The Preserve—

(Continued from Page 10)

Although the clubhouse has not been completed, space has been developed to serve the golfing public, according to Mark Neva, Grand View's head golf professional at The Pines. Assistant professionals Eric Petersons and Chuck Klecatsky are scheduled to oversee that operation when it begins.

"We're excited about the flexibility The Preserve provides," said Neva. "Even since The Pines expanded to 27 holes, there has been considerable pressure for tee times and The Preserve will help considerably in this respect. Besides, it also is a great golf course and offers even more variety for area golfers as well as guests at Grand View Lodge."

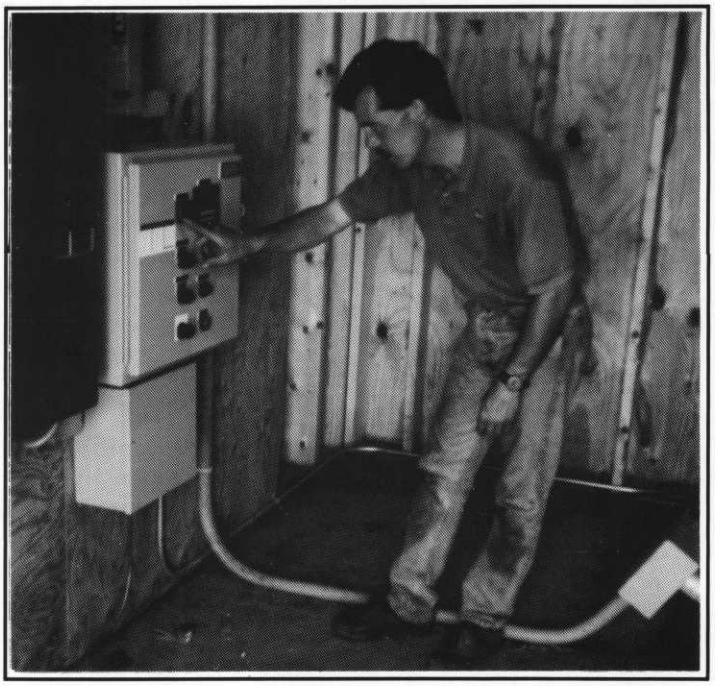
For Bohnenstingl, the opportunity to come to The Preserve was most appealing.

"It's been a pleasure to be involved in helping out on the development of a new golf course, and furthermore, it's almost like coming home," he said. "I went to college at Bemidji and also had a great experience as an assistant at Madden's at Gull Lake. My wife Becky also was an employee at Madden's and now we've bought a home in Nisswa, and my brother Chad is an assistant superintendent at Ruttgers at Bay Lake. Besides, The Preserve is a fantastic course and obviously should even get better as it matures."

A 1980 graduate of Wheaton (Minn.) High School, Bohnenstingl earned his bachelor of science degree in industrial psychology at Bemidji State in 1984. From 1989-91 he enhanced his turf management knowledge by taking several technical courses at Anoka Technical College.

From 1981-91, he was employed on the summer maintenance staff of Madden's where he was promoted to assistant superintendent at Minnesota Valley.

Becky served as catering director at Golden Valley Country Club before moving to Nisswa.



CHECKING variable frequency drive pumping system at The Preserve is Superintendent Bohnenstingl.

MGC Hosts 'Dayton's Challenge'

By Dale Wysocki

Many Mondays at golf clubs throughout the state are usually reserved for corporate or outside events. These events are usually an economic necessity for the club's bottom line.

