

Preserving Surface Water Quality Is As Easy As 1, 2, 3...

James H. Baird, Ph.D.

Water features are an integral part of many golf courses, especially in Florida. Thus, it is important that turf managers exercise common sense and sound management practices in order to protect water quality and the health of aquatic organisms.

One of the greatest risks to water quality is surface runoff of pesticides and nutrients. Runoff occurs when the rate of precipitation exceeds that of infiltration. Loss of chemicals is influenced by several factors:

- 1) time interval between chemical application and precipitation event causing runoff;
- 2) amount and duration of the precipitation event;
- 3) soil moisture prior to chemical application and precipitation;
- 4) slope;
- 5) amount and method of chemical application;
- 6) timing of application in regard to plant uptake;
- 7) physical and chemical properties of the pesticide or fertilizer;
- 8) rate of chemical degradation/transformation to a benign form;
- 9) soil properties; and
- 10) vegetation type or density.

Given these factors, the following recommendations will help to protect one of our most vital resources and to demonstrate environmental stewardship on the golf course.

Step 1

Have your water features and irrigation water tested to determine baseline values of pH, total salt content, sodium permeability hazard, specific ion toxicity, and critical nutrient levels.

Pay particular attention to levels of nitrogen (N) and phosphorus (P). Excessive losses of these nutrients into water resources can result in eutrophication, the promotion of algal growth that causes depletion of oxygen in water to the detriment

of other organisms. In many situations, application of additional P or other nutrients can be avoided by regular soil and water testing.

For more information on interpreting water test results, please refer to the article titled, *Understanding Water Quality and Guidelines to Management* in the September/October 2000 issue of the USGA Green Section Record.

Step 2

Establish emergent and shoreline vegetation surrounding surface water features. Examples of taller emergent vegetation include arrowhead, pickerelweed, sedges, and bulrushes. In addition to slowing down, filtering, or inhibiting surface flow, shoreline vegetation is beneficial to:

- 1) reduce or eliminate erosion;
- 2) help shade and cool water near the edge, thereby helping to maintain adequate levels of dissolved oxygen in the water to reduce algal blooms;
- 3) provide habitat for wildlife;
- 4) help deter Canada geese or other unwanted wildlife since it provides a good hiding place for predators and a barrier for entrance or exit;
- 4) save labor and, more importantly, grass clippings that normally fall into water features following trimming; and
- 5) improve aesthetics of water features especially where water levels fluctuate.

Step 3

In addition to establishing shoreline vegetation, you should raise the height of cut of turf adjacent to water features. Research has demonstrated that bermudagrass turf mowed at 3 inches was more effective in reducing time to runoff, runoff depth, concentration, and losses of chemicals compared to turf mowed at 0.5 or 1.5 inches.

Step 4

Establish areas of untreated vegetation between turf that is treated with pesticides or fertilizer and water features. Buffer strips help reduce surface runoff by diluting applied chemicals, reducing surface flow velocity of runoff water, providing a physical filter of sediment or chemicals in solution, and increasing the potential for infiltration.

Reduced chemical runoff has been documented using buffer widths between 15 and 30 feet. However, the effective size of a buffer is dependent upon several factors including slope, overall size of the watershed, type of vegetation, playability, and potential pollution from maintenance practices.

Check with your state or local authorities to determine if regulations govern size of buffers surrounding water features on your golf course.

Step 5

Avoid application of chemicals immediately before or after heavy rainfall or irrigation. This is almost too commonsensical to mention if it were not one of the most critical steps for protecting surface water quality. A study conducted at Oklahoma State University demonstrated that runoff occurred as much as six times earlier and total runoff was as much as 16 times greater when chemicals were applied to turf under saturated conditions prior to simulated rainfall.

Step 6

When using pesticides and fertilizer near water features, choose rates and formulations that have lower runoff potential. Consult the Material Safety Data Sheet (MSDS) for pesticides to find active ingredients with low water solubility and a high adsorption coefficient (KOC). Likewise, natural organic or other slow release forms of nitrogen fertilizer (e.g., IBDU, methylene urea, sulfur-coated urea) applied in smaller amounts are less likely to

contaminate surface water compared to readily soluble forms.

Summary

Despite recent public concerns about use and environmental fate of chemicals on golf courses, research has demonstrated that turf is an effective filter of most pesticides and fertilizers by interception and degradation in the organic or thatch layer of the upper root zone profile. Chemicals that are highly soluble or not strongly adsorbed to organic matter are more likely to leach or runoff into surface water features.

However, the potential for surface runoff can easily be reduced or even eliminated by employing simple and common sense management practices that include

- 1) incorporation of shoreline vegetation adjacent to higher cut turf both of which are designated untreated buffer strips;
- 2) use of pesticides and fertilizer that have low solubility and high adsorption to soil organic matter (high KOC); and
- 3) avoidance of chemical application when soil saturation favors runoff. It's as simple as 1, 2, 3.

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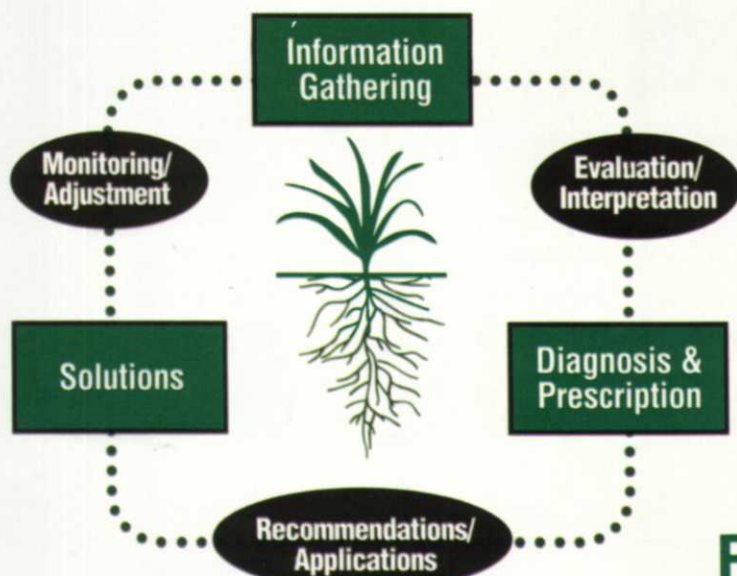
Runoff from rainfall simulators on sloped fairway height plots is stopped by 3" high rough buffer zone. Note standing water that will now infiltrate slowly. Oklahoma State research plots. Photo by Jim Baird.



Raising the height of cut to create a turfgrass buffer zone along this creek bank at the Mendham G&T Club in New Jersey could have helped to prevent the erosion. Photo by James Baird.

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"Prescription Without Diagnosis is Malpractice"



- Accumulation of comprehensive, site specific information from laboratory analysis, physical examination, and client dialogue.
- Evaluation and interpretation of information to understand and explain agronomic conditions.
- Recommendation of scientifically sound, environmentally responsible methods and materials to promote optimum soil functioning and turf quality.
- Continuing conscientious monitoring and appropriate program adjustment to achieve maximum health and aesthetics.

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