

# Tissue Testing —

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interpret. Soil testing is the place to begin when designing a fertility program.

Many turf managers have the impression that plant uptake of nutrients is directly related to the amount of nutrients available in the soil. Research has shown that this is not always true. The relationship between nutrient supply in the soil and nutrient concentrations in the plant is strongest when nutrient supplies become so low that they limit the growth of the turf. Plants have internal mechanisms that allow them to control nutrient uptake to meet their needs when nutrient concentrations in the root zone are plentiful. Nutrient deficiency develops when demands are in excess of supply (Kussow, 1993). Therefore, adequate nutrition levels may exist in the soil, but plants, for a number of reasons, might not be taking up those nutrients. Tissue tests could be used to indicate nutrient deficiencies in the plant that do not actually exist in the soil. In some cases, adjusting the soil pH may be all that is needed to correct a nutrient availability problem.

**Question:** Do baseline tissue nutrient concentration levels exist for turfgrass?

**Answer:** Unfortunately, no. Baseline nutrient levels for turfgrasses do not exist. Baseline levels refer to nutrient concentration within turfgrass plants that correspond to optimum development, growth and appearance. The nutrient concentration levels established for forage grasses were first used as the standard for turf, but one could question the use of forage standards in making decisions about turfgrass fertilization!

The fact remains that nutrient levels in turfgrass vary considerably depending on species, cultivar, time of sampling and management practices (Overman & Wilkinson, 1993). J. R. Jones (1980) summarized the literature and suggested sufficiency ranges for elemental tissue contents. These ranges, however, are not applicable in all situations (Turner, 1992; Turner & Hummel, 1992). For example, interpreting tissue test results for a polystand of turf (such as *Poa annua* and bentgrass) is even more difficult. Nutrient concentrations that are acceptable for bentgrass might not be acceptable for *Poa annua* or vice versa. Very few golf course putting greens consist of a single turf species. Even mixed stands of perennial-type and annual-type *Poa annua* could present a problem, as could blends of bentgrass cultivars. Much more research is needed.

**Question:** If I choose tissue testing as a tool to monitor my fertility plan, how frequently should tissue testing be performed?

**Answer:** Weekly testing would provide data that could be analyzed for possible trends. Maintaining weather records would also help. For instance, nitrogen will accumulate during cooler weather, while nitrogen depletion will

take place during warmer weather. Nitrogen concentrations are dynamic. On one day it may be adequate and two days later it can be deficient. Also, other nutrient concentrations may be affected by nitrogen fluctuations, which may or may not affect turf quality. The more data generated, however, the greater the chance that strong correlations (with soil tests, time of year, weather, visual quality, playability, etc.) will exist. Two or three years of data collection may be necessary before this information is of value.

**Question:** What are some of the pitfalls commonly associated with tissue testing?

**Answer:** Difficulty in interpreting results is a significant pitfall. Cost is also a consideration. Testing can become expensive if many samples are analyzed. In addition, if test results indicate deficiencies of micronutrients and corrective treatments are made, these applications can be expensive. Also, micronutrients are required in small amounts and overapplication is a risk.

**Question:** Since micronutrients are required in very small amounts, how can I tell if the materials being applied are doing any good?

**Answer:** A common pitfall in turfgrass maintenance is the lack of test plots. Test plots not only provide areas to calibrate spray equipment, but also provide an excellent opportunity to visually examine turf quality differences following different treatments. Tissue testing will not accurately determine nutrient concentrations unless all of the material applied has been absorbed. Any residuals that remain on the leaf will cause inaccuracy. In fact, some fungicides can solubilize nutrients and allow for uptake into the plant. The practical approach is to utilize a test area before deciding to make blanket applications of micronutrients.

**Question:** Is there a governing body or an association that monitors the testing procedures being used by testing laboratories?

**Answer:** Yes, the *Council on Soil Testing and Plant Analysis* was formed in 1969 (Jones & Kalra, 1992). Its major objectives are:

1. To promote uniform soil testing and plant analysis methods, use, interpretation and terminology.
2. To stimulate research on the calibration and use of soil testing and plant analysis.
3. To provide a forum and information clearinghouse for those interested in soil testing and plant analysis.
4. To bring individuals and groups from industry, public institutions and independent laboratories together and share information.

A survey was sent to testing laboratories in the United States and Canada. The results indicated that a majority of the laboratories responding to the survey provide a wide range of services and utilize the latest available technology.