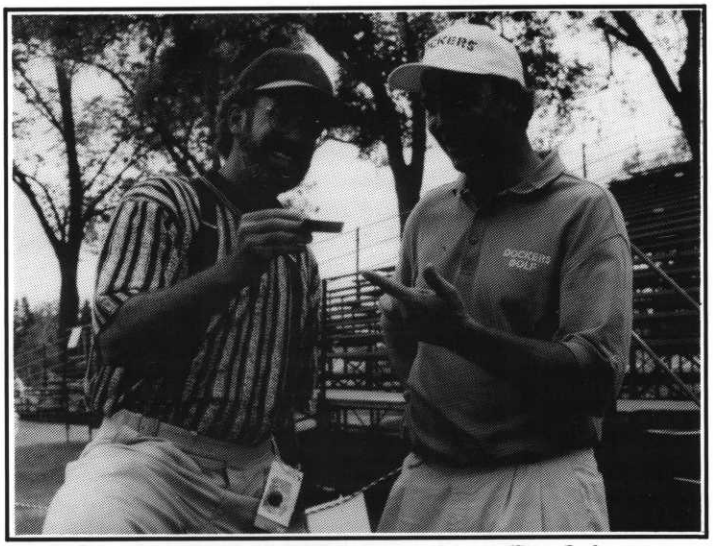
However, when the bottom line is the Children's Cancer Research Fund, you would know that the event will be special in many ways. In order to make a special event *special*, first you need a first-class location, like the Minneapolis Golf Club. Then you would need a "draw" like Tom Lehman and 11 of his close-personal friends...close personal friends who have won 79 times on the PGA Tour and five Majors. . . .and you have the makings of the "Dayton's Challenge."

But you also need a track that is kept in shape that meets the expectations of what some people in the know refer to as "tour caliber condition," and that is where Minneapolis Golf Club enters into the picture. For years the story has been that the membership at Minneapolis Golf Club maintains the lowest average USGA handicap index of any club around the metro area. Now with all of these factors you know that you're going to need a superintendent who is organized, possesses full working knowledge of agronomics and is an all-around good person.

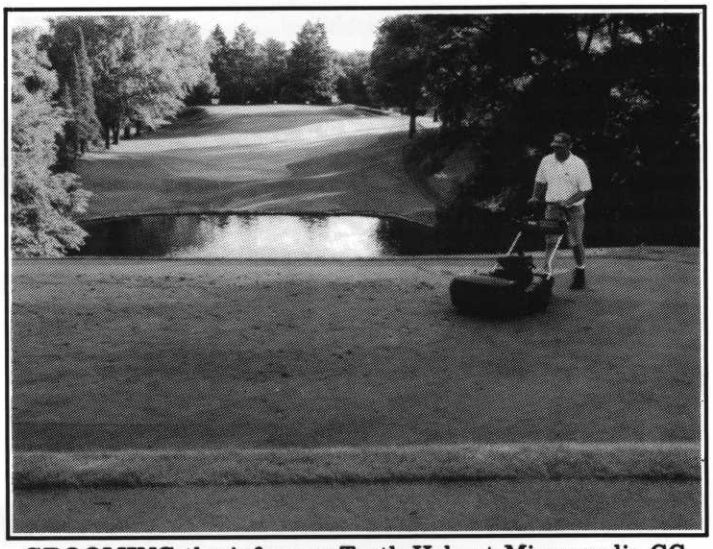
Dale Caldwell and the grounds staff of MGC made things happen; the golf course is excellent. The greens had found that fine edge, the fairways offerd a lie where it would be no problem to use the driver, and if you strayed far from the normal landing area, well, there is the rough.

Of course, the planning of this event does not happen overnight. To coordinate the 400-plus volunteers, the construction of the bleachers, the remote-controlled scoreboards and everything from course ecology to who parks what car on what tee, well that credit has to go to Chris Murray of Signature Sports.

As the day went on, Payne Stewart decided to become a part-time cameraman for MSC, Peter Jacobsen did his best imitation of fellow competitors and a few other tour favorites. Eventually Tom Kite won the golfing event while the Children's Cancer Fund wound up being the real winner.

