Close-cut zoysiagrass provides excellent fairway lie.

Why Don't The Greens Hold?

by WILLIAM G. BUCHANAN

GRASSGROWERS of the world unite! There needs to be some information relayed to the golfing public, and everyone needs to pull together. The problem is greens that will not hold. How come? Why?

Everyone who has played the game has, at some moment in the heat of battle, questioned the integrity of a green, the integrity of all golf course superintendents, and anyone else who could possibly be blamed. Why is this?

Scholars, seasoned consultants, hardened golf course superintendents, avid enthusiasts of the game, and novices of the sport all have opinions, but now we need some rational answers. Is it the construction of the green? Is it the maintenance of the green? Is it the lie of the ball? Is it the type of ball that is used? Is it the club that is used? Is it the quality of the stroke that hits the ball? The answer, please.

In trying to find an answer, it might well be useful to modify the old cliché "When all else fails, read the instructions" to "When all else fails, use some logic and scientific fact." This type of information will come from many sources: textbooks, trade journals, golf magazines, instruction books, and good old practical experience and common sense.

Volumes have been written containing all the best ideas on the proper design and construction of putting greens, but more has been written on hitting the golf ball.

There are many theories about how to strike a ball properly, what equipment to use, what grip to use, what weather conditions are the best to play under, and what type of golf course to play. Some of these theories have even been written down. Ben Hogan, Byron Nelson, Tommy Armour, Bob Toski, Arnold Palmer, Jack Nicklaus, Lee Trevino, and others have written books about the golf swing and the proper way to strike a golf ball. These books explain in layman's terms what is necessary for a good golf swing. Bobby Clampett and others have gone as far as to become more scientific in their approach by reading and becoming disciples of *The Golf Machine*, written by Homer Kelley. This is not for the layman, but for the heavy thinkers.

All the books and instruction articles, heavy and light, discuss at great length the driver, fairway woods, long irons, middle irons, short irons, bunker shots, chip shots, all kinds of trouble shots, putting, and the mechanics involved in properly executing these varied shots. Some even discuss the requirements of the player to plan his strategy in playing the golf course and the particular shot. Mention is made of wind conditions, whether the shot is being played with the wind, against the wind, or with the wind coming from the right or left. Some mention is made of playing conditions or methods of play if play is taking place in inclement weather, even rock-hard conditions.

It probably has been written somewhere concerning shots to the green: "Strike the ball with a descending blow and backspin will result; once the ball

comes back to earth, the resultant backspin will make the ball stop. The ball will hold the green." Sounds great! However, one slight change in the written word generally occurs after the shot has been played. The *ball* no longer holds the green. This is changed to, "The *green* should hold the ball." This is especially true after the golfer has hit the "perfect" shot and watches it gently settle on the green, then bound, skip, and roll off the green into some undeserved position. Thus, another chance for the elusive birdie, par, or bogey has passed — again.

Surely the cry will soon be heard, "The greens don't hold!" Why must it always be the greens' fault? Generally because somewhere between the written word and seeing the actual results, the logic of the backspin principle is lost.

Maybe more speeches, articles, or books need to be written on the agronomics involved in the properly played golf shot. The title of the piece will be tough to find. How about "Your Failure to Perform"? Nah, too self-defacing. How about "Dead Solid Almost Perfect"? Nah. Maybe "How to Score When the Greens are Right." Getting close. Aah, got it! "How Aeration, Vertical Mowing, Topdressing, Fertilization, Design, Construction, Water Control, Grooming, and Some Skill Helped Me Shoot My Career Round." The title may be a little long, but if a big name player will write it, the superintendent may be on the way to practically getting off the hook.

Just in case this book is not written in the next decade or so, some sort of thinking should be given to the subject now.

BALL CONTROL and golf course maintenance do not seem to be logical companions. But when we think of the overall game of golf, they must be not only companions, but close companions. The ball must rest somewhere, generally on soil covered by a turf. How that ball sits while at rest will greatly influence the way the player can strike the ball.

When the ball has been launched from the fairway toward the green, it will spin so the player can control its flight and landing, assuming this has been done properly. As the ball strikes the green, the combination of ball control and course maintenance becomes the most obvious. This spinning aerodynamically designed wonder will come in contact with a scientifically prepared soil mix covered with a specially prepared turf and displace a certain volume of soil and turf. Hence, all the theory of ball design and course maintenance must combine to yield the desired result for the player, or there is going to be some serious complaining taking place, generally about the landing, not the launch.

If we can't answer the complaint, what can be done to at least keep the noise down to a dull roar?