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# Tissue Testing —

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gy. Interestingly, not one of the nearly 200 laboratories responding to the survey (601 surveys were mailed) were using the NIRS technology to determine tissue nutrient levels. All were using wet chemistry techniques. The accuracy of NIRS has not been substantiated by research and thus is not recognized by the Council as a reliable testing method. However, NIRS is being used by a number of vendors nationwide, and this is where many of the concerns and questions from turf managers arise.

**Question:** Of what practical value is “tissue testing” in day-to-day golf course maintenance?

**Answer:** For tissue testing to be helpful in day-to-day turfgrass management, the results from tissue testing must be obtainable in a timely fashion. Regrettably, wet chemistry tissue testing takes time to complete, often days or weeks. Thus, if an immediate problem needs to be addressed, tissue testing would not be practical.

For tissue testing to be helpful as a diagnostic tool, it must provide results that are interpretable and also correspond well with soil tests. Much of the research examining soil nutrient levels to determine low, medium and optimum ranges was performed more than 20 years ago. The fertility trends of that era, particularly for nitrogen, were higher than those rates commonly applied today, so soil test interpretations that are based on 1970s protocols may be erroneous.

It is fair to conclude that correlating soil test data with tissue nutrient concentrations is very difficult (Hall, 1974; Gross & Brauen, 1985; Spear & Christians, 1991) and misleading.

**Question:** Is fast and accurate tissue testing unobtainable by the turf manager?

**Answer:** There is new technology available that can provide rapid, accurate, and inexpensive results. Inductively Coupled Plasma-emission spectrometry (ICAP) is an advanced wet chemistry technique that can analyze a sample for a wide range of elements. An increasing number of testing laboratories are using ICAP, although the atomic absorption wet chemistry method is still the most frequently employed procedure (Jones & Kalra, 1992).

Also, NIRS technology is improving. New hardware, software and a new and expanded data base are being developed. In time, this technology may have greater application in the turfgrass management industry.

## Summary

Tissue testing may prove to be useful for monitoring nutritional fluctuations within turfgrass. However, information on which to base a complete fertility program has not been developed (Christians, 1993). The usefulness of tissue testing is very site-specific due to variables such as soil pH, CEC, soil type, plant species, soil moisture, height and

frequency of mowing, time of sampling, soil temperature, herbicide, fungicide or growth regulator applications, fertility regimes, topdressing schedules and other cultural programs.

Tissue testing may be used to supplement soil test results but should not be considered as a replacement for soil testing. It is the consensus of all the scientists contacted while preparing this article that more research is needed to make tissue testing a standard tool on which to base fertility recommendations.

Tissue analysis has long been used in production-based agriculture to help achieve maximum yields (Smith et al., 1985). But turf management is not focused on maximum tissue yields. Quality is more important than quantity.

As with any new technique or management strategy, university research and field testing must be combined to document the usefulness and practical value of tissue testing. Establishing a strong foundation (cultural practices, sound water management, balanced fertility) is important before the full benefits of fine-tuning techniques such as tissue testing can be realized.

Many turf managers are integrating tissue testing into their management programs. It is one of many new tools being developed, all focused on helping the turf manager become more effective and efficient. New technology stimulates questions that are investigated, and this leads to better understanding and ultimately better management techniques.

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# Hazard Trees On The Golf Course

By Michael A. Beebe, ASCA  
Consulting Arborist

Trees are as important to a golf course as are the players. Recognizing tree hazards on the golf course and performing remediation or removal is essential to remove the risks involved with their presence. Trees may be dangerous.

In this litigative society, this is where an ounce of prevention is worth ten pounds of cure. There are many common defects associated with tree hazards and the ability to evaluate these defects should be left in the hands of an experienced Consulting Arborist. Golf course superintendents are experts with turf by virtue of education, continuing education and experience. Many are quite knowledgeable on trees, and tree health, yet this is not their prime area of expertise and rightly so. There is only so much time in one life.

The liabilities involved with "Hazard Trees" is tremendous. The bottom line responsibilities of serious injury from tree-related incidents lies with the owner. Our courts are getting more and more cases involving tree-related accidents.

Most of our golf courses still have old willow trees, poplar trees and cottonwoods that have passed maturity years ago. Many of the courses I have played on have older trees with large dead branches, big cavities, construction damage, reduced soil level or increased soil level on the roots or

around the trunk, dead branches hanging, and many more indicators of actual hazards.

