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Joe Robbie Stadium
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carefully to his players' comments about field conditions and doesn't hesitate to call in the groundskeeper for his response. He had done this regularly with Dale Sandin at the Orange Bowl and continued the practice with Dean Kuykendahl at Joe Robbie Stadium.

Try as he might, Kuykendahl could not satisfy Shula or completely master the PAT system.

He'd solved early problems with thatch and loose turf through a topdressing program. He grasped the delicate process of overseeding during the football season with perennial ryegrass. He got the field through a number of concerts without problems. Nevertheless, as football season started this past summer and the NFL started making its standard inquiries in preparation for the Super Bowl, support for his efforts started to dissolve.

Daniel suggested that the Dolphins hire turf consultant Tom Mascaro to help Kuykendahl out. Mascaro is a pragmatist whose experience with turf and soils spans more than 40 years. He is also an inventor, with claims to the aerifier, verticutter, Vertigroove and Vertislicer. He brought to Joe Robbie Stadium a confidence and relaxed method of problem solving that Kuykendahl could not match. When Kuykendahl had an opportunity to leave, he took it.

The Dolphins asked Mascaro to help them find a new groundskeeper. He learned that a golf course superintendent, who had applied for the job when the stadium was built, was still very interested.

Gary Morris, superintendent at Emerald Hills Golf Course in Hollywood, FL, was very familiar with the needs of hybrid bermudagrass in sand root zones. The bulk of his learning experience was gained as assistant superintendent at PGA National in Palm Beach Gardens, FL. "I really wanted the challenge of managing a professional field," Morris admits. "At PGA National I got used to the pressure of major events."

Super Bowl XXIII groundskeepers (from left) Chip Toma, George Toma and Gary Morris.

Pressure is what he likes and pressure is what he got — arriving at the stadium on a Wednesday in early October, with a Dolphins game on Sunday. "Tom had the stadium turf in good condition, so I focused my efforts on getting the field ready for the game, learning how to paint the lines and emblems," Morris says.

Much of his time the first week was spent at the Dolphins' training center in Hialeah, FL, working on the practice fields and getting to know the players and staff. "I wanted to know how they felt about things at the stadium and training center. It gave me a starting point to work from and let the players know I intended to be a good listener, Morris explains."

The two-and-a-half-field complex will serve as the practice site for the AFC champions the week before the Super Bowl. The NFC champions will practice at the University of Miami in Coral Gables.

Working together, Morris and Mascaro started to uncover the causes of some of Kuykendahl's problems. The center of the field was thinner than the rest. "It looked like disease, but it wasn't," Morris recalls.

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A network of drainpipe on top of a moisture barrier serves to drain and subirrigate the PAT system.

A foot of sand was carefully spread over the drainpipe.

Joe Robbie Stadium
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"The base for the pitcher's mound is also there."

They discovered that lightning had damaged the soil-moisture probes in the center of the field. They also found that the nozzles in the four center sprinklers were too small and changed them. "The center of the field just wasn't getting as much water as it needed," adds Morris.

He and Mascaro felt that the topdressing program had outlived its usefulness. More than two inches of sand had been applied on top of the sod in one year's time. They took core samples and noticed the roots of the overseeded ryegrass stopped at the level of the original sod.

The stadium's aerifier didn't go deep enough to break through the layer, so Mascaro brought out his latest invention, the vertislicer. Fixed vertical blades on the machine cut six-inch-deep slices in the soil.

"You can see where we sliced," says Morris. "The ryegrass is darker and has roots four inches deep. You don't see the lines during games, because we put down iron (Ferromec) beforehand and all the turf responds. Next year we are going to aerify deeper and more often. We'll also hold off on topdressing unless it's necessary."

Since he arrived, Morris has applied perennial ryegrass before each game for the players to work into the soil. "The surface is a little looser than it should be because of all the sand," he remarks. "The more roots the ryegrass can establish, the tighter the surface will be. Sand also gets tighter when it's wet."

When the NFL's George and Chip Toma arrived in late October to plan for the final preparations for the Super Bowl, they noticed the improvements Morris and Mascaro had made. "The field was a lot better than it was last spring," George recalls. "Morris is a good groundskeeper, and Tommie (Mascaro) may be the smartest grass man in the country. We talked about the rooting problem and made arrangements to get them some more equipment."