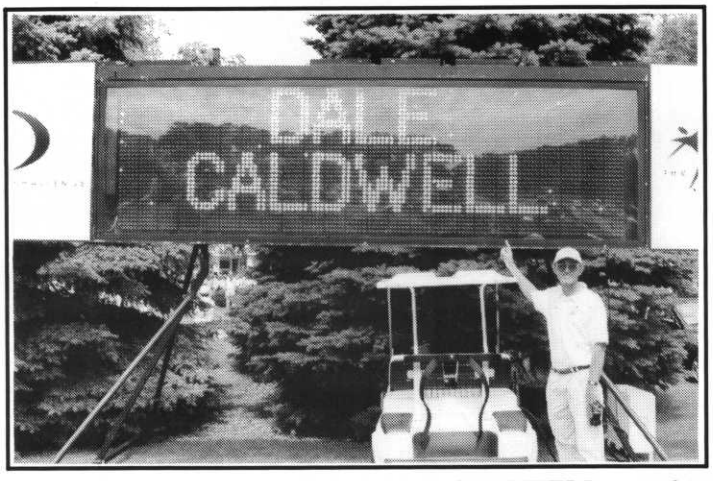


THE AMAZING HONDO amazed host Tom Lehman.

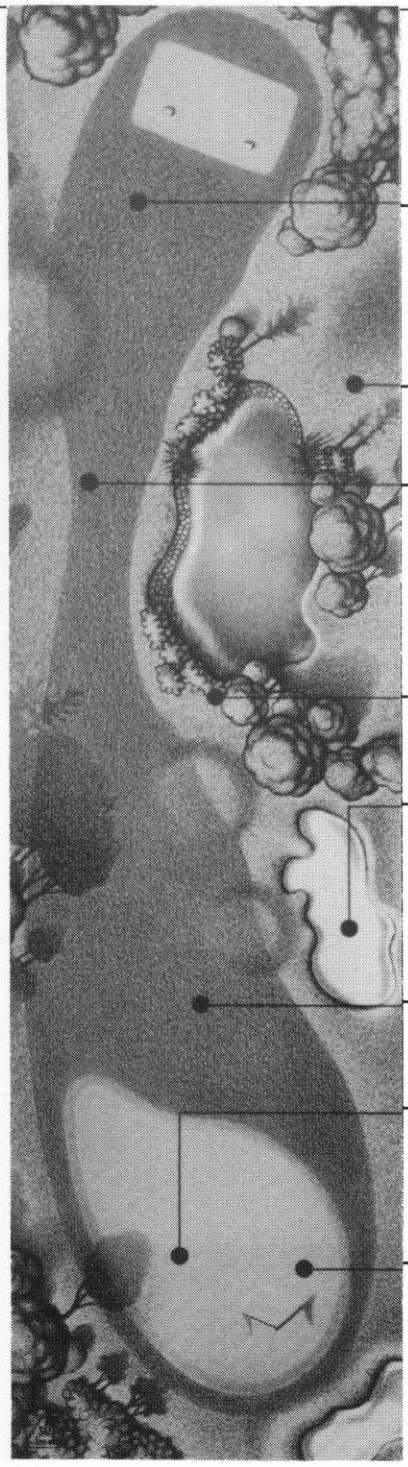


GROOMING the infamous Tenth Hole at Minneapolis GC.

TOM KITE WINS THE CHALLENGE with a fantastic birdie-birdie-birdie finish on three tough finishing holes at MGC.



HOST SUPERINTENDENT DALE CALDWELL gets his name in lights while being acknowledged for the great condition he and his staff had Minneapolis Golf Club.



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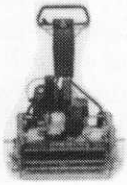

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The Ups and Downs of Rolling Putting Greens

A Practical Guide for Developing a Rolling Program

By Chris Hartwiger

(Reprinted from the July/August 1996 issue, USGA Green Section Record)

History has an uncanny ability to repeat itself. Nowhere is this more apparent than in the turfgrass management practice of rolling putting greens. Once an important tool in a superintendent's management program in the early 1900s, the practice of rolling has endured periods of popularity and disdain. Nevertheless, rolling putting greens has received considerable attention during the early 1990s, and its merits are being debated at many golf courses.

The attitudes toward rolling vary widely today. Some golf course superintendents view rolling as a means of improving putting quality, while others believe rolling is just another stress that makes putting green management just that much more difficult. While the debate over rolling continues, a large portion of the golf course management industry is interested in revisiting this old maintenance practice and learning about its potential for use today.

