

# *A Critical Review of Water Quality Impacts by Golf Courses: Update and Trends*

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## **Objectives:**

1. Obtain, screen (quality control), and evaluate all relevant and valid water quality monitoring studies for North American golf courses, with a focus on pesticides, nitrate-N, and phosphorous.
2. Enter the data into a database that will be used for statistical analysis.
3. Conduct an analysis of detections and exceedances.
4. Expand this analysis to include contaminant trends.
5. Prepare a manuscript suitable for publication in a peer-reviewed journal.

**Start Date:** 2005

**Project Duration:** two years

**Total Funding:** \$40,000

Potential and documented impacts by golf courses on ground water and surface water quality is an issue during the permitting and operational phases of golf course development and management, respectively. Historically, the perception by many members of the public has been that golf courses are significant sources of pesticide and fertilizer loading to ambient water.

The first national assessment of this issue - a metastudy - was supported by the GCSAA, with a grant issued to ETS in 1996. Work was performed with the GCSAA to identify all available golf course water quality monitoring studies. The nitrate, pesticide, and solvent results obtained indicated low frequencies of concentrations that exceeded human health and aquatic organism standards and guidelines. The update of this metastudy is being co-funded by USGA and the GCSAA's Environmental Institute for Golf.



*As more and more samples are taken, ETS scientists will analyze the concentrations of nutrient and pesticide detections, identify when they exceed current environmental health standards, and use the analyses to identify trends.*



*Dr. Stuart Cohen takes a water sample as part of this study jointly funded by USGA and the Golf Course Superintendents Association of America, to assess water quality as affected by North American golf courses.*

One goal of this new study is to use the water-quality monitoring data from a greater number of North American golf courses and from a much wider geographical distribution. Scientists at ETS will analyze the concentrations of nutrients and pesticides, identify when they exceed current environmental health standards, and use the analyses to identify trends.

The results of this research will provide scientifically valid, updated information that can be used in public hearings, regulatory decisions on golf course permitting and pesticide registration. Equally important, it will help the industry better understand the extent to which, if any, it is impacting water quality.

Potential contamination problems may be identified that indicate the need for improved or better informed turf management. It may be determined that certain costly analyses that rarely yield positive results should be excluded from monitoring programs, thereby providing money-saving advice. Trends may be identified that could be significant for national perspectives on the focus of water quality monitoring.

## **Summary Points**

- Data from the original water quality study have been updated into Microsoft Access database files.
- Quality control procedures have been developed that are being followed by the reviewers.
- A revised (updated) reviewer form has been produced that will be completed for each study.
- A press release was prepared and sent to golf course magazines for inclusion in upcoming issues and website postings.
- Letters have been sent to the EPA regional offices, to the GCSAA chapter leaders, and to the USGA regional agronomists requesting help in procuring data.
- Water quality monitoring studies are being reviewed.
- New contacts are being made through the press release in publications and on website coverage.
- We have tentatively identified 18 studies that may be included in this update, depending on whether they meet our quality control criteria.