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FACTORS AFFECTING GREEN SPEED

*By: Dr. Patty Sweeney, George Hamilton & Dr. Karl Danneberger
(The Ohio State University & The Penn State University)*

In golf, successfully managed greens are often associated with speed. Speed alone, however, does not symbolize a good or healthy golf green. The ultimate fast green would be as hard as a rock, smooth as glass, and void of grass. No golfer would want to play on this type of surface. The green would have no "feel" or "touch" and making a putt would be a function of luck.

Several components are essential to an ideal putting surface and influence green speed. Resiliency, uniformity, smoothness, and firmness contribute to overall green speed. Resiliency is the capacity of the turf to absorb shock and affects the ability of a putting green to hold a properly struck golf shot.

Uniformity implies that each green on a course and all areas of each green putt the same. Nothing is more discouraging than playing a round of golf on putting greens of variable speed. Variation in location, construction, microenvironment, and grass species makes perfect uniformity among greens nearly impossible. Even uniformity within a green is difficult to achieve. This variability is often the case when dealing with complex biological systems that are not easily separated into simple components.

The second major component affecting green speed is smoothness. A smooth surface generates less friction, and thus, causes less resistance to ball roll. On a rough green, the friction created quickly reduces speed.

Firmness refers to the hardness of the green. The firmer the surface, the faster the green speed. Difficulty arises in maintaining greens firm enough to promote speed, yet soft

enough to accept a well-struck golf shot. A small amount of mat or thatch is desirable since it provides some resiliency and cushion to golf balls struck onto the green; however, too much thatch can be detrimental to putting green speed and smoothness.

A Stimpmeter measures ball roll distance (BRD) and is used to quantify green speed. Although the Stimpmeter is a much-maligned device, used properly it can be a helpful tool in keeping green speeds consistent. The United States Golf Association (USGA) classification of green speed is based on Stimpmeter measurements (Table 1).

Mowing Height

Ball roll increases when the mowing height is reduced. Lower mowing heights tend to promote smoother, more uniform surfaces; however, reducing the mowing height below the optimum height for a species or variety can result in a loss of shoot density, root growth and production, decreased carbohydrate synthesis, and increased susceptibility to environmental and biotic stresses. All of which contribute to reduced turfgrass wear tolerance.

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In this issue.....

- *Roots of Summer Stress*
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President's Message.....

We have been trying to figure out when all this rain and cool weather is going to stop. (Next month I'll be begging for rain and cool weather). It certainly has been good for my fishing recently. It's been a great spring for me so far, catching and releasing many trout at my favorite fishing hole.

As usual we are in another crazy weather pattern. A little over a week ago many of you were seeing snowmold on your course. We had a few tees get hit pretty hard the next to last week of May.

By the time you receive this we will have had our May meeting, and I am sure we will all have had a great time. I would like to thank our host Charlie Labar for being gracious enough to get approval at his club to have us as their guests. GREAT JOB!

Recently Andy Jubinski, GCS at Glenmaura National, hosted two very big events at his club, the NCAA Regional championships and the "Steamtown Classic", Buy.com Tour event. Andy and his Assistant Jeff Koch had the golf course in excellent condition for both events. Green speeds were close to twelve feet on the stimpmeter. Fairways, tees, approaches and collars were below a half an inch. The rough was nearly five inches in height. From what was said, it will be a regular stop for the Buy.com Tour and a future PGA Tour stop. Great news for the entire area... It was great to have the opportunity to see the organization and camaraderie expressed while volunteering for the events. Many of you were there to help or sent help, and Andy and his staff surely appreciated it. Now the next event for his crew is their annual member/guest, only a few days away. Best of luck getting that rough down to its "member" playing height!

We are in the process of taking the names of members who may be interested in guiding this Association into the future. Please let one of your Board members know that you are interested in running for the PTGA Board. It's your Association!

See you all at the meetings!

Ron Garrison, CGCS



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From the Editor's Desk.....