At the same time, Toma took core samples where the turf had been painted. "We found paint six inches deep in the soil," he reports, "and the roots weren't growing in the paint. Sometimes you can brush or verticut the paint out. But since the worst problem was in the center of the field, we decided to order thick-cut sod for that area. We'd make a decision on the endzones after Christmas."

Fortunately, the stadium would not be used after the Dolphins' last home game on December 12. That week the truck carrying all the NFL equipment and supplies arrived at Joe Robbie Stadium. The two Tomas and three of their crew from Kansas City also arrived to stay, with only a break for Christmas.

The first order of business was to brush the paint out of the endzones and to "shattercore" the field 2½ inches deep, using a Coremaster with solid tines. Chip started to pregerminate 1,000 pounds of Ph.D. perennial ryegrass blend.

Central Florida Sod brought in 1,000 square feet of sod cut 2½ inches thick. As a 50-by-90-foot section of the center was resodded, the pregerminated seed was mixed with calcined clay and Milorganite in a cement mixer.

The crew spread half the seed over the field and aerified again to a depth of one inch. The rest of the seed was applied and topdressed with a light layer of sand and black peat moss. "The dark peat absorbs the heat of the sun," Toma adds. With the sod and pregerminated seed down, the field was rolled lightly to smooth out the sandy surface.

Morris' stadium crew worked alongside the Tomas and their crew for nearly two weeks without a break. "We had the lights on at night so we could keep working," says Morris.

"Glen Mon, the stadium manager, was a big help," adds Toma. (Mon moved over to Joe Robbie Stadium this past year from the Los Angeles Coliseum.) "He understands what it takes to put on the Super Bowl."

Because Morris needed to devote most of his time to the stadium, the Dolphins hired Mascaro's daughter, Linda, to work with Chip on the training center and the University of Miami facility. She graduated from Penn State's turfgrass management course last spring. "She may be the first women groundskeeper at a professional stadium some day," her father says proudly.

The Tomas brought a new NFL tarp with them this year. "We'll use the new tarp on the stadium and the Dolphins' tarps on the practice fields," George explains. The new Covermaster tarp is silver on one side and black on the other. "You put the black side up to help warm up the field."

As Toma prepared to go home for a three-day Christmas break, he was confident that any major problems were under control. "We may have to resod the endzones because of the paint, but everything else seems to be going fine," concludes Toma. "Mr. Robbie is going to be happy. It's a beautiful field. Just wait to see how she looks all dressed up on game day."

"I'm a lucky guy," says Morris. "Working under Tom, George and Chip is like a Christmas present for me. They've helped me out with the management and the team. The rest is going to be up to me. Next year the field will be as perfect as we can get it."

The stage is set. In return for the NFL's belief that he could build a stadium with private financing, Joe Robbie has given the NFL a perfect stage for the Super Bowl — and a field fit for champions.

GCSAA PREPARES FOR 60TH ANNUAL CONFERENCE

The Golf Course Superintendents Association of America is counting down the days until its 60th International Golf Course Conference and Show, February 6-13 at the Anaheim Convention Center in Anaheim, CA. It expects 14,000 turf specialists and suppliers from around the world to attend the conference this year.

Educational seminars begin on Monday, February 6. Exhibits open at 9 a.m. Saturday, February 11, and close at 1 p.m. on Monday, February 13. GCSAA will be utilizing four exhibit halls to house displays from more than 350 exhibitors.

The association urges those planning to attend to make hotel reservations immediately by contacting the Anaheim Convention Bureau at (714) 999-8939. To register for seminars or to obtain further information about the conference call GCSAA at (800) 472-7878.

GCSAA has announced the sites of the next three annual conferences. In 1990 the association will meet in Orlando, FL, while Las Vegas, NV, will host the conference in 1991 and New Orleans, LA, in 1992.

TAYLOR TO RECEIVE DONALD ROSS AWARD

Richard S. (Dick) Taylor, editor and vice-president of Golf World magazine, has been selected by the American Society of Golf Course Architects (ASGCA) to receive its 1989 Donald Ross Award.

The ASGCA will present the award to Taylor at a special banquet in April, during its annual meeting at the Pinehurst Hotel in Pinehurst, NC.

