



Best Management Practices for New York State Golf Courses

Potential Water Quality Contaminants

Fertilizers and pesticides maximize productivity and performance in a variety of agricultural and horticultural settings, including golf turf management. Although application practices can affect water quality, the environment may be at a greater risk from spills of larger volumes of the concentrated chemicals used to mix fertilizers and pesticides for application. Regardless of how the chemicals are released into the environment, superintendents should understand the fate of these inputs as well as other potential sources of contamination, such as sediments, hazardous materials, and waterfowl, in order to prevent or to mitigate any potential effects on water quality.

Fertilizers

Of the many nutrients applied to golf turf, the primary contaminants of concern in fertilizers are nitrogen and phosphorus. These nutrients can leach into groundwater or be carried in runoff into surface waters after applications. New York's Environmental Conservation Law (ECL) narrative standards state that no nitrogen and phosphorus are allowed in runoff that contribute to algal growth, weeds, or the impairment of the water.

Pesticides

Pesticides may be toxic to aquatic and terrestrial systems. The varying chemical properties of pesticides – for example, their solubility, toxicity, and chemical breakdown rate ([as provided in Appendix C](#)) – determine the potential impact to water quality.

Sediments

EPA defines suspended and bedded sediments as follows:

“...particulate organic and inorganic matter that suspend in or are carried by the water, and/or accumulate in a loose, unconsolidated form on the bottom of natural water bodies. This includes the frequently used terms of clean sediment, suspended sediment, total suspended solids, bedload, turbidity, or in common terms, dirt, soils, or eroded materials.”

Increases in sediment loading can compromise the ecological integrity of aquatic environments, affecting water quality physically, chemically and biologically. In addition, sediments often carry organic matter, nutrients, chemicals (such as pesticides), and other wastes. For example, phosphorus is immobile in most soils and concentrates in the top few inches of the soil, where it is very susceptible to erosion and thus likely to be present in sediment.

Hazardous Materials

Other potentially hazardous materials, such as fuels and paints that are used in everyday operation and maintenance, can contaminate water quality if accidentally released, especially in large quantities. BMPs followed for maintenance operations can prevent contamination from accidental releases.

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Waterfowl

The deposits of fecal matter by resident and migrating waterfowl (Canada Geese, mute swans, and others) may contribute to water quality impairment through nutrient enrichment. The overall impact of bird feces on water quality, however, depends on numerous factors, such as the size, depth, and natural chemistry of the water body; avian populations and behavior; and the rate at which other nutrient sources enter the water body (Unckless and Makarewicz 2007). On golf courses, shallow ponds with significant populations of waterfowl are most likely to be affected. In these cases, annual phosphorus loading by waterfowl can be calculated using the days per year that each species spent on any lake or reservoir.