This article will serve as a guide to developing an agronomically appropriate greens rolling program through careful consideration of several factors. To accomplish this, a brief history of rolling and the advantages and disadvantages associated with greens rolling will be reviewed. Next, research results on the effects of rolling putting greens will be presented in order to understand appropriate frequencies of rolling putting greens. Finally, the different types of rollers available today will be reviewed, and methods to compare different rollers will be offered.

Rolling History

Historically, superintendents used rolling as a supplement to mowing to improve the smoothness of putting greens. The mowing equipment, turfgrass varieties and cultural practices for putting greens during the early 1900s were much less sophisticated than those available today, and the practice of rolling provided an immediate improvement in putting conditions. As golf course management evolved, the attitudes about rolling changed too. New bentgrass varieties and improved mowers allowed superintendents to make major improvements in putting quality. Also, turfgrass scientists discovered the negative effects of compaction on turfgrass growth and development. Needless to say, many rollers were relegated to the back corner of the equipment storage facility.

Several events have occurred during the last 20 to 30 years that have made superintendents reconsider the practice of rolling putting greens. The first is the proliferation of high-sand-content putting greens, which are less susceptible to compaction. Also, many equipment manufacturers have introduced new lightweight rollers designed specifically to provide an efficient and reliable means of rolling greens. A final consideration is the increasing pressure being placed on superintendents to provide faster and smoother putting surfaces.

Rolling Perceptions

With the renewed interest in rolling, it is important to understand the potential advantages and disadvantages associated with an appropriate putting green rolling program. Under reasonable mowing heights, rolling will increase green speed. Accompanying the benefit of green speed is an improvement in smoothness and uniformity. After rolling, improved smoothness is readily apparent, especially to golfers. Some superintendents roll greens in conjunction with mowing, while others roll as a substitute for mowing. This approach reduces the stress associated with mowing and can smooth spike marks, remove dew and provide an immediate improvement in smoothness.

While golf's Scottish ancestors considered inconsistent greens a challenge, the demands of today's players dictate a consistent surface from the first green through the 18th green. Rolling all 18 greens can improve the uniformity and consistency of speed among greens.

Aerification is a practice that's essential for high-quality putting greens, but unfortunately golfers have a poor understanding of this practice. Some superintendents are using rolling as a way to minimize the surface disruption caused by aerification and improve post-aerification putting quality for golfers.

Equipment used to maintain turfgrass has limitations, and rollers are no different. Over the years, several areas of concern with rolling have arisen. Turf scientists have demonstrated that compaction hinders turfgrass growth, and some fear that rolling increases compaction. Along with this change, some believe that rolling may cause a decrease in the infiltration rate that could hinder oxygen

(Continued on Page 16)

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Rolling—

(Continued from Page 14)

and water availability to the roots. Also, there is a concern that rolling may result in wear injury or bruising of the turgrass on the putting green..

Until recently, researchers had not investigated these concerns, and the result was a cautious approach to rolling by superintendents. For example, some use rollers prior to a tournament or special event and use it sparingly at other times. Two major forces are driving this conservative approach. The first is a lack of research on the effects of rolling. Additionally, superintendents do not want to raise golfers' expectations without knowing more about the negative effects of rolling.

The Effects of Rolling

If the practice of rolling is to find its place in the future of putting green management programs, several important issues need to be resolved. First, the practice of rolling appears to increase green speed, but both the immediate effects on green speed and the residual effects on green speed are not understood completely. Also, turf managers are aware of the negative effects associated with compaction, but no one has determined if the new lightweight rollers compact putting green soils. Finally, examples of rollers injuring turf through abrasion have been observed, but little is known about what conditions and frequencies of rolling can cause this injury.