ASGCA President Pete Dye said Taylor is being honored for his "more than 40 years of outstanding golf writing, particularly for noting the contributions the country's golf course architects have made to the game by constantly striving to provide the best possible courses for the golfing public.

"Dick Taylor understands the problems the experienced golf course architect faces in today's marketplace with its complex site, environmental and real-estate restrictions, and he has written extensively about the knowledge and ability necessary to transform a barren piece of land into a challenging but fair test of golf."

Taylor has been editor and vice-president of Golf World for the past 26 years. Prior to joining that publication, he was golf editor of the Palm Beach Post for 14 years.

He was born in Indianapolis, IN, attended Butler University, served as a multi-engine pilot in World War II, and began his career in journalism as a feature writer for the Tampa Times.

Taylor is a past president of the Golf Writers' Association of America. He served as its secretary for seven years and on the board for 20 years. He has twice won the association's writing contest in the magazine division. Taylor is also a member of the Association of Golf Writers (Britain) and an honorary member of the Australian GWA.

In his golf writing career, Taylor has seen the world, its courses and players many times over. He is a member of the Board of Governors of Pinehurst No. 7 Club; a member of Pinehurst Country Club and Pine Needles Resort, which he considers his home course; Pinehurst National Golf Club; an honorary member of Ballybunion in Ireland for his initial efforts to raise funds for the club's erosion-prevention project; Guadalajara Country Club in Mexico; and Waitangi Golf Club, Bay-of-Islands, New Zealand.

Taylor's early interest in golf course architecture was first piqued by the late Dick Wilson, one of many he places in his "hero"category. He has spent many hours in the Pinehurst library studying plans by the late Donald Ross, the first honorary president of the society, upon whose creations he has played most often. Taylor considers them to be the template for design fairness.

"The honor bestowed upon me by the society's Donald Ross Award is the most meaningful of my life," Taylor declared.

The American Society of Golf Course Architects is comprised of leading golf course architects in the U.S. and Canada.

DRUM TO ADDRESS GOLF COURSE CONFERENCE

Bob Drum, the personable humorist of CBS-TV Sports, will address the opening session of the 60th International Golf Course Conference and Show on February 9 in Anaheim, CA.

The event will be hosted by the Golf Course Superintendents Association of America (GCSAA). More than 14,000 turfgrass representatives are expected to attend the eight-day conference.

Drum was born in Brooklyn, NY in 1918. He attended the University of Alabama, where he played both basketball and baseball. Upon graduation he was drafted by the Brooklyn Dodgers, but he signed instead with the U.S. Army during World War II.

After the war, Drum joined the sports staff of the Pittsburgh Press. He spent the next 18 years covering all sports, but his main love was golf.

He has co-authored three books with Arnold Palmer and has consulted on golf tournaments across the country. Five years ago, he provided some free-lance writing for CBS Sports, which led to the "Drummer's Beat," a highlight of every CBS Sports golf presentation.

First Annual Man of the Year Award

Man of the Year, Fred V. Grau.

As Fred Grau lay in a hospital bed in Maryland recently with a less-than-cheery prognosis from his doctor, he wasn't contemplating his mortality. Instead, the 86-year-old Grau was figuring out how he could promote a creeping tall fescue and a variety of zoysiagrass. He had every intention of leaving the hospital to carry on his work that has spanned six decades.

Grau has battled the status quo throughout his life, always saying "it can be done." Driven by the potential he sees for the turfgrass industry, he never gives up. And he didn't give up this time either. He's back at home on the phone, working on his endless agenda.

SportsTURF magazine is proud to honor Fred V. Grau as the first recipient of its Man of the Year Award. Without his foresight, persistence and dedication, the turf industry would not be what it is today. His influence over the decades has affected thousands, if not millions of turfgrass managers, researchers and suppliers. And, as Fred sees it, there are millions more out there to help.

Leadership is more than being in the right place at the right time. Leaders must be resolute, able to overcome criticism, and continuously willing to fight for what they believe. Grau's timing couldn't have been better and his resolve couldn't have been stronger. Both his supporters and his detractors will tell you this.

He started his turfgrass career as a student at the University of Nebraska in Lincoln. As an agronomy major he observed his professors in the College of Agriculture tackle innovative research into improved varieties of crops for the American farmer. But Grau had a different kind of field in mind.

