Water Quality On The Golf Course

By Lynn Griffith

Golf Course Superintendents apply many things to their grass in order to establish and maintain a quality playing surface. Fertilizers, wetting agents, pesticides, fungicides, herbicides, and nematocides are all applied regularly to turf in order to accomplish these goals. If you think about it, however, a golf course superintendent applies far more water to his course than anything else. Water quality is often overlooked and only occasionally thought of by most turf professionals, but all things considered, it can lead to a significant difference in turf quality between your course and the one down the street.

Water quality affects performance in various and subtle ways. It can affect soil pH, moisture stress, pesticide activity, buffer capacity, disease pressure, nutrient requirements, and a number of other surprising, seemingly unrelated parameters. How water chemistry interacts with turf performance is the subject we will cover here.

Probably the most important thing to consider is the pH of the irrigation water. Soil pH is significantly affected by the pH of the water applied. In fact, at lower fertility rates, soil pH often takes on the irrigation water pH, especially in sandy or poorly buffered soils. Golf courses in central and southern Florida often irrigate with water of pH 7.2-7.6, even approaching 8.0 in some areas. Inland areas in central and northern Florida have water which runs 6.6-7.2, although there are many exceptions to these averages. When alkaline water is a problem, trace element availability in the soil can be a problem. Chelates may be necessary in these cases where high pH tie-up hinders uptake of non-chelated metals.

High pH water have been shown to adversely affect pesticide performance in a number of instances. The organophosphates can be especially sensitive to high pH hydrolysis. With the cost of chemicals today, it makes sense to consider acidification of the spray tank water. The amount of acid needed to place alkaline water into a good pH range (say about 6.0) varies with water pH and the buffer capacity of the water. As a general guide, however, a shot glass of 75% food grade phosphoric acid (available at most chemical supply houses listed in the yellow pages) will put 200 gallons of spray tank water into and acceptable pH range.

Another major water quality criterion is the amount of dissolved salts in the water, as measured by electrical conductivity. The higher the level of dissolved salts in the water, the more electricity it will conduct. In fact, total dissolved solids is a direct calculation from the elec-

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trical conductivity reading. When using water containing high soluble salts, risk of burn from pesticides and soluble fertilizers is substantially increased. Conductivity ideally should be less than .75 millimhos (about 500 ppm) for golf course irrigation. If it is much higher, the grass will be more sensitive to water stress, especially in areas subject to winds or elevated berms and tee slopes.

Most Florida ground water contains only minimal amounts of the major plant nutrients - nitrogen, phosphorus, and potassium. Those who inject soluble fertilizers into lines where drinking water is taken from the same well should be sure that fertilizer does not enter the drinking water. Levels above 45 ppm nitrate can affect the health of infants under six month of age.

Most coastal and southern Florida irrigation water contain high levels of calcium. High calcium can affect water pH. At the same time, magnesium availability in turf soils can be a problem when high calcium waters is used. Staining of fixture can also be troublesome.

Carbonate and bicarbonate ion content is also very important. In addition to contributing to the staining problem, large amount of these ions will, upon drying in the soil, precipitate calcium and remove it from the soil. This can result in a net deficit of soil calcium over time, leading to pH or nutritional problems. Carbonate ion will not be present unless the water pH is above 8.0. Bicarbonate levels can be a problem above 120 ppm, and are especially troublesome in southeast Florida.

Iron staining can be a serious problem for some golf courses. When water contains high levels of calcium and bicarbonate, and has more than 0.1 ppm iron, staining often results. The iron dries on plant and soil surfaces as iron hydroxide. The sunlight oxidizes this to iron oxide, or rust. If rusty water is a problem from wells, it is best prevented by the use of filters or injection of chelating agents. Lake water with rust can be improved by aerating the water, which will precipitate some of the iron in the lake itself.

Salt intrusion can be a serious obstacle to turf maintenance . Areas around Melbourne and the Bradenton Sarasota area are especially affected. The high sodium in the water tends to "crowd" the potassium out of the soil solloids. The grass plant tends to run deficient in potassium, causing abnormal water stress and sensitivity to wear. The golf ball may not stand up well in the grass. Salt intrussion can also add excess levels of boron to irrigation water.

Varying the depth of a well can significantly affect water quality. These wells can be high in iron and sulfates. Deep wells may yield very good or very bad water. Tendencies vary from region to region. One way to combat salty well water is to dilute it by pumping into a lake to mix with rain water.

During drought periods, water quality deteriorates noticeably. There is less water to dissolve everything in, and the water travels farther to get to the well point. Thus, any existing water problems become magnified in a drought. Rain water is far more pure than ground water, and quality is improved when rain replenish the ground water. The purity of rain water and the oxygen dissolved in it often "linen up" turf more than an equal amount of irrigation. This response to rain is a classic example of the benefits of good water quality.

Pesticide and herbicide residues are not frequent problems with well waters, but may be significant in lake and canal waters. Detection is difficult, and chemicals must usually be analyzed individually or by the class of compound. Superintendents sometimes ask to have the water tested for "chemicals", but this can only be done if a specific type of chemical is suspected.

Plant disease causing organisms may sometimes be present in irrigation water. Water from ponds, lakes,or canals are more likely to contain pathogens. Bacterial pathogens and the water mold Pythium are the most likely to occur. This is not a common problem, but if pathogens are suspected, water samples can be baited for disease causing organisms.

As you can see, water quality has many facets, and any of them can affect turf production in unexpected ways. If you are having problems that other fellow superintendents are not having, even though their cultural practices are similar, water quality might be the hidden cause. Bad water problems must first be identified, and then appropriate measures taken. Sometimes a superintendent just has to live with bad water quality, but if he knows what the specific problem is, he can compensate for it more intelligently.

Your turf gets more water than anything else. Good water quality can make production of superior turf much easier. Keep it in mind. ■