



# Following BMPs to Reduce Nitrate Leaching Can Offer Legal Protection

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**B**ecause of concern about nitrate-nitrogen ( $\text{NO}_3\text{-N}$ ) contamination of groundwater, the Florida Department of Agriculture and Consumer Services and the Florida Department of Environmental Regulation have a joint program that is funded by a 50-cents-per-ton tax on nitrogen fertilizer. The legislation authorizing the program is commonly referred to as the "Nitrate Bill."

Nitrate-nitrogen can cause methemoglobinemia, which can lead to impairment of oxygen transport in the blood stream ("Accumulation of Nitrate," National Academy of Sciences, Washington, DC, 1972). It is mainly a problem in infants under three months age, causing the "blue baby disease."

The problem has seldom occurred in modern times here in the United States. It is easily diagnosed and treated. Infants can ingest high levels of nitrate in a number of ways, such as by drinking concentrated vegetable juices, eating fish and meats cured with nitrates and by drinking milk formulas prepared with water containing excessive nitrate.

To prevent the latter, many years ago the U.S. Public Health Service set a drinking water standard of 10 mg/L (ppm) for nitrate-nitrogen. Virtually all water treatment facilities are subject to this standard for drinking water and the state of

Florida intends to keep groundwater at or below this level.

The Department of Environmental Protection has the authority to level penalties against those it finds guilty of nitrate pollution of groundwater. Money collected from the Nitrate Bill is used to fund research aimed at minimizing nitrate leaching in agricultural enterprises and to develop Best Management Prac-

seems that following the BMPs could prevent expensive legal problems in the future.

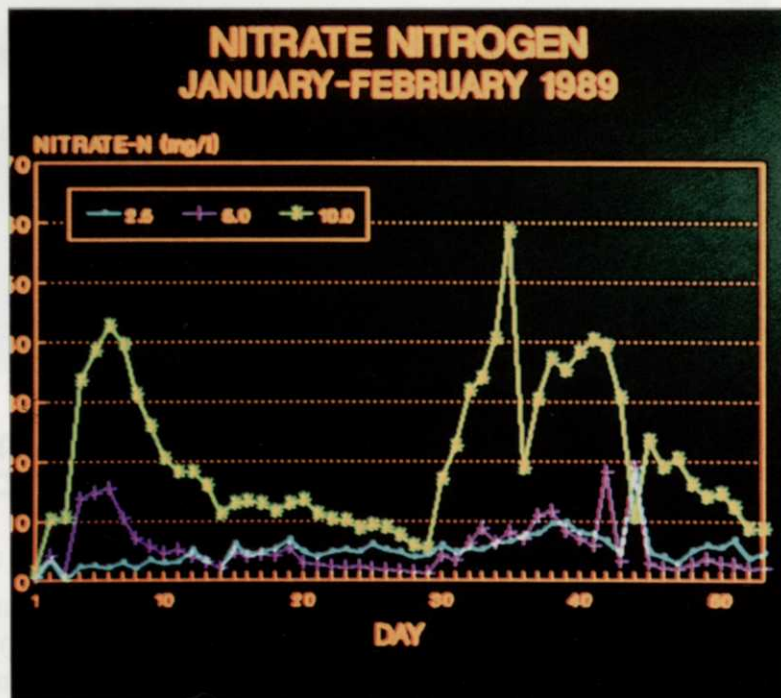
Fortunately, considerable research already has been conducted in Florida on the subject of nitrogen leaching in turfgrass and the work is continuing. In recognition of this, FDACS funded Drs. Snyder and Cisar to compile the scientific literature pertinent to nitrogen leaching

in turfgrass, develop BMPs and IMs where appropriate and develop a list of research priorities to obtain information that is lacking for the further development of BMPs.

The literature compilation is nearly complete. Over 100 scientific articles have been entered into a computerized database with key words for searching out specific topics. Hard copies of the associated papers are on file.

The first draft of proposed BMPs for established golf courses is complete. Drs. Snyder and Cisar are beginning to present these proposals to various golf course industry groups for their

reaction. With some modifications, these general proposals likely will be considered for other turfgrass uses. This article in the *Florida Green* is written to present the proposed BMPs to a wide array of turfgrass professionals for their consideration and comment. The final report will be made to FDACS in the fall. Questions, suggestions, arguments and other comments will be appreciated and should be directed to either Dr. Snyder or Dr. Cisar. It must be emphasized that the following are



Keeping soluble N application rates at or less than 0.5 lbs. N/1000 sq. ft. kept nitrate levels in perolate below 10 ppm Nitrate-N. Photo by G. Snyder.

tics for achieving this objective. The BMPs must, however, be supported by research. Suggested practices for which research is incomplete are known as Interim Measures.

The Nitrate Bill does not mandate that the BMPs be followed. However, those who can present credible evidence that they are adhering to the BMPs will not be prosecuted by the FDEP, even if excessive nitrates (greater than 10 mg/L) are found in groundwater below or emanating from their property. It certainly

## BMPs For Minimizing Nitrate-Nitrogen Leaching in Golf Course Turf

**OVERVIEW.** The principle factors that can be implemented to minimize nitrate-nitrogen leaching on golf courses are 1) nitrogen rates, 2) nitrogen sources, 3) methods of application, 4) irrigation practices, and 5) enhancement of root growth and activity. Some of these factors are interrelated.