Oddly enough, his fascination with turf started when he was on the sidelines as a cheerleader for the Cornhuskers. There were lots of students planning to go into agriculture, but few saw the potential of the turfgrass industry. While his fellow students were captivated with the beginning of the agricultural revolution, Grau charted his career in turf's direction.

It was an inspired decision, as the Great Depression spread across the nation's grain belt. The United States Golf Association (USGA) was impressed with the young agronomist who had an interest in turfgrass selection and breeding. The plots at the Midwest Turf Gardens in Chicago needed the attention of a specialist, so they gave Grau the job. After a few months, the USGA moved him to its larger experimental gardens in Arlington, VA, now the site of the Pentagon.

As Grau maintained and recorded the performance of turfgrass samples collected from across the country, he realized that his education was incomplete. Diseases often made or broke the turf in his plots. He had sought the advice of Dr. John Monteith, a pathologist at the University of Rhode Island, and made plans to work toward a Master's degree under Monteith in Kingston, RI.

Ironically it was Monteith who suggested Grau continue his work with the USGA while he took classes at the University of Maryland in nearby Beltsville. Instead of studying pathology, Grau directed his study toward weed control in turf.

Selective weed control was a wide-open field for him to explore, since 2,4-D would not be developed for another 15 years. He found that sodium arsenite killed common weeds without killing the turf. Selective weed control was the first of the turf technologies he would pioneer.

He continued to work for USGA, evaluating the performance of bentgrasses, Kentucky bluegrasses, fescues, and a new type of turf from Korea called zoysiagrass. It was also Grau's job to document the benefits of the growing C-series of bentgrasses for USGA that included Arlington (C-1) and Cohansey (C-7). He could see the differences between European varieties of turfgrasses and those established from samples collected by golf course superintendents and fellow researchers across the U.S. It was *potential* he was looking for — and he saw it long before others would agree. Meyer zoysia is just one example.

At the same time, he studied pasture grasses for his doctoral thesis at Maryland. One reason he studied pasture grasses instead of turfgrasses was that there were stipends and fellowships for agricultural research, but not for lawn, golf course and athletic field research. From that point on, he started looking for ways to generate dollars for turfgrass research and student fellowships.

Grau wanted to apply some of the advances he had observed at the Arlington Turf Gardens. He got his chance when Dr. Burton Musser was able to squeeze out money from his research budget at Pennsylvania State University at University Park.

While Musser concentrated on research, Grau focused on field work and helping Pennsylvania golf courses, parks and schools solve their turf problems. "This work led to my becoming the first Extension Turf Specialist in the United States," Grau proudly exclaims.

That might not have happened had the golf course superintendents in Pennsylvania failed to organize and voice their demand for help from the university. "Greenskeepers joined forces to create the demand for support services," remarks Grau today. "The squeaky wheel gets the grease, as they say."

In 1935, as he traveled Pennsylvania in his Ford Model A Roadster, his eyes wandered from the pavement to roadsides, pastures and lawns. One day he was driving from Allentown to Reading when he had to make a decision about which road to take. "I turned right at a fork," he recalls, "and you could say I never turned back."

Grau noticed a pile of cinder shale alongside the road, covered with pink and white flowers. He stopped his Roadster and asked the farmer, Robert Gift, about the plant. Gift said attempts to get rid of the plant had failed so he'd just left it alone, without water or fertilizer. The plant, which he discovered was crown vetch, apparently reseeded itself successfully into the sterile pile of shale.

As Grau continued along his way to

Grau gets around his neighborhood in College Park, MD, in a golf cart.

Reading on highways with their barren, eroding roadsides, he realized that this tenacious plant might be a low-maintenance solution to erosion control and beautification of the rapidly growing network of highways in the country. Not only did crown vetch improve the soil by recycling nutrients from deep in the ground, it did not become a nuisance by spreading into cultivated areas.

There were two problems with this idea. First, someone would have to grow the seed and secondly, a convenient way to seed hundreds of acres of roadsides was needed. Working with engineers at the University, he developed a machine that would spray a mixture of seed, mulch and water onto slopes from a truck-mounted tank. The resulting machine was the first hydraulic seeder.

Using seed Grau had gathered from Gift's farm and the seeder, the Pennsylvania Turnpike planted a section of roadside in 1939. The crown vetch along much of the turnpike is clearly visible today to travelers.

