Special Inside: The Importance of Solution Analysis

NORTH CAROLINA Turfgrass

May/June 2006

A Publication of the Turfgrass Council of North Carolina

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The Importance of Solution Analysis to the Turf Industry

By Shaun Casteel, NCDA&CS Agronomic Division

Water is a critical component involved in the everyday management of beautiful lawns, golf courses and athletic fields. It is used for irrigation, to mix pesticides and fertilizers, and to fill ponds and water features. As a result, water chemistry has great potential to affect many aspects of turf growth and management. For this reason, you should routinely monitor the quality of your water source.

Importance of water quality in turf management

All water sources are not created equal. Some are innocuous; others have chemical properties that can cause growth problems. That is why determining water quality is critical. Chemical properties to monitor include alkalinity, pH and concentrations of essential plant nutrients. If any of these parameters are outside of the desired range, they can potentially cause problems.

For example, high alkalinity in irrigation water can raise soil pH above the optimal range for healthy turf. **Source water with high pH can also reduce pesticide efficacy and fertilizer solubility.** Furthermore, high concentrations of certain minerals can clog irrigation systems or lead to the buildup of excessive levels of micronutrients.

Good water quality requires a proactive approach. Using solution analysis to routinely monitor the chemical status of all water sources used for irrigation, pesticide mixtures and nutrient solutions is an excellent way to manage and protect turf. All new water sources — wells, ponds, holding tanks, municipal sources — should be sampled and tested before use. It's a precaution the success of your business deserves.

Even long-standing, "permanent" water sources should be tested on an annual basis, since flooding, drought, salt-water intrusion or environmental contamination can alter quality at any time. Taking samples regularly, having them tested and correcting any problems noted helps prevent unexpected problems. This monitoring process can also provide a reliable record of environmental stewardship.

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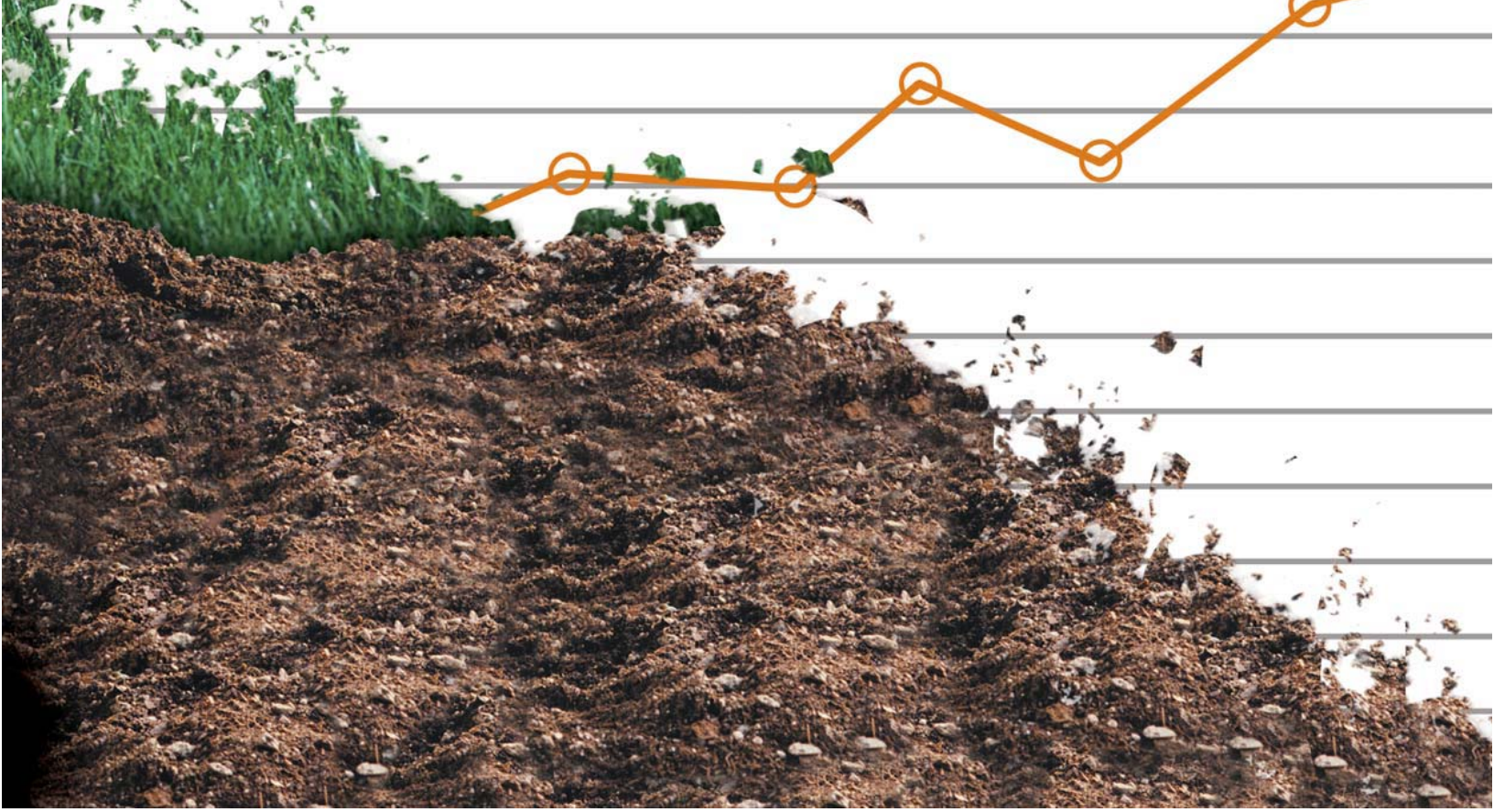
Solution analysis — your water testing resource

