

Water quantity is not everything when it comes to golf course irrigation. Water quality is of equal importance.

What is water quality and how is it classified? Water quality is determined by its intended use. For instance, a pure source with no mineral or organic contaminants would be ideal for drinking purposes, but a poor choice for golf course irrigation. Alternatively, a water source high in calcium magnesium, potassium, nitrate and liberally laced with microbes might be a great irrigation source but completely unsuitable for drinking purposes.

Generally, water is evaluated in terms of its mineral and biological components and classified based on intended application. There are numerous sources which classify plants with respect to their tolerance of, or sensitivity to, salinity and specific mineral toxicities. Unfortunately many superintendents do not have a choice of quality of water available for their course and, to an increasing extent, are being forced to accept water that may not be fit for other domestic uses eg effluent water. The growing trend in mandating the use of recycled water on golf courses if further reducing the choices of water quality.

The simple fact is, that if a given soil is irrigated with a given water quality over an extended period of time the soil will assume the characteristics of that irrigation source. Most of the problems encountered with irrigation water are associated with the direct and indirect effects of excess total salts (TDS), excesses of specific mineral ions, sodium, boron, chloride etc and in excesses of bicarbonate and associated elevated (alkaline) pH.

What To Look Out For

How do I know when poor water quality may be affecting my turf-

grass growth? Certainly poor water quality has many disguises. It has been diagnosed as soil borne Pythium, nutrient imbalances, heat stress, black layer, bad seed, improper greens construction, too much shade, too much water, bad physical sand mix, nematode stress, too much play, etc etc etc...and these diagnoses are all correct! Poor water quality manifests itself as many

different things and sets the stage for secondary problems. We can spray the chemicals to kill the disease, correct the nutrient imbalances, rebuild the poorly constructed greens and trim the trees around the greens. The turf responds... for a limited time. Without removing or correcting the primary problem, the secondary problems will continue to return. Many times, water qual-

ity is the last area to be identified. If these visual symptoms sound familiar you may want to look further into the water quality issue.

Where Do I Start?

The first step should be an irrigation suitability test. There are well over 50 different types of "water tests" available from analytical laboratories. The irrigation

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suitability test looks for those things that will affect plant growth such as sodium, bicarbonates and chlorides. It is important to test the water throughout the year to document the changes that may occur on a seasonal basis.

The second step should be soil sampling. The soil test will ultimately determine the degree of poor water that the turf grass will be able to tolerate. Samples should be taken throughout the golf course and from all greens, tees and fairways.

What Does It Mean?

After you receive the results of your water tests, how do you make sense of a page full of chemistry formulas. The components of water quality can be broken down into five main areas.

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1. **Salt Concentration** – TDS (Total Dissolved Salts) EC (Electrical Conductivity)
2. **Sodium Hazard** – SAR (Sodium Absorption Ratio), sodium in ppm or meq/l.
3. **Bicarbonate Content** – Adj SAR (Adjusted Sodium Absorption Ratio) and pHe Ratio
4. **Toxic Ion Concentration** – In turfgrass the main ones are boron and chlorides.
5. **Water pH** – pH scale is from 0-14 with 7 being neutral. For ideal turfgrass growth pH should be between 6.5 and 8.4.

Several problems may occur to turfgrasses growing in situations where high levels of soil salinity and irrigation with the saline water source are common. These problems are usually not uniform across the site but many occur sporadically. A high level of soil salinity can reduce or delay seed germination and seeding development. On establishing turf the first sign of a salinity effect is a blue-green colour of turf similar to drought. Salinity problems are most often encountered during periods of heat and/or drought stress. This occurs because the demand for water by the turfgrass plants is high at this time. Water availability to the plants is reduced because of the high salt content of the soil solution. High demand by the turfgrass coupled with reduced water availability due to salts causing drought-like conditions. This is compounded by the fact that it is very hard to leach excess salts from soil during periods of high temperatures and limited rainfall.

What Can I Do?

Following are some suggestions to help fight a poor irrigation source.

Remember, a solution to the problem may not be found in just one of the suggestions. Your problem may require a combination of several (or all) of the following suggestions.

- **Plant Salt Tolerant Grasses** – Not all grasses perform equally under the same conditions. When selected grasses play close attention to the electric conductivity of the irrigation water.
- **Improve Drainage** – Any additional tools that can be utilised to add aeration, reduce soil compaction and improve percolation may be beneficial in the removal of harmful salt concentrations.
- **Leach Excessive Salt** – Leaching salts through the plant root zone by exceeding the leaching fraction will carry dissolved salts with it through the zone.
- **Acidification of Irrigation Water** – The addition of acidification agents will cause the soil sodium to be more easily leached from the soil profile and neutralise the bicarbonates from the water and soil, freeing up available calcium forming better soil structures and increased water percolation.
- **Additional Soil Amendment** – Careful consideration should be given to the base saturation of exchangeable cations portion of the soil test. In poor quality water, the reduction of available calcium and magnesium is critical and must be replenished as required.

Summary

Use of poor water quality for irrigation of golf courses presents a unique set of advantages and disadvantages.

They potentially affect every decision the greenkeeper must make.

However, despite increased problems, concerns and cost, these impacts are not necessarily unsurmountable. Rather, they present a challenge which demands attention to every agronomic and management detail.

- **References:** Throssell, Clark S. and Kopac, David, 1994. Irrigation Water Quality-Salt Affected Irrigation Water and Soil: Impact on Turfgrass Growth and Management 1994 GCSAA Seminar; Peacock, Charles 1994 Wastewater Irrigation for Golf Courses: Advantages versus Disadvantages. The USGA, Lewis Publishers Inc Chelsea MI.

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