In order for a tree to become a "Hazard Tree" it must have a target. Unfortunately, like myself, not all golfers stay in the fairway. By virtue of the game, this makes most of the golf course accessible and susceptible. To protect your crews, players and owners, may I suggest having a "HAZARD TREE INVENTORY" completed during your off months (Jan., Feb., March, April). Most golf courses have tree pruning crews do their work in the winter, and armed with your "Hazard Tree Inventory" you derive multiple benefits from your tree care dollars. You may have only one hazard tree on your course or you may have many. Hazard trees are dangerous. Have them identified and remediated.

An inventory of trees is advisable. It should contain enough information, i.e. size, species, location, condition and dollar value to be of any real use to your organization. Ideally an inventory not only includes the above but it also should be done as to be acceptable on your computer. With the above information on disc the superintendent is well-armed with the necessary data to make timely, money saving and wise decisions regarding the trees on his or her course and the safety of all who play on it.

## Turf and Grounds Conference —

(Continued from Page 7)

that a second day had to be added to insure attendees enough time to thoroughly cover the show. Refreshments will be available in the trade show as well as at the Hospi-

tality/Social night scheduled for Thursday evening. This will be an excellent opportunity to get to know others in our industry, and also to catch up with old friends.

For those who plan on staying in Minneapolis, the conference committee has chosen the Minneapolis Hilton as the headquarters hotel. The Hilton has agreed to a \$55 per

night rate, which is a great bargain for a hotel of the Hilton's calibre. Guests will have privileges to the large health spa, including a swimming pool, a sauna and a whirlpool. The restaurants and lounge will accommodate the parched and famished with fine dining and beverages.

As you can see, this year's conference and show have all the elements for a great educational experience—all it needs is you! In addition, if you take the time to locate a turf or grounds professional in your area and invite him or her to this conference, you will be doing a service to the industry by helping to educate the green industry. See you at the conference!

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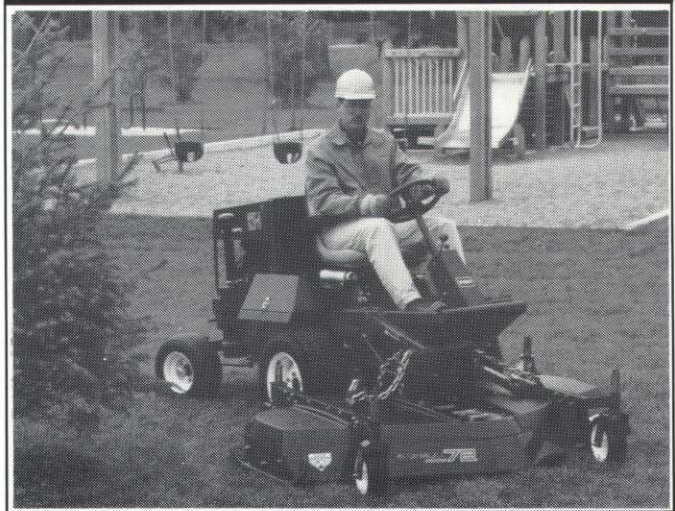
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## Scholarships —

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Gardner said that "James has shown a personal commitment to the profession with family responsibilities and work responsibilities being balanced to make his goals come to fruition. James will be an asset to the profession, wherever his goals take him."

Schmitz has a 3.58 GPA at Riverland.

**Eric Sundet**, 24, a 1988 graduate of Coon Rapids High School, attended Augustana College in Sioux Falls, the University of Minnesota and Anoka Ramsey Community College before enrolling at Michigan State in 1993. He expects to graduate this December.

"My initial interest in pursuing golf course management as a career came under the direction of Jim Nicol at Bunker Hills Golf Course," Sundet said. "After working at Bunker Hills for four years, I found the work to be very gratifying. I also enjoy playing the game as well as working outdoors."

Sundet decided to major in turf management for two reasons.

"The first," he said, "is my ongoing curiosity for why turf reacts to adverse conditions such as lack of fertility, pests, inadequate soils and other detrimental effects made to the turfgrass plant. Secondly, receiving a degree in turf management will allow me to work for the betterment of a game that I am truly interested in."

John Katterheinrich, superintendent at Interlachen where Sundet interned for the past summer, said that "Eric will be a positive influence on the profession as a golf course superintendent."

He has a 3.78 GPA at Michigan State and plans to apply for an assistant superintendent position or possibly a spray tech position upon graduation.