To complete the puzzle, Grau decided that he would grow the seed himself and formed Grasslyn, Inc. In 1946, the company began marketing crown vetch to highway departments across the nation. Later in his career, Grau's Penngift crown vetch would provide him with the financial independence to pursue some of his many ideas.

The Depression and World War II set back the golf course industry tremendously. But when the war ended, there was a tremendous demand to build new golf courses and expand existing ones. The USGA was loaded down with requests for assistance. Fielding Wallace, chairman of the USGA Green Section Committee, asked Grau to return to Beltsville as the first director of the Green Section in 1945. For eight years, he coordinated USGA's efforts to help architects and superintendents meet the exploding demand for golf in the U.S.

Under Grau's direction, the Green Section promoted the development of hybrid bermudagrasses by Dr. Glenn Burton at the Georgia Experiment Station and improved seeded bentgrasses at Pennsylvania State University. Grau encouraged the use of Merion and other improved Kentucky bluegrasses as well as zoysiagrass in the transition zone. He kept superintendents apprised of developments with fungicides, fertilizers and herbicides.

Despite the tremendous load on USGA, Grau wanted to expand the organization's influence to other turf areas. "So much of the technology benefiting the golf course industry was desperately needed by others," explained Grau. It seemed only natural to him, especially because of USGA's close relationship with the U.S. Department of Agriculture at Beltsville. Grau's controversial opinion was not shared by the USGA, and he left the organization in 1953.

Grau saw three options for him to participate in the improvement of turf management for all uses. The first was from the commercial side of the market, promoting new products that he believed would make a difference. He did this by working for Nitroform Agricultural Chemical Corp. (later Hercules, then Nor-Am), giving demonstrations across the country of Nitroform ureaformaldehyde, a slow-release fertilizer. He also helped refine and demonstrate the first turf aerifier and verticutter for West Point Products.

Some of his greatest work has come from his participation in the second option, state and national turfgrass associations. In 1959, Grau became executive secretary of the Pennsylvania Turfgrass Council upon the death of Dr. Musser. He worked diligently to involve representatives from all types of turfgrass occupations in the state, in addition to gaining support from industry suppliers. The result was a larger financial base from which to support all types of turfgrass research through grants.

Grau is perhaps best known for his involvement in the Musser International Turfgrass Foundation, created after Musser's death to raise funds for turf research and fellowships. He resigned as

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Man of the Year
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executive director of MITF this past year when his health started to slip. Five years ago he helped launch the National Sports Turf Council in order to gain recognition and support for the improvement of parks and athletic fields.

Throughout his career he has contributed in numerous ways to the American Society of Agronomy. In 1987, the Crop Science Society of America, a division of ASA, created the Fred V. Grau Turfgrass Science Award to recognize significant contributions to turfgrass science. ASA will present the award to those in the turfgrass industry regardless of their occupation. It will consider the career work of researchers, teachers, suppliers or administrators.

The third option Grau has successfully mastered is writing. Starting with the USGA Green Section Bulletin, Grau's words have been printed in the *National Geographic, Golfdom,* and virtually every industry publication today. He always has a cause to promote and writes prolifically to get the word out. Most recently he has been published on the importance of living soils. "We should be managing turf to encourage beneficial microorganisms, not discourage them with overuse of chemicals and sterile soils," he asserts.

According to Grau, he still has a great deal of unfinished business. He admits that somebody else will have to pick up the ball for the National Sports Turf Council and run with it. But he has every intention of pursuing his ideas for a creeping tall fescue and releasing Sunburst zoysiagrass.

Grau and former assistant Sharon Lee Flavell, remove a plug of zoysiagrass from a lawn in his neighborhood.

"I've kept Sunburst on the back burner until now so it wouldn't interfere with Meyer," he explains. "It's too good to hide any longer. It has excellent resistance to insects and diseases and doesn't develop thatch. It is a low maintenance grass that will do great in regions of the country where bermudagrass and Kentucky bluegrass are hard to manage."

Grau still lives just a few miles from the USGA turf plots in Beltsville. He doesn't get there as often as he used to, but nearly every yard in his neighborhood was planted with selections he made throughout his career. He reads stacks of trade magazines and journals every month and either calls or writes his comments to their editors on a regular basis. His son, Fred V. Grau, Jr., manages the Grasslyn farm in Pennsylvania and keeps him informed of production and orders weekly.

