

Cruisin' for a Bruisin'—Ball-Mark Injury and Repair

Why does the seemingly innocuous "ball mark" on the left, turn into the slow-to-heal "ball bruise" on the right?



Complaints about the severity and longevity of damage from ball marks (a.k.a. "ball bruises") have been increasing over the last few years. The trend is probably correlated to changes in the game and its equipment, such as high-tech urethane-covered balls that spin more, perimeter-weighted game-improvement clubs that hit the ball higher, and just more (perhaps lazier) golfers. Problems with ball marks may also be increasing in conjunction with our evolving greens management practices, such as increased amounts and frequency of sand topdressing, ever-lower mowing heights, frugal nitrogen rates and reduced irrigation. Of course, all of the aforementioned are done to get a firm, fast, consistently smooth putting surface for today's demanding golfers, so perhaps problems with ball marks are just another trade-off for these management trends.

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As the ball-mark topic gets hotter, it seems to get more controversial as well; there are even conflicting views about how to fix the marks and what kind of tool to use to do the deed (no lifting!?!). Also, claims abound that the newer, dense, semi-dwarf bentgrasses are more sensitive to ball bruises, and are slower to heal once bruised. Ball-mark repair is becoming expensive, as most superintendents have crew members and man hours devoted to ball-mark repair, either as part of the morning mowing activity or in the guise of a separate, trained employee who custom-fixes ball marks. Many supers have given up altogether and are just plugging out bruises, sometimes even going to the trouble of replacing the small plugs with new grass—a tedious chore indeed.

And why does everyone fret so much about ball marks anyway? It's just another part of the game—along with divots, cart traffic and footprints from mosquito spray. Actually, ball marks can be disruptive to the quality of the putting surface, no matter how many times you try to repair/smooth them as they heal. Greens with heavy ball-mark damage can be uneven and bumpy, plus the purple-to-brown spots all over the surface don't add to the visual appeal. Perhaps just as important is the concern that thin, slow-healing ball marks act as entry points for weed seeds (like *Poa annua*) or moss spores. The ball-mark problem can certainly be a bad one, but it's not going to go away until the golfers do, and we don't want that, do we?

Ball-Mark Physics: Impact and Injury

Golf holes that require a short-iron approach are the most likely to have concentrated ball-mark damage, most often in the front third of the green. A

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short-to-middle iron approach may land on the green at speeds up to 60-70 miles per hour, with a rotation rate of 2,500-3,500 RPMs. The direct force of the impact of a 1.62 oz golf ball hitting the green surface at 60 mph can severely injure turf leaves (crushed cells leak water and nutrients!), and often causes a depression and pushes up a "hill" of turf in the direction of travel. If the surface is especially firm, only a small dent may form with no raised turf. Although the speed and angle of descent contribute to the severity of the ball mark, the spin rate of the ball may be even more important. It seems likely (I have no proof) that more damage is done by a high-spin-rate impact, especially on new greens with little or no developed "mat" layer, or on recently (or regularly) sand-topdressed surfaces. How many times have you seen sharply struck short-iron shots hit heavily sand-topdressed greens with an explosion of sand and leaves? Even if carefully repaired, these ball marks will leave a distinct, mostly dead scar, especially during hot, dry weather in summertime. (The leaves are shredded by the impact and quickly wilt and die.) These ball marks will be slower to heal as well, since the dryness and high surface soil/sand/mat temperatures of summer will keep new shoot and leaf growth from developing.

If ball marks were consistent in size, shape and amount of turf displaced, they might be easier for golfers to find and fix, and for superintendents to deal with. Unfortunately, ball marks are highly variable, due to many factors (golfer-related and turf-related). The distance the shot travels, club selection and angle of descent into the green all vary with each individual shot. Ball marks also vary greatly based on the agronomic character of the greens, moisture content and their day-to-day management. A new, sand-rootzone (USGA-type) green with a thin, less-established turf will probably have much more disruptive ball marking than an older, push-up, soil green with a dense turf and a well-developed mat and thatch layer. Greens that are maintained at very low mowing heights with minimal N and with light, frequent PGR applications will likely suffer differently from ball impacts than higher-cut, well-fed greens that are not under growth regulation.