In 1992, I identified these questions and initiated a research project at North Carolina State University under the guidance of Drs. Joe DiPaola, Charles Peacock, Leon Lucas and Bill Cassel. The goal of this project was to evaluate the effects of lightweight rolling on green speed, compaction and turf quality. This experiment was conducted on bentgrass greens constructed with a USGA specification rootzone and a native soil rootzone. The initial study was conducted for 10 weeks in the summer of 1993 and was repeated in the summer of 1994. Rolling frequencies on the bentgrass test plots were either 0, 1, 4 or 7 tiimes per week.

Outlined below is a brief summary of the results of this research.

Green Speed

The experiments performed on green speed revealed two important points. First, green speed measurements taken one to two hours after rolling were 10 to 15 percent faster than an untreated area. Also, a residual effect was observed. Approximately 48 hours after rolling, the plots receiving the rolling treatment had green speeds approximately 2 to 4 percent faster than untreated plots.

Bulk Density

Bulk density measurements were used to assess the level of compaction of both the USGA and native soil rootzones. On the USGA specification green, no change in compaction was detected in either of the treatment years for any of the rolling frequencies. In essence, rolling as much as seven times per week for ten weeks did not produce a measurable change in bulk density.

On the native soil green, mixed results were observed. In the 1993 experiment, rolling frequencies of four or seven times per week produced and increase in bulk density.

On the native soil green, mixed results were observed. In the 1993 experiment, rolling grequencies of four or seven times per week produced an increase in bulk density. No change in bulk density was noted for the plots receiving zero or one rolling treatment per week. In the second year, no change in bulk density was detected regardless of rolling frequency.

Turf Quality

Results of the study indicated that, depending on the rolling frequency, turfgrass thinning and decreased turf quality can result from rolling. At a frequency of rolling one time per week, no decrease in turf quality was evident when compared to an untreated plot. However, rolling frequencies of four or seven times per week did result in turfgrass thinning after approximately three to four weeks of rolling treatments. When thinning did appear, it began in isolated areas and increased as treatments continued. Rolling four or seven times per week did reduce turf quality, but only if practiced for several consecutive weks. Therefore, superintendents can roll at low frequencies for extended periods of time and at high frequencies for short durations.

Types of Rollers

There are three primary types of rollers available for putting greens. The drum roller is the oldest type of roller in use today. Drum rollers have been used for many years and they vary in size, shape and weight. Typically, these units were constructed by a creative golf course mechanic. During operation, drum rollers are pulled behind a utility vehicle.

The second type of roller is called a triplex attachment. These rollers are attachments substituted for the reels on a triplex mower. The actual operation of these units is virtaully identical to mowing a green with a triplex mower. As a result, little operator training is needed for effective use. A difference between these units and the other two categories is that tires of the triplex, and not the rollers themselves, are the last part of the unit to impact the turf.

Dedicated lightweight rollers are the third category of roller available today. These units have been receiving the majority of the publicity surrounding the renewed interest in rolling. Designed only to roll putting greens, these models come in a variety of sizes, shapes and weights. The major differences between various models of dedicated lightweight rollers on the unit are the number and size of

(Continued on Page 17)

Rolling—

(Continued from Page 16)

actual rollers on the unit, the presence or absence of hydraulics and the weight of the unit. A dedicated lightweight roller usually has two or three rollers underneath the unit. The presence of hydraulics, which is a source of concern to superintendents who worry about hydraulic leaks, is found on some of the models, while others have a belt-only drive system with no hydraulics..

Comparing Rollers

Choosing the type of roller for your golf course is an important decision that involves several factors. The cost of the roller is a key consideration. Typically, drum rollers are least expensive, followed by triplex attachments and dedicated lightweight rollers. The need for operator training must be examined closely. Triplex attachment rollers require the least amount of operator skill, while dedicated lightweight rollers are the most difficult to operate. The terrain of the greens and surrounds can dictate the level of operator skill needed. The more undulations or steep slopes present, the greater the need for operator skill and the capability of a roller to handle these conditions.