Education is the key. We must make an effort to inform and thus educate the golfer as to what his responsibilities are and what the superintendent's responsibilities are. The player feels his responsibility is to get the ball started, and it's the superintendent's job to get the ball stopped.

Golf course superintendents are hired to maintain and condition the golf course for the play of the game. Now there are all different ideas on how the course should be conditioned, but basically it breaks down to the superintendent's taking into consideration the climate, course location, soil types, and maintenance budget and making the best out of it. There are golf courses that have been on land that seems to have been created for the specific purpose of providing a pleasurable place to play golf, and there are other courses that have literally been built from the sub-soil up. This is not the superintendent's fault. He must adjust the maintenance to suit the conditions.

There are good methods of building golf courses and there are poor ones. Unfortunately, the amount of available money will generally dictate which method is used. If there is adequate funding, a golf course can be built using good soil mixes and have good drainage. With these there is a good chance of a good end result. The superintendent can manage these with minimal problems.

Not all clubs have the resources to build, or even maintain, ideal grass-growing mediums. But even the poorest club cannot afford to construct greens in a slipshod or cheap manner.

THE USGA'S GREEN SECTION Specifications for Putting Green Construction have been developed to provide the best growing medium and conditions for grass that will be groomed for a putting surface. Not all greens have been built to these specifications. The main reason is a tremendous number of courses were built before the Green Section Specs were created by Dr. Marvin Ferguson in 1960. Since 1960, a substantial number of greens have been built using this technique. Nevertheless, too many golf courses are still building greens that do not conform to the Specifications. Clubs will insist their superintendent build greens without checking the soil mix because they want the greens built quickly. A similar problem occurs with contract work. The ingredients for a very good topmix may be available, but the materials will be mixed on site, and a very poor quality topmix results. Then, when the green becomes hard or the grass will not grow, the superintendent must find the answers.

The hardness or firmness (if you will) is dependent on such things as solid particle density, bulk density, and percentage pore space, and another number that is called the coefficient of restitution. All very impressive names. Imagine telling your playing companions of your concern for the coefficient of restitution on No. 15 green. Anyway, here is how these things fit together.

Solid particle density is the weight of a unit volume of soil solids. Bulk density is a different method of expressing soil weight. The total soil space is considered. Therefore, bulk density is the weight

(Above) Three heights of cut, used at a USGA Championship, reward the accurate player.

(Below) The coefficient of restitution and spin stop the balls quickly.

per unit volume of dry soil. This volume includes solids and pores. To illustrate, imagine a cube filled with soil. The cube with pore space and solids would be full (bulk density). Then, if the cube's contents were compacted, all air or pore space removed, and the result was a cube half full, the measurement would be solid particle density.

Percentage pore space is of course that portion of the soil occupied by air and water.

The Green Section has requirements for these measurements. Bulk density ranges between 1.25 and 1.45 grams per cubic centimeter, and total pore space volume ranges between 40 and 55 percent. Now, how about the coefficient of restitution and how it relates to golf putting green management?

The coefficient of restitution is found by dividing the velocity of separation by the velocity of approach. Translated, that means that when a golf ball hits the putting surface, it will bounce. The ball will bounce with less velocity than when it landed. The first bounce will be higher than the second, the second higher than the third, etc., until the ball has come to rest.

Now that this scientific phenomenon has been explained, it is easy to see how bulk density, percentage pore space, and the coefficient of restitution can be related to each other. Bulk density will ensure that there is air space in the soil mix. Percentage pore space ensures we have enough porosity in the soil mix to allow good plant growth. Pore space will also be taken up by water, which will make the putting green soft when abundant and firmer if limited. Therefore, the coefficient of restitution can be controlled by soil mix and water. Sounds simple enough. Turn on the water and make the greens hold — oh no! More explanation is needed.

As we mentioned earlier, ball spin affects the flight of the ball; it also affects the reaction of the ball when it strikes the ground. The coefficient of restitution does not take spin into consideration.

Top amateurs and professional golfers are very proficient at judging how far they can carry a ball with a given club. They also know that when the ball lands, it will stop quicker if it has been struck with a 7-iron than with a 3-iron. The 7-iron shot will stop quicker because a 7-iron's standard loft is 40 degrees,

whereas 24 degrees is standard loft for a 3-iron.

BALL SPIN can affect the flight of a ball; side spin can result in a hooked or sliced shot. The hook or slice spin will be of more help in stopping a ball than top spin. Top spin on a golf ball is almost nonexistent unless the ball has been completely topped when struck.

