



The best managed greens offer golfers a happy medium. They're not too slow to take away from the fun of putting, nor are they too fast that they make it easy to sink a long one.

NO SPEED LIMIT

Despite what club members might say, there's more to a quality green than speed. Here are some management tips to keep your greens looking good.

by Karl Danneberger, Ph.D., The Ohio State University

The word "fast" has become synonymous with success. Fast cars, fast track careers, even fast food are associated with the good life. Speed has also become an important factor in sports. Baseball pitchers are evaluated on how fast they throw and football players on how fast they run the 40-yard dash.

In golf, successfully managed greens are often associated with speed. However, speed alone does not make for a good green. If a wide receiver cannot catch a football, his time in the 40-yard dash is meaningless. The same is true in golf: the ultimate fast green would be as hard as rock, smooth as glass and void of grass. I know of no golfer who would want to play on this type of surface. In this situation, the terms "feel" and "touch" would be meaningless since making a putt would be a function of luck. Clearly, green speed is impor-

tant, but not the only component of a good putting surface.

Important elements of a good putting green are uniformity, smoothness, firmness and resiliency. Uniformity, smoothness and firmness are associated with green speed while resiliency is important in the green's ability to hold golf shots.

Uniformity implies that each green putts the same. Nothing is more discouraging than putting on a fast green followed by one that is slow. Uniformity is often difficult to achieve. Variation—such as location, construction, micro-environments and grass species—makes perfect uniformity nearly impossible. For example, greens may dry out at different rates or greens in the shade might putt faster due to thinner, less dense turf.

Smoothness is a major component of speed. The smoother the surface, the less resistance to ball roll. If a

green is not smooth, the ball will tend to "bounce," thus stopping quicker. Often these types of greens are characterized by golfers as bumpy.

Green firmness is associated with hardness. The firmer the surface the faster the green will be. For example, a ball will roll a greater distance on a floor than on a mattress. Difficulty arises in attempting to maintain greens firm enough to promote speed, yet soft enough to accept a well-struck golf shot. Balancing these two aspects of greens management requires an understanding of your golfer's expectations.

In addition to uniformity, smoothness, firmness and resiliency, green contour is a major component for determining proper green speed. Speed is a relative term and what constitutes fast greens on one course may not be the same on another. For example, if two greens are each rolling nine feet

measured by the stimpmeter (USGA measuring device) with one green being flat and the other severely contoured, the putting difficulty varies drastically. Speed measurements on contoured greens have a different meaning than on a flat green.

Managing greens for the proper speed is achieving a happy medium. Greens that are too slow are not fun to putt. Nor are greens so fast that they eliminate or diminish the skill level required of golfers.

Management strategies

Good putting greens have a number of components. To achieve fast, uniform greens, proper cultural programs need to be practiced. (Though top dressing and brushing may initially slow down a green, eventually they will increase its speed.)

● **Mowing height.** Reducing the mowing height will increase green speed. The lower mowing heights promote uniform and smooth surface. Often the question is asked: "How low can we mow?" A more proper question would be: "How long can we stay?" In other words, the lower you mow, the shorter the time interval at which putting greens stay healthy.

If you are considering purchasing groomers, first try them out to see if they will work in your situation.

The shorter you mow, the more likely the turf will become susceptible to temperature and moisture stress, disease pressure and damage through wear. Putting greens cannot be maintained at championship cuts for an indefinite period without turf loss or spending considerable money trying to prevent loss.

Care should be taken if mowing heights are to be reduced from normal cutting heights. A gradual lowering is advised. An abrupt change can result in scalping the turf which at low heights may result in turfgrass death.

Under non-stress conditions, if mowing heights are being lowered for a tournament, return to the normal height of cut when the event is over. Care should be taken if height of cut is to be increased under stress-type conditions. Research from the West and Southwest has shown that increasing the height of cut increases the water use rate of turfgrasses. In situations



The most important elements of a good putting green are uniformity, smoothness, firmness and resiliency, says author Karl Danneberger. "Fast" for its own sake isn't important.

where low mowing heights have been practiced, restricted root systems occur. By raising the height, especially under stress conditions, the root system may not be able to supply enough water to the additional tissue. In some instances, it may be best to leave the cut low until the stress period has ended.

● **Mowing frequency.** Frequent mowing promotes high shoot density and vertical leaf growth which results in smooth, consistent greens. Varying the directional mowing pattern daily helps promote a more upright plant. Research has shown that a break in regular mowing can result in a brief, yet significant reduction in green speed.

● **Double-cutting.** Double-cutting is a practice of mowing the green twice in one day. Research at Ohio State has found that double-cutting greens can significantly increase green speed. If pressure exists to increase the speed of greens, double-cutting is a viable option in place of dropping the height of cut.

