The Soil Takes on the Characteristics of the Water

One of the best quotes I have ever read is from the book, Ideas in Soil and Plant Nutrition by Joe Traynor, 1980. "As the water is, so then shall be that of the soil." There has never been a truer statement. Joe Traynor said, "If a given soil is irrigated with a given water over a long period of time, the soil will assume the characteristics of the water. In such cases, a look at water analysis data can provide an insight into the soil, even if no soil analysis data are available."

Taking a soil test is certainly a prerequisite to good soil and turfgrass management but taking a water test is equally as important too. Therefore, understanding the constituents that make up your irrigation water must be understood to fully explain why the soils are the way they are, and the turf is responding the way it does. This winter, use this down time as an opportunity to send off samples of your irrigation water. Testing is done through an Irrigation Suitability Test from your lab that typically does your soil test. A simple measure of water ph is not sufficient. You may need to send off multiple samples

if you have several different sources of irrigation water. This may include well water, potable water, effluent water, lake water, reverse osmosis water, etc. The test must include all the major areas of concern, i.e., Water ph, Bicarbonates, Carbonates, Hardness, Sodium, Soluble salts, SAR (Sodium Absorption Ratio), etc. Once you get this data back, this will hopefully allow you to employ strategies that are conducive to growing a successful turf with your water.

There is not enough reading time to cover all the different situations that water qualities may present, so I am just going to break down some examples of how different water types may impact one's agronomy and turf. Hopefully, some of these illustrations will help you understand why water testing is so important as it relates to soil chemistry and plant health.

The coastal courses usually have the poorest water that may create a problem due to sodium. **When sodium is an issue, it will cause the soil to tighten up and adversely affect drainage and permeability in the greens**. To make matters worse, the bicarbonates will cause the calcium and magnesium to become less available, therefore making it more difficult to maintain soluble calcium and magnesium in the soil and displace the sodium.

So, where do we start in reducing sodium levels?

This usually begins with applying gypsum to the soil. Gypsum is well known throughout the industry for its remediation properties on sodic soils. Gypsum is used to displace sodium. Where there is lots of available calcium, there is very little sodium. So, applying calcium by using gypsum is an excellent remediation tool to limit the buildup of sodium in the soil.

In conjunction with using gypsum, it is important to maintain good potash levels. Products like sulfate of potash and K-Mag are excellent ways to achieve this. Keeping the potash levels in the soil greater than the sodium levels is also a prerequisite to good soil health. However, this is easier said than done when irrigating everyday with poor quality water that is loaded with salt like constituents.

The other option is to utilize foliar ammonium sulfate. It becomes sulfuric acid in the soil and helps make calcium more available. One of my favorite recipes of all time is one I got from Tom Green, former superintendent at The Orangeburg Country Club. This recipe can be used at various rates. For example, 25 lbs. per acre of Potassium Nitrate, 15 lbs. Ammonium Sulfate, 10 lbs. of Calcium Nitrate and 5 lbs. of

Epsom salt per acre respectively and water-in or cut the rate in half and foliar spray over the top using at least 1.5 gallons of water per 1000. Put the Ammonium Sulfate in the tank first, or you might have a mess on your hands. Certainly, this needs to be adjusted from Bermuda to Bent, etc. This recipe is great because the calcium, magnesium and potassium are cationic (positive) and react off ammonium sulfate that is anionic (negative). This creates a tremendous synergistic affect. This is just an idea when dealing with poor water. You can mix in micros and amino acids into the recipe if you choose too.

Another strategy to consider in dealing with poor water on the coast is to use a coarse sand to back fill your aerification holes. The idea is to create macro pore-space so it is easier to flush sodium. Remember, anytime the salt index in the soil becomes greater than it is in the plant, the plant can't get water. The last thing we need are for salts to remain near the surface. There are two sands that I find attractive for backfilling aerification holes when dealing with poor water quality in the Carolinas. There is a #35 sand and a #25 sand. The lower number reflects a coarser gradation of sand. Your local sand supplier can give you a gradation sheet. If sodium is an issue, there are many superintendents that have had success using these two sands.

The Pinehurst area of North Carolina offers a totally different water source for irrigation than the coastal area. Their water has a low pH. It has little to no constituent values that makeup its water. Some industry experts refer to this kind of water as Stripper Water, or Dead Water. One might see this kind of water in a Reverse Osmosis situation. Basically, due to its acidity, it can strip the soil of calcium and magnesium, etc. It was about a year ago that Alan Owen, Superintendent, Course # 4 at Pinehurst, and I were pondering a Rhizoctonia Zeae issue on some of his greens. Alan said," The greens he treated with a heavier rate of Triazone Urea and Potassium Carbonate had no Zeae, while the others did. We both realized that by using these two products that it helped reduce the Zeae problem. Both Urea and Potassium Carbonate are non-acidifying fertilizers. These two products helped counter the effects of the acid water that was being used for irrigation.

The Carolina mountains can reflect values that are high in hardness. This means a lot of calcium and magnesium are in the water. Typically, this does not harm the plant, but can seal off the surface of the soil and make it difficult for water to penetrate. Sometimes, Bicarbonates can also be present in conjunction with hardness. High Bicarbonates and high hardness can give some golf courses fits. I did some water

quality consulting at Valderama Golf Club in Spain off the Costa del Sol many years ago for Jimmy Patino. I had never seen hardness and bicarbonates like I did there.

The above is an example of the extreme hardness and high bicarbonate water that accumulated on a pump bowel screen. Imagine what is going on in the soil. Certainly, no one in the mountains has this kind of situation, but this is what can happen when water constituents become out of balance. Sulfurous acid was used in this situation to help remediate some of the problem.

I hope this helps explain the importance of testing your water, and I strongly recommend Joe Traynor's paperback book. It is 99 pages of water quality and soils made simple. It will change the way you view water and its impact on the soil forever.