The article on the front page is adapted from a new publication/pamphlet produced by three leaders in the industry: The Ohio State University, Penn State University and the USGA (See Ron, OSU & PSU can work together). It is worth getting this information out to our membership because I believe a **common misperception among the golfing public is that the only factor effecting green speed is height of cut (HOC)**. As we know, HOC is extremely important, but it is only part of an integrated system of different factors that dictates green speed. There is not much in the article that most of us do not already know, however, most of it can be adapted to our own club newsletters to inform golfers. The full color pamphlet includes research summary graphs excluded in our publication and is worth looking at. It can be obtained by calling the USGA at Golf House (908) 234-2300. At Glen Oak we're purchasing 300 copies to send to our membership.

As always your comments are welcome & see you at the meetings!!

Darrin Batisky

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Mowing heights should always be within the tolerance range of the variety being maintained. When reducing mowing height, the height of cut should be gradually lowered over time. A rapid reduction in mowing height often results in scalping.

Over the last 40 years, mowing heights for putting greens have decreased from 0.25 inches to as low as 0.10 inches. An acceptable mowing height for a putting green varies and is influenced by a number of factors including: (1) golfer expectation, (2) amount of play, (3) budget, (4) climate, (5) microclimates, and (6) turfgrass species or variety. Generally, the acceptable range for cutting height for creeping bentgrass and mixtures of creeping bentgrass and annual bluegrass is 5/32 (0.156) to 3/16 (0.187) of an inch.

Mowing Frequency

Frequent mowing promotes high shoot density and vertical leaf growth that results in a smooth putting surface. Research has shown that changes in mowing frequency can result in a temporary loss of green speed. Interruptions in mowing frequency are usually caused by wet conditions that limit mowing in poorly drained areas. Thus, adequate drainage can indirectly influence green speed by minimizing disruptions in mowing frequencies.

Multiple mowings per day, such as double cutting, can significantly increase ball speed. Double cutting normally consists of mowing the green in one direction, then mowing again perpendicular to the first mowing. In our studies, double cutting usually increased green speed compared to a single cutting. When double cutting was used in conjunction with other practices such as grooming, significant increases in ball roll occurred; however, daily double cutting can result in reduced stress tolerance and significant wear damage.

Grain Control

Grain refers to a condition when turfgrass plants lie horizontally in one or more directions. The result is a non-uniform green with non-uniform putting speed. Putting "with the grain" results in significantly longer ball rolls than putting "against the grain." In our studies, we have found as much as a 24 to 30 inch difference in ball roll when putting with, versus against, the grain. However, the closer a green is mown, the less effect grain has on the roll of the ball.

To minimize grain, cultural methods that promote or encourage upright growth should be practiced. These

practices include:

Mowing in different directions from day to day. For example, if greens are mowed east and west on Monday, on Tuesday they should be mowed north and south.

Verticutting. Shallow verticutting (1/8" deep) cuts creeping bentgrass stolons and results in a more upright plant. In addition, verticutting removes excessive tissue. During active plant growth, a light verticutting may be done weekly.

Brushing. Brushing lifts turfgrass plants before they are mowed. This promotes a more upright and less leafy putting surface. Avoid brushing during periods of stress.

Grooming. Grooming (1/16" deep) works similar to light verticutting although groomers have more closely spaced blades. Groomers are available for most greensmowers.

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Using grooved rollers. Grooved or Wiley rollers stand turfgrass plants up before being clipped by the reel. Grooved rollers should only be used during periods of minimal stress. During the summer when environmental stress occurs, switch to solid rollers to reduce the additional mechanical stress induced by grooved rollers.

Fertility

Fertilization, primarily nitrogen application, influences green speed. When nitrogen is reduced, leaf blades become thinner and less succulent, resulting in a less dense turf stand. The loss in density reduces resistance from turfgrass plants, and theoretically, should increase green speed. In our research, we found that nitrogen levels did not significantly affect ball speed under normal nitrogen regimes. When nitrogen levels were compared to controls receiving no additional nitrogen, significant reduction in ball roll was observed in the treatment with no nitrogen. The benefits of increased green speed due to a deficient nitrogen fertility program need to be weighed against the reduced density of the turf that will become more susceptible to annual bluegrass and moss invasion.