The amount of force per unit area that a roller imparts on the green is another important consideration. Historically, measures such as pounds per square inche (PSI) or pounds per lateral inch (PLI) have been used to determine the force applied ;to a green by a piece of turf equipment. Unfortunately, both PSI and PLI are difficult to apply to rollers. PSI and PLI will be reviewed to understand their limitations, and a formula called the Roll Factor will be presented as a means to compare the compaction potential of different rollers.

In simple terms, PSI can be calculated by dividing the weight of the roller by the area of surface contact. Often, the technical specifications for the roller will contain the weight, but not the areas of surface contact. On a concrete floor, the surface area is easy to determine. Unfortunately, rollers are used on a putting green and not on concrete. When a roller is placed on a putting green, there is some amount of depression into the putting surface, which changes the area of contact. To complicate matters, the area of contact is not linear but circular, and the weight of the unit is not distributed equally at all surface points. The amount of depression into a green can vary with thatch levels, mowing height, soil moisture, rootzone construction and other factors. As a result, PSI can be extremely variable and difficult to determine. In determining PSI, it is unlikely that each manufacturer has used the same assumptions, leaving the superintendent to try and compare apples to oranges.

Another popular method of comparing rollers is to measure pounds per lateral inch. The PLI equation is calculated by dividing the weight of a unit by the lateral inches of all the rollers on th unit. For example, a roller weighing 525 pounds with three rollers of 36 inches each would have the following PLI measurement: $525 \div (36 \times 3)$

(Continued on Page 19)

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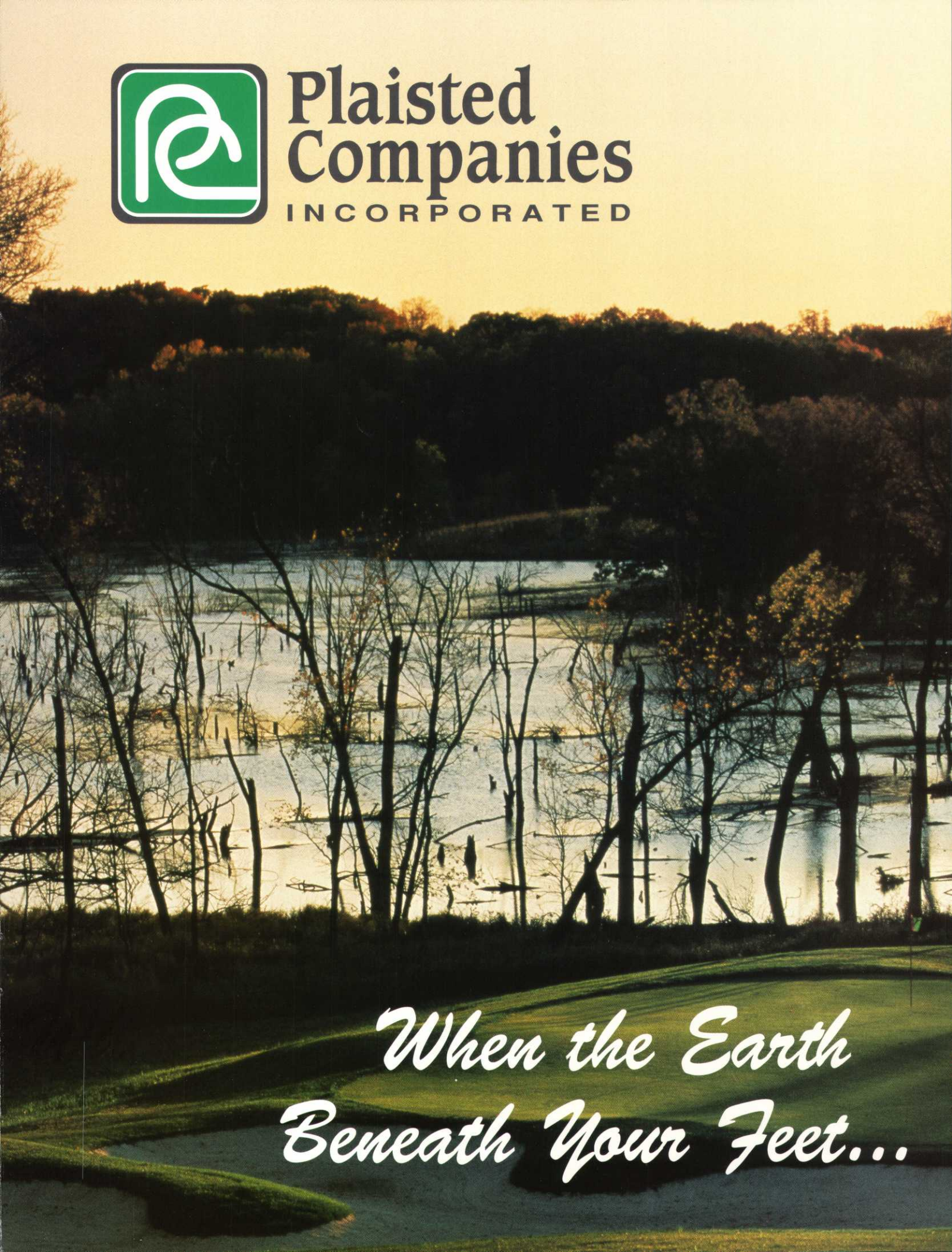