Frank Thomas, the USGA's Technical Director, has studied golf balls and their flight. Several statements can be made that should be considered when spin of the ball is considered as a factor in the ball's holding the putting green. One: When a ball is launched with a driver, the flight time for an expert player is roughly seven seconds. Two: The type of ball being used will affect the rate of spin. A two-piece ball will spin at about 45 revolutions per second (RPS), or 2,700 RPM; a surlyn-covered ball will spin at approximately 55 RPS, or 3,300 RPM; and a balata-covered ball will spin at a rate of 60 RPS, or 3,600 RPM when struck with a driver. Drivers generally have a loft ranging from 10 to 12 degrees. Three: A ball will lose about 50 percent of its spin after being in the air for four seconds.

These little tidbits of information make for some interesting reading because it is not hard to see how much spin a good player can put on a ball and how much more the player can achieve by using a particular type of ball.

Scientific observation also tells us that when a properly struck ball comes to earth, the first bounce will make a ball mark and spin will have very little effect. The second bounce will have some "check" to it. The third bounce should stop the ball. If the ball bounces more than three times, forget it. The ball did not have enough spin to stop. You can either blame yourself for a bad shot or complain that the greens don't hold.

The amount of backspin is high when the ball is hit from a lie where there is no grass between the club and the ball. Ever notice how fast the ball stops when played from a bare lie? Tees and fairways are groomed to provide a good, close lie for the ball. The rough is intended to partially penalize the player for not hitting his shot in the fairway. The height of cut of the rough will reduce the amount of spin a player can impart on a ball and therefore make it more difficult to stop the ball quickly because the grass blades are smashed between the club and ball. If you will notice the course setup in a USGA Championship, PGA Tour, or LPGA Tour event, you will notice the fairway cut short, an intermediate rough cut slightly higher, and then the primary rough cut, which is the deepest. This type of mowing will place more emphasis on accuracy.

A helpful suggestion to courses where the greens will not hold may be to check the fairway height of cut. If the height is more than ¾-inch, the problem may be the fairways are being mowed too high. If the cut is ¾-inch or less, the problem may be the fairways are not being mowed often enough. A frequently mowed fairway will generally provide a good playing surface.

Another consideration is how many complaints come from golfers playing preferred lies. Ever notice how they move the ball from a close lie (good for spin) to a teed-up lie (flyer) and then complain the greens won't hold?

Even armed with all this knowledge about ball spin, bulk density, coefficient of restitution, and mowing heights, there is still this ambiguous term of "firmness" to consider.

Firmness is a relative term. In golf, a firm green to one might be a soft green to another. Generally it depends on the type of shot the player has just made as to whether the green is soft or hard or just right. This sounds like a story I heard about a little girl with golden locks and some bears. Anyway, attempts have been made to put accurate numbers to the firmness of putting greens. Measurements were made with an instrument that calculates the penetration of a lead golf ball into a green. This device measured penetration in thousandths of an inch. Now, this is high mathematics! In the formula $[1/3\pi h^2(3R-h)]$, h is the penetration and R is the radius ($1.68 \div 2 = .84$). Therefore, volume = $2.638h^2 - 1.047h^3$. This would not be good to use in everyday locker room discussions to determine the displaced volume of penetration for a golf ball into a green.

THIS HARDNESS TESTER yielded some very good information. It showed that greens are not uniform in hardness from green to green or even over the same green, and greens that are steeply sloped are often softest in the back. However, this device is not what is needed to rate a green's firmness the way the Stimpmeter can rate the roll of a ball. We need a better instrument that will help the firmness argument.

Now, let's recap and combine all this information:

1. Putting greens can be constructed to grow grass that is best for putting.

2. Not all putting greens are created equal; some may be firmer than others.

3. Depending on maintenance practices, some greens will putt faster than others.

4. The coefficient of restitution is a measure of how much a ball will bounce on a green, but not a good factor in determining if the green will hold.

5. Backspin on a ball will make it stop quickly, generally on the third bounce.

6. Golf balls make a difference in the amount of spin a player can impart on the ball. Two-piece balls spin slower than surlyn-covered balls.