"The turfgrass industry is still a long way from reaching its potential," says Grau. "All you have to do is look around and see the bare, rutted football fields at schools and parks, lawns that fail because they are overfed and overwatered, and highway roadsides that are eroded and collect trash. We have a long way to go. We have to get organized to make sure that the turf industry will reach its potential in the future."

Editor's Note: Doris J. Watson of Marketing Support Services in Austin, TX, and George Jones of Nor-Am Chemical Company, Wilmington, DE, assisted with the development of this story.

TIPS FROM THE PROS

How To Get The Most From Diagnostic Tools

By Tom Mascaro

When working with Mother Nature, even your best decision may be haunted by a little doubt. The way to reduce this doubt is to have as much information as possible. That is why diagnostic tools are so important to the professional turf manager.

By using these tools as an aid to decision making, you replace uncertainty with factual information. When facts are added to visual and sensory determinations, they help confirm conclusions on how to solve problems.

Diagnostic tools should be available quickly when needed. They may not fit into a briefcase, but they will fit easily into a pickup truck or turf vehicle. Professional turfgrass managers should learn how to use them and be able to apply the facts that they provide to decision making.

Each tool serves a specific purpose. Following is a brief description of some of the tools available and the information they provide.

Soil Profile Samplers. These instruments extract a cross section of soil a few inches deep for visual analysis without materially disturbing the turf surface. The narrow sampling tool is forced vertically into the soil. After it is withdrawn, the device is opened to expose an undisturbed profile of the soil.

Visual diagnostic analysis of the sample provides information on the depth of thatch, the thickness of the mat layer (partly decomposed thatch), consistency of the soil (texture), compaction, different soil layers, and the nature of the subsoil. The sample can be dissected to closely inspect the depth of living and dead roots.

After inspection, the sample can be returned to the soil intact. Soil profiles can also be photographed or preserved in epoxy for comparative purposes, or to show problems to others involved in turf management decisions.

Soil Probes. These are usually hollow tubes that remove cylindrical samples of soil one inch or less in diameter, much like a core removed by an aerifier. Soil probes are useful for taking quick samples for inspection and to determine soil moisture depth. They are also handy for obtaining soil for laboratory analysis.

Soil Moisture Meters. Moisture sensors utilize various techniques to indicate the amount of moisture in the soil at any given time. Some are hand-held field tools, while others utilize buried probes which are connected to meters for reading. In either case, these devices measure moisture at the depth of the probe. It is always important to take readings from different levels.

John Mascaro explains how soil moisture meter works to superintendent.

Moisture sensors can be used to locate problem areas during periods of heat and drought stress. When grass takes on a blue-gray color and footprints remain visible, it is under drought stress. A moisture sensor will confirm a visual analysis and pinpoint the depth of the problem. For instance, dry spots can be detected before they cause a serious loss of turf.

Moisture sensors can also indicate problems that are not visible. Although water may have been applied, it may have not reached the root zone. It is more important to have adequate water six inches deep than to have only a wet surface. Conversely, water held by the soil too long can result in diseases and other problems, especially at high temperatures. Monitoring soil moisture, especially in troublesome turf areas, can provide the facts needed to make decisions.

Water conservation has become an important part of turfgrass management. The sports turf manager needs to have a grasp on soil moisture and factors which influence it to maintain quality, uniform turf with limited water.

Soil Thermometers. Monitoring soil and air temperature provides useful information during periods of high temperature stress and when scheduling seeding or weed control. Standard or digital thermometers can be useful tools for the turf manager.

Soil temperatures can warn the turf manager of impending danger especially when a turf area has a heavy layer of thatch. Under the right temperature and moisture conditions, bacterial activity in the thatch layer accelerates, resulting in even higher temperatures. It's the same process that takes place in a compost pile. The grass plants can be killed unless syringing is done immediately.

Compacted soils also have higher temperatures than well-textured soils, since they hold less cooling moisture. On the other hand, puddles that develop in uneven turf surfaces can scald turf. Monitoring suspicious depressions with a digital thermometer can help you determine corrective action.

We know that cool-season grasses and certain weeds germinate or grow better at certain temperatures. This information can be used to time seeding, overseeding and applications of preemergence herbicides.