The NC Department of Agriculture and Consumer Services (NCDA&CS) analyzes water samples and nutrient solutions for general quality as well as for plant-growth purposes. This test, known as solution analysis, measures nutrient content and chemical properties relevant to the specified purpose, whether that be spray or drip irrigation, nutrient solutions, aquaculture, pesticide source water or environmental monitoring. Solution analysis is quick,



reliable and easy to incorporate into a management program.

NCDA&CS solution analysis measures pH, total alkalinity, electrical conductivity and water hardness, as well as concentrations of nitrogen (ammonium, nitrate and urea forms), phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, zinc, copper, boron, chloride and sodium. For the spectrum of information it provides, solution analysis is very cost effective. The service is available to North Carolina businesses or residents at a cost of $5 per sample. The fee for out-of-state samples is $25. Laboratory results are usually available online within three business days after samples arrive at the lab. Customers also receive a copy of the report in the mail.

Interpreting the solution-analysis report

The solution-analysis report contains information relevant to managing water quality for its intended purpose. That purpose, as indicated by the solution-use code provided for each sample, determines how results will be interpreted. A staff agronomist reviews lab results and provides comments regarding usability, hazards and management strategies.

As you read a solution-analysis report, it helps to be able to compare sample values

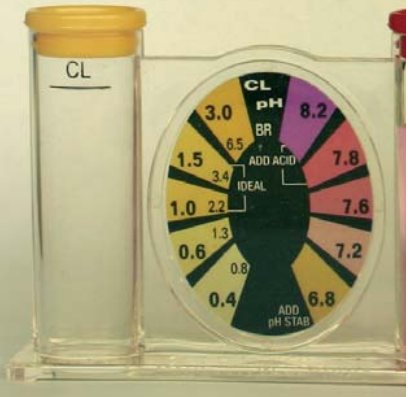


TABLE 1. SOME "NORMAL" NUTRIENT BACKGROUND LEVELS FOR WATER SAMPLES.

NH4-N	LESS THAN 0.3 PPM
NO3-N	LESS THAN 3.0 PPM
P (PHOSPHORUS)	LESS THAN 1 PPM
K (POTASSIUM)	LESS THAN 10 PPM
S (SULFUR)	LESS THAN 25 PPM
B (BORON)	LESS THAN 1–2 PPM

TABLE 2. SOME PROBLEMATIC PARAMETERS FOR WATER SAMPLES.

PARAMETER	LEVELS OF CONCERN	SYMPTOM/PROBLEM	CORRECTIVE ACTION
B (boron)	more than 1–2 ppm	Causes leaf-tip yellowing and/or scorching.	Collect clippings to remove B that accumulates in leaf tips; dilute B concentration by blending irrigation water with better quality water; irrigate thoroughly to leach B.
Fe (iron)	more than 3 ppm (in overhead irrigation water)	Causes stunting, interveinal chlorosis and deformed buds.	Treat to remove Fe (i.e., complex with bromide or chloride, aerate or other means).
Na (sodium)	more than 100 ppm	Competes with uptake of calcium, magnesium and potassium; reduces plant stress tolerance; results in high SAR & high soluble salts.	Blend irrigation water with better quality water; apply gypsum, lime or sulfur to soil; aerate soil frequently.
SAR *	more than 9	Indicates the potential for sodium to accumulate in soil.	Apply calcium (e.g., gypsum); provide increased drainage; irrigate with another water source to dilute and leach Na; test soil and water regularly.
EC **	more than 75	Interferes with water uptake, which can lead to leaf and root burn.	Leach soil with good quality water source; rely on salt-tolerant plants.

* SAR (sodium adsorption ratio) indicates the balance of Na with Ca and Mg.
SAR predicts the tendency for Na to accumulate in the soil when the water tested is used for irrigation purposes.

** EC (electrical conductivity) is a measure of soluble salts, given in units of mhos ¥ 10-5/cm. It measures the extent to which minerals (N, P, Ca, Mg, Na, Cl and bicarbonate) are dissolved in the water.

with "normal" background values (Table 1). For example, in most cases, clean water can be expected to contain less than 3 ppm NO3-N, so a value of 5 ppm might indicate an inadequate vegetative buffer near a pond or stream. Depending on the parameter, some higher values may or may not be a problem. Table 2 lists some water quality parameters, levels of concern, potential problems and remedies.

Although fairly comprehensive, solution analysis provided by the Agronomic Division does have some limitations. It does not identify or measure pathogens and pesticides. Tests to ascertain these kinds of problems can usually be performed by a county health department or a private lab.

Contacting the NCDA&CS Agronomic Division

Information on collecting or submitting solution samples is available online at the NCDA&CS Agronomic Division website at www.ncagr.com/agronomi/. For additional help, call the division office at (919) 733-2655, or contact the NCDA&CS regional agronomist assigned to your county. A list of regional agronomists and their service areas can be found at www.ncagr.com/agronomi/rahome.htm.