**Theresa (Tess) Vyskocil**, 28, was graduated from Shakopee High School in 1984 and North Dakota State University in 1989. She worked at Minnesota Valley Country Club and LeSueur Country Club before joining the staff of Hazeltine National in 1992.

She enrolled at Penn State in 1993, currently has a 3.73 GPA and plans to graduate next March.

Vyskocil became interested in golf course management while holding summer positions while going through college. Currently a student member of the MGCSA, she plans on remaining an active member upon graduation.

"Academically, Tess has proven to be a dedicated and high-achieving student," said Patty Knaggs, Hazeltine's head superintendent. "Her grades prove that. She and I remained in contact throughout the academic year, and she frequently supplemented her academics with questions regarding real-life applications."

"Tess has attacked all jobs on the golf course with the seriousness of someone who realizes that their future depends upon their knowledge and skills," Knaggs said. "She is not afraid to get dirty or work overtime, and she is an extremely versatile employee. . . Her prior experiences on golf courses had made her an extremely capable equipment operator and pesticide applicator, and she also has shown

signs of becoming a thorough and patient staff trainer with our junior staff members."

The Stodola Scholarship Program, begun in 1987, provides annual grants to candidates who are interested in golf course management as a career, have high scholastic capabilities and have shown superior performance as an employee of a golf course.

Candidates must be residents of Minnesota or be employed by a member Superintendent of the Minnesota Golf Course Superintendents' Association.

In addition, they must have completed the first year of a two-year turfgrass technical program or completed the second year of a four-year or baccalaureate program with major emphasis in turf management.

## Load Off Your Back —

(Continued from Page 15)

grip and once again bend your knees to get extra leg muscle into the final effort.

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# Meeting The Challenge

\* \* \* \*

## *Here's What We Can Do to Proactively Advance Our Cause*

Over the past six months, there have been a record number of critical media reports about golf courses and pesticide use. Paul Harvey, *The Wall Street Journal*, CBS Evening News and ESPN SportsCenter (in addition to dozens of local papers and TV stations) have all taken shots. Chances are good that this intense media focus will lessen as the golf season winds down. But, the real challenge still lies ahead.

It's a frustrating fact that those who oppose pesticides will use fear, emotion and pseudoscience in support of their agenda. On the other hand, we have research and truth on our side. The question is, how do we proactively advance our cause? What can you, as a professional, do to support the effort? What can GCSAA do to help you? Read on.

### What You Can Do

The most important thing any superintendent can do is to know the facts and communicate them to golfers, media and decision-makers in your community. We've been very good at "preaching to the choir" for many years, but we must now make public relations a critical professional function. To be successful, every superintendent must participate in this "grass roots" campaign to build an influential constituency that supports us.

You can start by taking some simple but active steps to let others know about the environment benefits of golf courses, the safety of your practices, the testing and research required to register a pesticide product. Use club newsletters, bulletin boards and special events to spread the word. There is a world of information and a capable staff in Lawrence, Kansas, ready and willing to help you do this.

Invite local sportswriters, environmental leaders and other key figures out to tour the course (and play, if appropriate) and see your facility firsthand. Join the Audubon Cooperative Sanctuary Program. For just \$100, you can learn how to make your facility a better home for wildlife and help your players see the course as more than just a playing field. The benefits of the program are enormous.

Keep informed about the local, state and federal regulations that affect you. Every time a golf course is cited for a compliance problem or an OSHA violation, it hurts all golf courses. The fact that you're reading this information right now is proof you're already making an effort to keep up to date, but you can take an extra step by keeping in touch with your extension pesticide coordinator, chapter government relations liaison and local environmental officials. This "early warning system" can help you anticipate and better manage changes in regulations and laws that affect you.

Finally, bring others into the fold. One of the biggest con-

cerns shared by GCSAA members is that "the other guy" who doesn't have the education, interest or professional commitment will cause an incident that will reflect badly on the whole industry. The only way to solve this problem is to actively recruit non-members into your chapter and the national association. In short, every member must reach out to help those who could hurt us most. Nothing can contribute more to our eventual success than a unified, well-educated profession.

### What GCSAA Can Do For You

Aside from representing the profession's interests at the federal level, the primary goal of GCSAA's government relations effort is to give you the tools and information you need to manage the regulatory and legal aspects of your job. The association has an amazing number of resources available to help you do this:

**Greentips Fact Sheets:** These one- and two-page summaries are designed to give you important basic information about the key issues that affect you. Current topics include:

- Facts About Golf And The Environment
- Grass Clippings Disposal
- Hazard Communication
- IPM
- Pesticide Storage Facilities
- Recycling
- UST and ABT Management
- Waste Disposal
- Water Conservation
- Water Protection

**Position Papers:** The GCSAA Board of Directors has issued position statements on key issues ranging from posting and notification to applicator licensing.

