1985 to study the impact of late fall-applied N on groundwater quality. Two sites on Long Island, N.Y., were chosen for this experiment.

The first site was St. Charles Cemetery in Pinelawn, which was established in 1982 as a mixture of Kentucky bluegrass (Adelphi and Glade) and perennial ryegrass (Citation, Manhattan and Derby).

The second site was at the Long Island Horticultural Research Laboratory in Riverhead, which contained three cultivars of Kentucky bluegrass seeded in 1980. After establishment, little or no N was applied to either site. The surface soils at each site were sandy loams; however, the subsoil at the St. Charles site was considerably more gravelly.

In November of 1985 and 1986, ion exchange resin bags were buried about 12 inches below the surface or below the depth of rooting.

Generally, it is believed that once nitrogen has gone deeper than the root zone, it will eventually end up in groundwater. This is especially true for the fall, winter and spring period because little or no water will move up from below the root zone.

Each November, six different N sources were applied at a rate of 2 lbs. N/1000 sq.ft. The following April, the ion exchange bags were removed and the amount of nitrate collected was determined. With collecting nitrate on an area basis, the information presented can be related to the percent of N applied.

The percent of fertilizer N applied that leached as nitrates passed the root zone.

Nitrogen Source	Manufacturer	Long Island, NY Location	
		Pinelawn	Riverhead
		% fertilizer N that leached	
Sulfur-coated urea	Scotts	21	14
Ureaformaldehyde	Noram	1	3
Plastic-coated urea (150D)	Estech	0	0
Activated sewage sludge	Milorganite	2	2
Flowable ureaformaldehyde	Cleary	9	5
Urea		42	27

The results

In the table with this update are the results averaged over the two years of the study. These results revealed that the highly water soluble N source urea was suspect to considerable leaching, especially at the Pinelawn location. However, slowly available N sources of ureaformaldehyde, plastic-coated ureas and activated sewage sludge had little or no potential for nitrate leaching. The other N sources—sulfur-coated ureas and flowable ureaformaldehyde—were intermediate in nitrate leaching potential.

Conclusions

From these results, several conclusions can be drawn.

- Applying a highly water soluble N source at a high rate in late fall can result in considerable nitrate leaching. As pointed out before, this could be a "worst case scenario."
- The degree of leaching is very manageable based on the source of N used (i.e. less leaching with slow release sources).
- Factors found at each site affect the degree of leaching. The factors that were different between Pinelawn and Riverhead were grass species used, soil type of the subsoil and possibly climatic factors, like the amount of precipitation. At this point, which one(s) responsible can only be speculated on.

The general concern over the protection of groundwater quality is important to all turfgrass managers. The results of this project show that there is potential for groundwater contamination. However, as managers, you have options available to reduce or eliminate any nitrate leaching from late fall applied N. **LM**