Thatch

Thatch occurs between the soil surface and the green vegetation and is composed primarily of turfgrass roots, stems, and crowns. A slight amount of thatch provides a mat that improves the wear tolerance of a putting green, and thus, is desirable. Thatch also adds resiliency to the turf and provides a cushion for golf shots. The result is increased holding capacity. Excessive thatch, however, can negate management practices intended to increase ball roll. In our studies comparing mowing and grooming practices on thatchy turf, we found that increased thatch tended to (1) minimize ball roll, and (2) reduce the effectiveness of management practices targeted at increasing speed. Today's newer creeping bentgrass varieties tend to have more mat thatch to be managed.

Rolling

Rolling putting greens to enhance green speed has been practiced for years. In the past, however, the use of heavy rollers lost favor due to soil compaction. With the introduction of advanced technology and lighter rollers, interest in rolling greens—especially sand-based greens—has increased. In short-term, intensive-rolling studies, we found rolling to significantly increase green speed on both USGA and native soil greens. Ball roll distance on rolled plots was 5 to 11 inches farther than non-rolled

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plots on a USGA sand green. As the study progressed, a general increase in putting green speed was observed. On a native soil green, roll was also greater for the rolled treatment. Ball roll was 5 to 13 inches farther on the rolled plots. However, on the native soil green, only 3 of 7 Stimpmeter readings were significant ($P = 0.05$). On greens constructed to USGA guidelines, 6 of 7 Stimpmeter readings were significant.

Increasing green speed with successive rollings was not observed on the soil green. Weather may account for some of the variation (conditions ranged from hot and humid to cold and dry). Comparison of Stimpmeter readings of the rolled plots versus control plots immediately preceding the rolling treatment revealed no difference in green speed on both the USGA and native soil greens. From these data, it appears the effect of rolling on green speed is short lived (less than 24 hours). Infrequent rolling (once or twice a week) will enhance ball roll on the days of rolling with little affect on soil compaction.

We also conducted a study to measure the longevity of the increase in ball roll using various rolling devices. The increase lasted at least 8 hours. Further studies revealed the increase in ball roll was maintained for 48 hours after rolling. The 48-hour duration is longer than previously reported. However, the second study was done in the fall when turfgrass growth was slow and few clippings were removed. This lack of growth may have been a major factor in the sustained ball roll. Thus, seasonal changes in turfgrass growth influence the effect of rolling. During periods of active turfgrass growth, the effects of rolling are short term; but during periods of minimal growth, rolling effects can last much longer. As in the previous study, no difference in water infiltration was detected. The frequent use of rollers (up to twice weekly) resulted in no apparent wear damage during this study.

USGA Classification of Green Speed

	Membership Play	Tournament Play
FAST	>8'6"	>9'6"
MEDIUM	7'6"	8'6"
SLOW	<7'6"	<8'6"

Golf Shoe Tread Type

New golf shoe treads and spikes are being developed to minimize the damage to putting green surfaces. Changes in spike design and materials have significantly increased the number of tread types that are commercially available.

Conventional 8-mm metal spikes have been banned from many golf courses because of their effect on putting green quality. Metal spikes, or any spike that causes plant tissue damage, can cause significant turf wear. Spikes that lift up turf plants or create depressions will affect green speed.

Treads and spikes also respond differently as surface characteristics change. Some spikes are good for uniform surfaces where thatch is present, while other types of spikes are good for firm greens with high sand content

(Continued on page 5)



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rootzones. Research and on-course spike evaluations should be part of any shoe tread control policy.

Summary of Management Practices That Influence Green Speed

Many turfgrass management practices influence the uniformity, smoothness, firmness, and resiliency of a putting green. The premise of this report is the effect of management on ball roll. Management practices are influenced by changes in temperature, humidity, light, and biotic stresses. In turn, all these factors can influence ball roll. Actual increase or decrease in green speed may vary on conditions present.

Conclusion

Maintaining healthy turfgrass and fast putting greens requires the integration of several management practices. Mowing height and frequency, grass type, fertilization, irrigation, thatch management, grooming, and rolling can all contribute to putting green speed. The effects of many of these practices are interrelated and are sometimes dependent on other external factors. In addition, some practices can effect the turf stand. All these factors need to be considered to maintain a healthy putting green with adequate speed.