7. Close, frequent mowing on fairways and tees will help the putting greens hold.

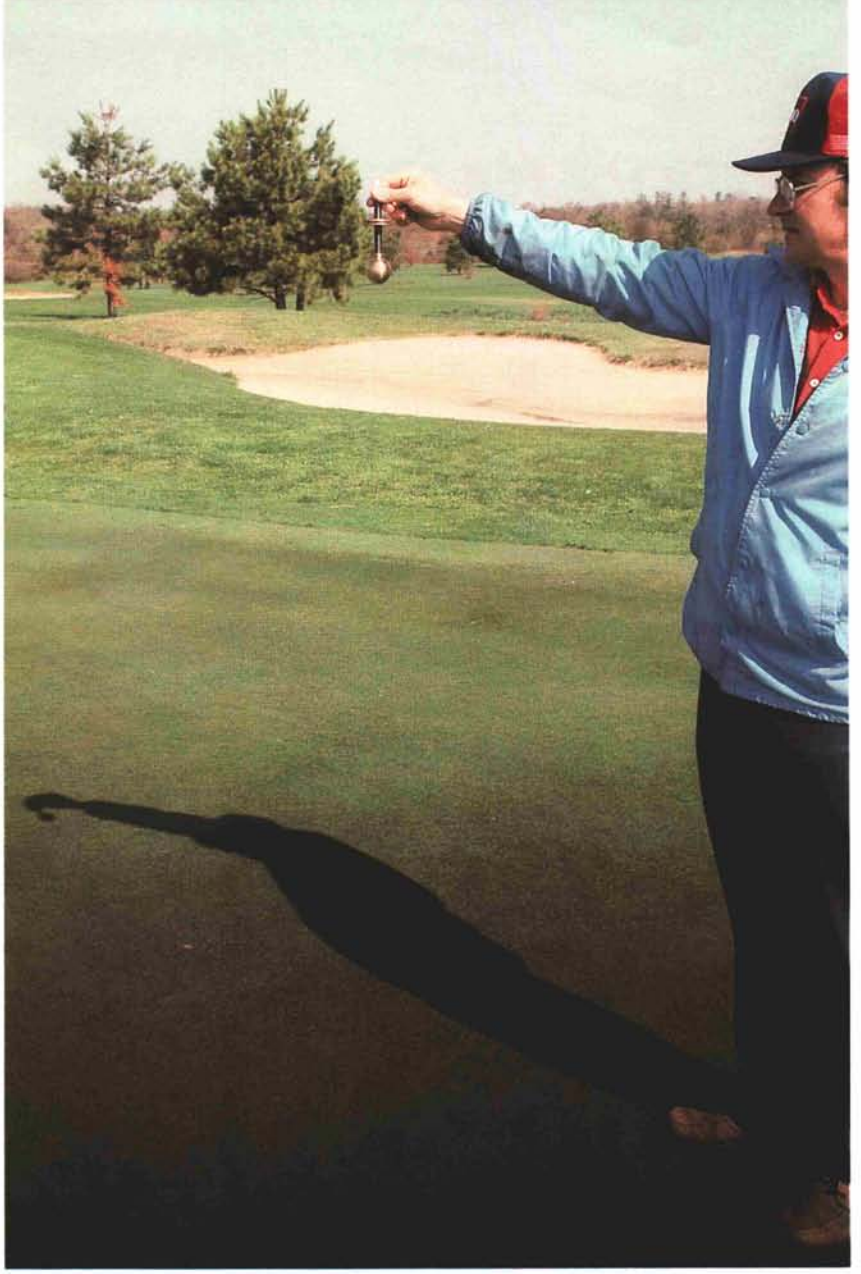
8. Hardness testers for greens will not solve the problem. They only give us more numbers to use. (Has the Stimpmeter made putts for anyone?)

In conclusion, all aspects of golf must be considered with any problem relating to the golf course. Large numbers of golfers have been raised on soft putting greens. They have not played on firm putting surfaces. Golf courses of the future will be forced into conserving water, and the game will be better for it.

Players who have not played under firm conditions are in for a treat, once they learn to allow for the roll. In golf, the player should adjust his game to course conditions. The superintendent is employed to maintain the grass so it will best suit the play of the game. It is both unfair and unreasonable for the golfer to expect the superintendent to adjust the golf course to each individual's game. The handicap system should be used to equalize skill, and the golf course should provide the test. Richard S. Tufts, a former USGA President, said, "Play the ball as it lies and play the course as you find it." We need more of his philosophy.

Golf courses hire superintendents to maintain putting greens. They want the greens to provide the best possible putting surfaces. To be good, greens must be firm, closely mowed, and smooth. Some golfers want the putting green also to be an ideal landing area, soft and resilient. Some kind of an agreement must be reached; either maintain a putting green or a landing area. Since the Rules of Golf do not define a landing area, but they do define a putting green, my vote goes for the putting green. Therefore, when asked, "Why don't the greens hold?" we might tell them they are "putting greens," not "landing areas."

Bluegrass fairways must be mowed frequently to prevent flyers.



(Above and left) The Green Hardness Tester only showed that putting greens were not uniform in firmness from green to green or even on the same green.