● **Grain control.** Grain appears when grass plants lie down in different directions. Grain disrupts the uniformity of greens. In severe cases, shoots, stolons and rhizomes orient in various directions on the surface of the putting green. The effect is to deflect or interfere with the golf ball's proper roll. Our work has shown that the difference between putting "with" the grain versus "against" the grain can vary as much as three feet with moderate grain present. Effective grain control is a prerequisite for achieving uniform greens.

Verticutting is a device where rapidly-turning blades nick or cut into

the top of the turf. This process helps reduce grain by promoting more upright growth and removing undesirable tissue. Verticutting is often done weekly during periods of active growth.

Brushing is a common practice for reducing grain. Brushing is the process whereby a stiff, bristle-type brush is placed in front of the mower. As the mower moves across the green, the brush lifts the turfgrass plant up before it is cut. Brushing is effective but can cause damage to the plant. The best time to brush is under conditions that promote turfgrass growth. Time interval between brushing depends on the severity of the brushing and how quickly the turf recovers. Avoid brushing if the turfgrass plant is under stress.

The groomer is a relatively new mowing device available for greens management. It is similar to a verticutter that is placed between the reel and roller of the mower. The groomer stands the turf up before it is cut. In studies, we have found that groomers are effective for increasing green speed in situations where thatch levels are minimal. In situations of minimal thatch, we have measured as much as six-inch to one-foot increases in ball speed with the use of groomers.

In thatchy situations, the groomer did not effectively increase ball speed. With repeated use on thatchy turfs, damage did occur to the grass plants. As in all mechanical practices, grooming should be eliminated or reduced if the turf is under stress.

Groomers are an exciting new device in managing greens. However, variable results may occur due to factors such as thatch. If you are considering purchasing groomers, first try them out to see if they will work in your situation.

● **Thatch control.** Thatch plays an important role in green speed and quality. A small amount of thatch provides a certain amount of resiliency. However, excessive amounts of thatch disrupt the firmness and smoothness of the turf.

Achieving a desired green speed cannot be accomplished with an excessive thatch layer. Priority should be set to control or manage thatch at an acceptable level. Vertical mowing, top dressing, and coring are effective means of minimizing a thatch layer. They should be done as a regular maintenance program.

● **Top dressing.** Addition of top dressing material to greens smooths the surface and provides a firmer surface base. Frequent top dressing is a positive step in providing a uniform turf.

● **Rolling.** Rolling was done years

ago to increase the speed of greens by making them smoother and firmer. Rolling fell from favor when it was realized that surface compaction which inhibited water movement and root growth could occur.

However, in some situations light rolling is a viable practice for achieving speed without lowering cutting

height. In situations where greens are constructed to USGA specifications or are constructed of sand, rolling is a feasible practice for short periods.

A study was conducted on a USGA-constructed green to look at the effect of rolling. With a rolling treatment equivalent to 70 pounds per square foot, we were able to increase

speed without significantly increasing the soil's bulk density (Table 1).

Rolling is a practice that a golf course superintendent needs to consider carefully. It is not a practice to use on soils susceptible to compaction or in situations of high moisture. Rolling is best used infrequently and for specific tournament situations.

● **Fertilization.** A popular practice in attempting to increase speed of greens is to reduce the nitrogen level in

an attempt to discourage growth. The feeling is less growth and a thinner, weaker plant provides less resistance to ball roll. The problem with this type of management is the turf is susceptible to wear, environmental stresses, disease and—a growing problem on low-nitrogen greens—moss.

We have found that moderate levels of nitrogen (3 to 4 lbs./sq.ft./year) have no appreciable effect on increasing or decreasing ball speed. For the vast majority of situations, nitrogen fertilization practices should be used to promote turfgrass health and not as a means of increasing speed.

Know your greens

The challenge to improving green speeds is knowing what practices will work for you and at the same time providing a visually appealing and healthy turf.

It is important to communicate with your golfers the fact that those fast greens seen on television have been peaked for that week and will not tolerate championship conditions for any period of time. And finally, for all the practices that are available for increasing speed, the environment plays the critical role in what you can and cannot do and what you can expect.

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TABLE 1

Effect of rolling on green speed and bulk density on a United States Golf Association constructed green

Number of Rolls (70 lbs./sq.ft.)	Green Speed (feet)	Bulk Density (g/cc)
0	7.7	1.41
10	8.9	1.43
20	9.6	1.54
LSD (0.05)		ns

Green speed was measured using a USGA stimpmeter; ns = not significant

Source: Karl Danneberger

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