Finally, air and soil temperatures can vary greatly depending upon location. Temperatures for valleys, shaded sites or pocketed areas invariably are different from those presented in weather reports. A turf manager needs to know what is happening in a variety of different locations, not just one. Soil thermometers provide that information.

Soil pH Meter. Acidity and alkalinity play an extremely important part in turfgrass management. A scale, known as the "pH scale," is used universally to express varying degrees of soil acidity and alkalinity. Field pH meters are diagnostic tools which allow the turf manager to monitor soil pH quickly and conveniently.

In order to understand how acid and alkaline conditions affect turf growth, one must first understand the pH scale. A reading of seven indicates that the soil is neutral, neither acid or alkaline. A reading below seven means the soil is acid, whereas a reading above seven indicates the soil is alkaline.

The pH scale is totally unlike other measurements, such as temperature or distance. A difference of one point in pH is actually a factor of ten. In other words, a soil with a pH of six is ten times more acid than one with a pH of seven. A pH of five is 100 times more acid than seven and a pH of four is 1,000 times more acid. The same is true for alkaline readings above seven.

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Turfgrasses grow best at pH readings of between 6.5 (slightly acid) and 7.5 (slightly alkaline). And reading higher or lower than this range can have a profound effect on how leaf and root growth take place. Applications of certain fertilizers and other chemicals or amendments can change the soil pH.

Turfgrass diseases are definitely affected by pH. It also has a proven effect upon the availability of nutrients in the soil. Minor elements, such as aluminum and iron, will become deficient when soils are too acid or alkaline. Beneficial microorganisms cannot reproduce.

Intensively used turfgrass areas are subject to pH change for a number of reasons. For instance, thatch, can become very acid or alkaline, since it is constantly being washed by frequent rain and irrigation. The pH of rain or irrigation water also alters the pH of the soil.

Correcting an acid pH in soils can be accomplished with light applications of dolomitic limestone and monitoring with a field pH meter. Various acidifying materials, such as gypsum and sulphur, can be applied to make soils more acid. The pH meter will let you know when soil reaction reaches the desired range.

Soil Penetrometers. These are instruments which measure the degree of compaction of soils. Some penetrometers, used mainly for scientific studies, are very complicated. Simpler versions utilize either a spring-loaded needle or a gravity drop. The consistency of readings is considered better for the gravity drop penetrometers. However, all types provide useful information.

Periodic monitoring of turfgrass areas helps the manager determine when and where to aerify. Grass roots do not grow in the soil; they grow in the spaces between the soil particles. A compacted soil is dense, with limited space for roots to grow. Penetrometers measure the bulk density of the soil. When the bulk density reaches 60 to 70 percent, it's time to aerify.

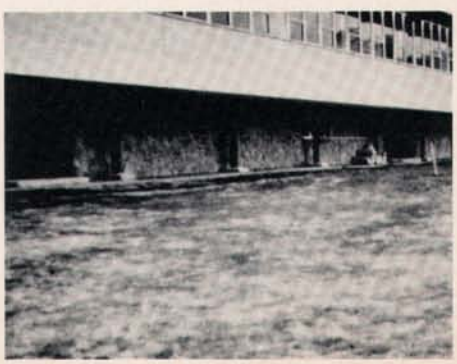
Dense, compacted soils not only affect turfgrass growth, they are hard and do not cushion the impact of players or balls striking the surface. Compacted sports fields and playgrounds become dangerous. Compacted greens and fairways will not hold a properly played shot. It is more difficult to tee up or strike a ball on tees that are compacted.

Soil profile sampler.

Players of all sports depend upon a consistent response from turf. When they do not receive it, the quality and safety of the sport is reduced.

Monitoring sports fields and playgrounds for soil compaction should be mandatory for two important reasons, besides having a good turf cover. The first reason is to minimize serious injuries to children and athletes. The second reason is to have document backup for insurance purposes. Recording and dating soil compaction levels can become valuable evidence in lawsuits.

As the profession of turfgrass management grows more demanding, diagnostic instruments become valuable and necessary aids in helping diagnose problems early. Visual analysis alone, or "eyeballing" as the old-timers used to say, may be too late to save expensive turf. There is less and less room for doubt in turf management today.



Heavily-thatched, moist turf killed by heat.