### SPECIFIC PROPOSALS

#### NITROGEN RATES

(All fertilization rates are presented as pounds of nitrogen per 1000 square feet. Multiply by 43.56 to convert to pounds per acre)

- A. Nitrogen fertilization of greens and tees should not exceed 2, and that for fairways and roughs should not exceed 1 of nitrogen that will become available in any given month.
- B. Water-soluble nitrogen should not exceed 0.5 per application.
- C. Nitrogen in irrigation water, such as that in effluent, should be credited towards the maximum monthly allowance.

#### NITROGEN SOURCES

- A. Controlled-release nitrogen sources should be used when more than 0.5 needs to be applied in a single application. These sources may be indicated on the Florida fertilizer label as 'water-insoluble nitrogen,' or as 'controlled-release' nitrogen.

#### METHODS OF APPLICATION

- A. Fertigation may be used to apply small amounts (less than 0.5) of nitrogen on a frequent basis.
- B. Nitrogen may be applied in sprays either for foliar applications or for ground applications, but the rate of nitrogen application should not exceed 0.5.

#### IRRIGATION PRACTICES

- A. Irrigation amounts should not exceed the amount needed to restore soil moisture to field capacity, plus the percent irrigation efficiency of the irrigation system in use.

#### ENHANCEMENT OF ROOT GROWTH AND ACTIVITY

- A. Cultural practices should be employed to enhance turfgrass root systems, within the confines of desired turfgrass playability and legal use of agrochemical. Root-damaging conditions to be avoided include soil compaction, soil layering (including excessive thatch), poor aeration, root-feeding insects and nematodes, root diseases, inadequate soil depth and localized dry spots.

#### DIRECT COMMENTS, SUGGESTIONS AND QUESTIONS:

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first-draft proposals, some of which may be changed in the final presentation to FDACS.



Controlled and slow release N sources help reduce N leaching. Photo by G.Snyder.

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## Fairy Ring Experiment Pays Off at Sun 'n Lake

If the members at Sun 'n Lake Golf Club in Sebring hadn't already experienced problems with fairy ring, they may not have agreed to participate in a fairy ring experiment the winter of 1996. The club rebuilt the front-nine greens of the original 18-hole course in late summer of 1995 and began having problems with fairy ring in February 1996.

"We stripped the greens, reshaped them and cored them down to 12 inches," says Mark Hopkins, golf course superintendent for the past 8-1/2 years. "Then we brought in an 85/15 sand and Canadian peat mixture. Since we sit right on top of a sand hill, we didn't feel we needed any more drainage. But fairy ring most often attacks sand-based greens."

When fairy ring began popping up,

some of the Sun 'n Lake members first thought improper mowing procedures were causing the problem. But Hopkins launched an educational effort, posting information from the USGA about the disease on the club bulletin board and working to dispel the rumors about the brown, unsightly rings. Hopkins tried everything he could think of to control the problem: wetting agents, extra water and fungicides. He finally used the curative rate of ProStar® 50WP Fungicide and the problem cleared up within two weeks.



Golfers putt on practice green with fairy ring at Sun 'N Lake Golf Club in Sebring. Photo by Bob Hickman.

### Splitting Greens Down the Middle

Before rebuilding the back-nine greens, Hopkins talked to the greens committee and other club members to discuss what he wanted to do. He suggested

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applying ProStar® on half of each green at a preventive rate, as a test plot to see how well the fungicide controlled the fairy ring he knew would appear. "It's hard to get a golf course to split greens in half as an experiment," notes Hopkins. "But they knew we had to do something. Luckily, they got to see firsthand how well the product worked."

The greens were rebuilt and sprigged by May 1996. Hopkins waited four months before starting the applications so the greens would have full cover. He put PVC sleeves in the ground at the sides of each green and marked the halves with flags.

Starting in September, he first sprayed the green halves at a preventive rate of 3 ounces of ProStar® per 1000 square feet, returning every six weeks with the same rates of ProStar® and Primer, a wetting agent. The AgrEvo EH sales representative, Bob Hickman, supervised the experiment with the help of Dr. Monica Elliott from the University of Florida.

"Fairy rings started popping up on the sides we didn't spray by the end of February or early March 1997," explains Hopkins. "You could see a perfect line, where half the greens had rings all over them and the other halves were perfectly clean. The only thing we didn't see was half rings right at the center line!"

After Elliott and John Foy of the USGA Green Section visited the Sun 'n Lake course to observe the experiment, Hopkins sprayed ProStar® at the curative rate on the affected halves of each green. All the greens remained clean for two months after the ProStar® applications. Hopkins plans to continue using ProStar® on a regular basis during winter months until the fairy ring fungus completely goes away.

Since the newest nine-hole course on the 27-hole Sun 'n Lake facility was built only four years ago, Hopkins does not intend to rebuild those greens anytime soon. "But when we do rebuild them, we'll use ProStar® as a preventive treatment from the beginning," he said.

BOB HICKMAN  
AgrEvo EH

Business Support Representative

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