**Pesticide Q&A:** This new fact sheet is designed to help you answer the typical questions golfers might ask about your chemical management program.

**Research Reports:** Full text copies of key studies on health and environmental issues are available.

**Videotapes:** GCSAA's a/v library includes dozens of training tapes and informational programs (such as "Links With Nature") produced specially to help educate superintendents, staff members and golfers.

**Staff Resources:** The GCSAA Communications Department and Technical Information Services Department are ready to answer your specific question on virtually any topic. If we can't help, we can direct you to someone who can. Call us at 913/841-2240 to find out more about how your association can be a professional resource for you.

— GCSAA Briefing

# EDITOR'S CORNER

By Dale Wysocki  
Faribault Golf & Country Club



What is this all about? Our careers take us to all different types of extremes.

At some golf courses the golf course is strictly rated by how "fast" the greens are. The condition of turf, blade count or even if there is turf on the putting surface, isn't important.

Then you can look at the teeing: nice flat areas with turf shorter than the fairways and, of course, the ball will sit up without a tee. What is this all about?

It's about the perfect lie. After reading old books about the history of the game of golf, looking at old lithographs and seeing old movies of U.S. Opens of the early '50s, it's evident that the conditions we offer our "bosses" have improved radically in the last 10-15 years. Just think, the invention of the first hydraulically driven triplex mower came during the late '60s. The super-ultra thin bedknives were developed during the late '70s.

Our "bosses" go to different golf courses and experience different conditions, from "tables of terror" that stimp at 10' 6", to fairways that stimp at 7'. Has television influenced what we do?

Recently I was conversing with an extremely close friend about his recent change to lightweight fairway mowers and how the conditions are going to change for him. The one item he picked up on was that the young junior golfer, who hangs around the bag room, said "You mean that we can stripe our fairways?"

No consideration was given to what this Golf Course Superintendent was going to have to do as far as extra maintenance. Will he have to change cultural practices or use different fertilizer strategies.

Regardless of what type of facility you are at, you always strive to give your bosses the absolute finest conditions regardless of budget, environment or equipment. What's it all about? Why the perfect lie from tee to green.

\* \* \* \*

**Congratulations to Gordy Miller, who had a most magnificent hole-in-one at Southview Country Club back in June. Gordy is available for private lessons.**

## 1994 MGCSA MONTHLY MEETINGS

Mon., Oct. 10 ..... Minneapolis Golf Club  
Sat., Nov. 12 ..... APPRECIATION PARTY  
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Wed.-Fri., Dec. 7-9 ..... ANNUAL CONFERENCE  
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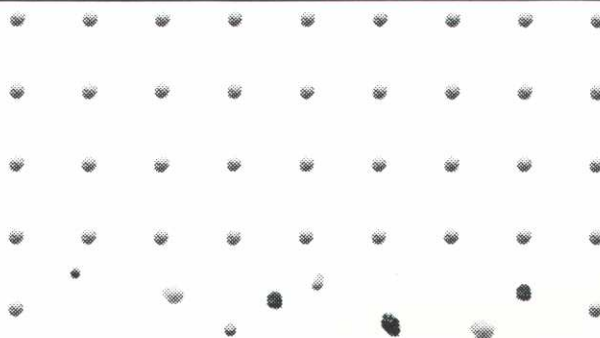
COST: \$ 75.00 Preregistration  
\$100.00 Registration at the Door  
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The registration includes lunch, two cocktail and refreshments on Tuesday, as well as coffee at the program breaks and "The Great Getaway" on Wednesday afternoon.

The following speakers will be presenting:  
Dr. Frank Rossi- University of Wisconsin  
John Matheny- USGA  
Joe Kosgolov CGCS- Wolf Run Country Club  
David Stone CGCS- The Honors Course  
Jim Gilligan CGCS- Richmond Country Golf and CC  
Steve Mona CEO- GCSAA  
James McLoughlin, President- The McLoughlin Group  
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For further information regarding the Symposium contact Alan Nees or Terry Ward at:

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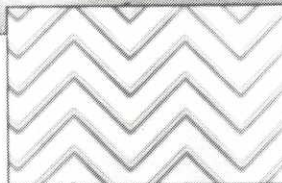
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