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Note;
The article below mentions the gaseous loss of nitrogen from dry hot-spots. In desert turf, this is equivalent to the weak spots in an irrigation pattern or tops of mounds. In other words, where you are in greatest need of plant growth, the nitrogen presence is the least.

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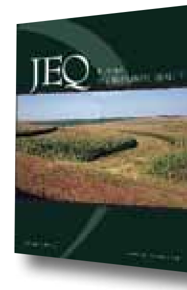
Society Science

Measuring the Fate of Nitrogen Fertilizer Applied to Home Lawns



We know that nitrogen fertilizer from farm fields can end up in aquatic ecosystems, leading to water quality problems, including toxic algal blooms, fisheries declines, and underwater "dead zones." It can also end up in the atmosphere through the process of denitrification when it is converted from nitrate to inert N_2 gas or nitrous oxide (a powerful greenhouse gas). There is concern that fertilizer use in lawns may contribute to these problems, too. Nitrate is a major component of lawn fertilizer, and lawns in the United States cover an area almost as large as Florida, making turfgrass one of our largest "crops."

Scientists have conducted nitrogen input–output studies on lawns to figure out how much nitrogen is taken up by vegetation or deposited in soils and how much is lost. Unfortunately, in many cases, these nitrogen budgets have not always balanced, and the "missing" nitrogen has usually been attributed to denitrification. While the factors that lead to denitrification are well known (e.g., high soil moisture, low soil oxygen, and sufficient nitrogen availability), it has been notoriously difficult to measure this process outside of the laboratory. Denitrification occurs mostly in small areas (hotspots) during brief time periods (hot moments), making it hard to pinpoint peak activity. Also, because the atmosphere is mostly N_2 gas, it has been difficult to detect the N_2 that is produced by denitrification.

In a new study published in the November–December 2011 issue of the *Journal of Environmental Quality*, a team of researchers from Cornell University and the Cary Institute of Ecosystem Studies was able to overcome these challenges to measure rates of denitrification from residential lawns in Baltimore, MD. Their findings suggest that denitrification is an important pathway for removing excess nitrogen from lawns. Nitrogen removals by denitrification (largely in the form of N_2 gas) were equivalent to 15% of annual fertilizer inputs to the study lawns. Most of this nitrogen removal occurred over a small part of the year when soil conditions were most favorable to high rates of denitrification. Most of the remainder of fertilizer N inputs was retained in lawn soils with small amounts being transported to groundwater and streams.

This news is encouraging, the researchers say, but caution that more work needs to be done before their results can be applied to a wider range of soil, climatic, and lawn management conditions. Further, while most of the measured nitrogen losses from denitrification were in the form of N_2 gas, their results suggest the possibility for significant losses as nitrous oxide (N_2O), which is as a greenhouse gas, is more potent than carbon dioxide (CO_2). Finally, continuing excessive fertilizer applications is likely in the long run to saturate soil storage capacity, eventually resulting in transport to surface and ground water.

Adapted from Raciti, A.M., A.J. Burgin, P.M. Groffman, D.N. Lewis, and T.J. Fahey. 2011. Denitrification in suburban lawn soils. 2011. J. Environ. Qual. 40:1932–1940. View the full article online at www.agronomy.org/publications/jeq/tocs/40/6

In the state of Maryland, where this aerial photo was taken, approximately 10% of the terrestrial surface area is covered by turfgrass. If we are to predict the implications of development on water quality, it is critical that we understand the role of lawns in ecosystem processes. *Photo by Emerge Inc., under contract with the U.S. Forest Service.*