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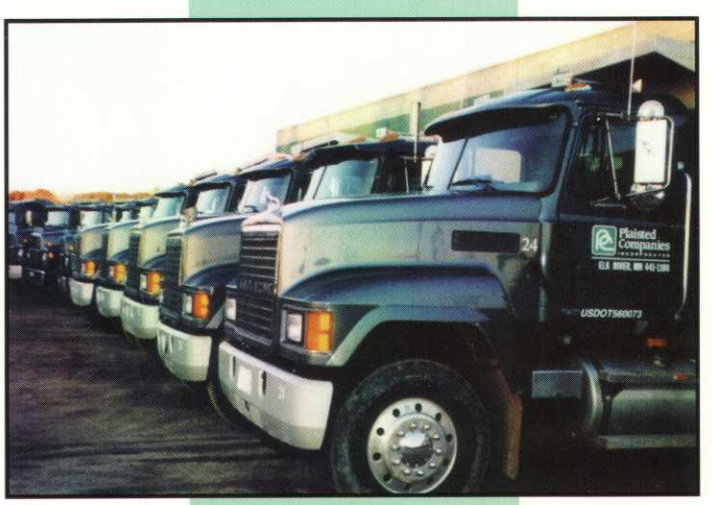

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Rolling—

(Continued from Page 17)

= 8 PLI. While this method is certainly easy to compute, it does not take into account the diameter of the rollers. Theoretically, two different models each would weigh 525 pounds with three rollers 36 inches long, but with different roller diameters. In theory, the model with the larger roller diameter would have a larger area of surface contact and would affect the turf differently. By not taking roller diameter into account, the PLI equation is limited and is not a good method to compare rollers.

Introducing the Roll Factors

While neither of the two methods above appears to be effective in comparing rollers, all hope should not be lost. There is a formula called the *roll factor* that can be used effectively to compare different pieces of turf equipment, including putting green rollers. As we have noted above, the important factors to consider when evaluating rollers are the weight of the unit, the length of the rollers and the diameter of the rollers. The formula for the roll factor takes all of these factors into account as noted in the following formula: Roll Factor = Weight of Unit ÷ (Diamter of Rollers × Length of Rollers).

To illustrate how this formula works, consider the following example:

Specification	Roller A	Roller B
Roller Weight	525 lbs.	750 lbs.
Number of Rollers	3	3
Length of Rollers	36 in.	36 in.
Diameter of Rollers	5 in.	8 in.
Roll Factor Formula	$\frac{525}{5\times(36\times3)}$	$\frac{750}{8\times(36\times3)}$
Roll Factor Value	0.97	0.87

In the example, Roller B has a roll factor value of 0.87, while Roller A has a roll factor value of 0.97. Based on the higher roll factor value, Roller A has a greater potential for compaction than Roller B. Remember that the roll factor does not offer a meas-

(Continued on Page 23)

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