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GOLF WINNERS AT THE MAY MEETING AT WATER GAP C.C.

Low Gross

1 st	72 – Ron Garrison/Gene Huelster
2 nd	75 – Steve Taggart/Ron Martin
3 rd	75 – Tony Stranzl/Steve Stranzl

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Quotable Quotes

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A message from your golf course superintendent and GCSAA



Roots of Summer Stress Tolerance

The summer of 1999 has demonstrated, once again, how the turfgrass industry is limited under periods of severe stress as a result of the genetic nature of our plant material. Cool season grasses, such as Kentucky bluegrass simply do not have the genetic capacity to sustain active growth under periods of high temperature and moisture stress conditions.

Researchers at Rutgers University have been exploring the genetic diversity of Kentucky bluegrass varieties for the last several years. Recently, research has been attempting to identify the specific mechanisms by which some bluegrass varieties are more able to tolerate summer stress conditions.

A field experiment was conducted in 1995 and 1996 to evaluate five stress tolerant and five intolerant varieties for canopy temperature, root and shoot growth as well as soil moisture depletion. Plots were maintained at 1.5 height of cut and fertilized to supply 4 lbs. of N per 1000 square feet.

The most fascinating result was the clear difference between stress tolerant and intolerant varieties when canopy temperature and stomate resistance was monitored. It was long suggested that *decreased* transpiration was an important strategy for summer stress survival. However, this research suggests that stress tolerant varieties are able to maintain water movement through the leaves while under stress, thereby providing transpirational cooling which likely sustains active growth during stressful periods. This transpirational measurement was supported by the soil moisture depletion observed at the 6' to 12" depth by the stress tolerant varieties. Interestingly, while there was no difference in root mass at the 6-12" depth, the tolerant varieties were extracting more moisture while intolerant varieties did not.

This work provides key observations that under conditions where a moisture reserve can be maintained deeper in the profile, there are summer stress tolerant bluegrass varieties are able to extract moisture, maintain transpirational cooling and sustain active growth. This information will be useful for breeders attempting to develop more stress tolerant varieties.

(From. Bonos, S.A. and J.A. Murphy. 1999. Growth responses and performance of Kentucky bluegrass undersurmounterstress. *Crop Sci.* 39:770-774.)

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POCONO ROUNDUP

NEWS AND VIEWS FROM THE POCONO TURFGRASS ASSOCIATION

Congratulations to the following:



John Chassard (Lehigh C.C.) and his wife Susan on the birth of a bouncing baby girl (Madaket) on May 5.

And

Wesley Avance (Eagle Rock) and his wife Jeni on their new addition to the world!

Congratulations to **Roger Zellner** (Green Pond) who got married March 25, 2000.

Ed Keil had his gallbladder removed 4-4-00. Doing fine! Now has two navels!

Woodstone Golf Club in Danielsville:

The course is now open for play. It has been a treat to see **Pete Coughlin** and his staff whip the place in shape for opening. It is a beautiful and challenging facility.

buy.com Tournament a.k.a. Steamtown Classic

To **Andy Jubinski, Jeff Koch** and his staff, a big round of applause for their successful efforts in preparing the Glenmaura National Golf Course for the tournament. Word from the players, "It's as good or better than most PGA Tour stops."

Observed as of this writing:



- ⇒ Many, many, many incidences of Pink Snow Mold (*Microdochium navale*) in the area. This being caused by the cloudy, cool weather we were experiencing. Easy to control with a 26-GT type fungicide.
- ⇒ Also, *Atthracnose* has reared its ugly head. Don't let it get to the crown stage or you will be in deep doo-doo all summer!
- ⇒ *Hyperodes weevil* have been observed also. If you see your *poa Annua* going south in your collars, look for the little critters. The new Delta-Guard has given excellent control!
- ⇒ Remember – Dursban (all formulations) CANNOT be shipped UPS. So if you get caught with your pants down, order other products.



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