Scanning the Journals

Nitrogen and Amphibians: A Closer Look

The turfgrass industry, similar to most agricultural production systems has become increasingly aware of the potential for inputs such as fertilizer nutrients and pesticides to influence the environment. Millions of dollars have been invested to research the environmental fate of applied chemicals. These studies attempt to determine the role that specific management practice may play in minimizing off-site movement and often use established EPA concentrations to evaluate success. In general, these levels are established from toxicological research that determines concentrations that might cause human health concerns. But what if the levels we have been using were harmful to other species vital to aquatic ecosystems?

Environmental researchers from Canada recently published an assessment of nitrogen pollution affects on amphibians. The paper is a review of available water quality information for the Great Lakes region of the US and Canada. Of the over 8,000 water quality samples collected in areas surrounding the Great Lakes, 20% of them were found to have concentrations that cause sublethal effects in amphibians. Nitrate levels, as low as 2.5 ppm, have been shown to affect amphibians (background levels in temperate regions are assumed to be less than 3 ppm).

The nitrate in the water appears to disturb the digestive process in tadpoles in a way similar to the mechanism in humans. The nitrate is converted by the bacteria in the babies' gut and then severely restricts the blood's ability to become oxygenated. There is a significant lack of information available on the toxicity levels relative to the different amphibian species, including influence on the predators and prey.

The review did not point the finger at the turfgrass industry, but rather to understand the influence of wastewater treatment, livestock, precipitation, and fertilizers on nitrate pollution. Clearly, as major users of fertilizers for turfgrass areas, whether it is home lawns or golf courses, we must be aware of best management practices to minimize off-site movement. In addition, turf has a place as a potential vegetative buffer and biofiltration system to protect sensitive aquatic habitats. Now is the time to think about this bigger picture before another crisis occurs.

From: Rouse, J.D., C.A. Bishop, and J. Struger. 1999. Nitrogen Pollution: An assessment of its threat to amphibian survival. Environmental Health Perspectives, 107:799-803.

Copper and Turf Growth

Copper is considered a minor element in plant nutrition because it is found in relatively low concentrations in plant tissue. However, while low levels might be required, it is considered an essential element that can become toxic to plants. Recently, the interest in using fertilizers containing copper and copper-based fungicides combined with the relative immobility and potential to accumulate in the soil, has raised questions regarding toxicity.

Researchers at Iowa State University investigated the influence of increasing copper concentrations supplied by cupric sulfate to sand rootzones of differing pH in the greenhouse. Creeping bentgrass clipping weights from plants growing in the calcareous sand (pH 7.3) was not inhibited at copper concentrations as high 600 ppm, as compared to plants growing in silica sand (pH 6.8) which were reduced 16%. Root growth decreased in both sands, but interestingly while a significant amount of copper was applied, less than 1% was taken up by the plant regardless of pH. Clearly, the inhibitory effect of copper is more evident in examining root growth as opposed to shoot growth.

The final aspect of the study was to evaluate the use of the DPTA-TEA extraction method for analyzing soil copper levels. The role of this test was to determine the amount of plant-available copper to indicate what a plant may absorb. The researchers concluded that based on the accumulation of copper in root tissue regardless of pH, the DPTA-TEA test did not provide an accurate assessment of the potential for copper availability. Therefore, as we continue to include more copper-based materials into turfgrass management, we must be aware of soil pH, root growth and root tissue content, and realize that current soil testing procedures may not accurately assess the risk for copper toxicity.

From: Faust, M.B. and N.E. Christians. 2000. Copper reduces shoot growth and root development of creeping bentgrass. Crop Sci. 40:498-502.

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