Bruisin' the New Bentgrasses

Which brings us to the next topic of concern: the vigor and recovery rates of the newer, semi-dwarf creeping bentgrasses. Varieties such as Penn A-4 and L-93 have higher shoot densities and a finer leaf growth habit than old standbys like Penn-

cross and Pennlinks. On these new greens, a dense, soft, mat and thatch layer may quickly develop during grow-in; so even though lower cutting heights and "fast" green speeds can be maintained, these greens can get soft and spongy. Therefore, the amount and frequency of sand top-dressing has been increased to try to firm the surface organic layers. Often the sand applications start very soon after establishment, well before a new green is even open for play. Ball bruising on new greens managed in this way has been very severe, and has led to a lot of negative comments from golfers, superintendents and the industry press (the "nattering nabobs of negativism").

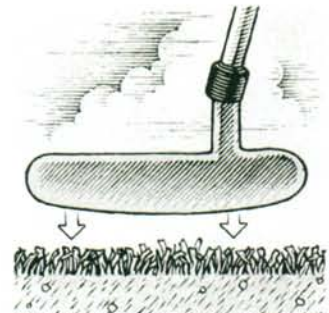
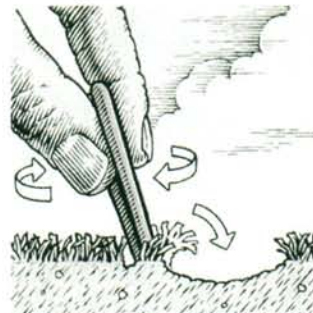
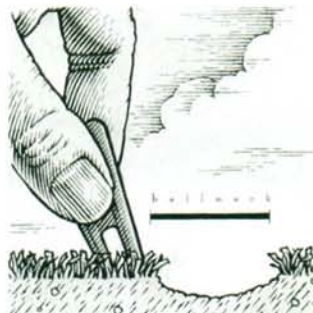
There have been a few research projects that have tried to answer questions about the initial damage and recovery rates of newer versus older bentgrass varieties, including some meager attempts by the author a few years ago at the Cantigny research site. Perhaps the best study to compare ball-mark recovery rates was recently published by Professor Jim Murphy and cohorts of Rutgers University. Summaries of this research can be found in *Golf Course Management* (December 2003) and the *Green Section Record* (July-August 2003). Dr. Murphy built a gas-powered "gun" to shoot golf

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The Proper Way to Repair a Ball Mark



- 1** Use a prolonged ball mark repair tool (preferably), knife, key or tee.
- 2** Insert at the edges of the mark—not the middle of the depression.
- 3** Bring the edges together with a gentle twisting motion, but don't lift the center. Try not to tear the grass.
- 4** Smooth the surface with a club or foot. You're done when it's a surface that you would putt over.



Source: Golf Course Superintendents Association of America

balls into putting green-height test plots, then measured initial injury and recuperative ability of 15 bentgrass cultivars, including a couple of velvet bents. The study was conducted in such a way as to remove confounding construction and management variables—they really only wanted to look at the contribution of genetic variability among the grasses. It is notable that the research green they used was only in its second year of establishment, but was not heavily topdressed with sand.

Not surprisingly (to me anyway), Murphy's group found less initial damage and more rapid turf recovery on the newer bentgrass cultivars (including the new velvet bents) than on older, Penncross-type grasses. Their study also included factorial treatments of simulated wear and compaction, which were found to increase initial damage and slow recovery from ball marking. The study was initiated in 2001 and repeated in the summer of '02, and the second year's data showed that the additional year of maturity for all the grasses lessened the damage from ball marks. The authors suggest that, in most cases, two or more years of growth are required to allow root-zone stabilization and a sufficient mat to form in order to resist the damage from the combined impact and spin of golf balls.

Alleviate the Damage, Assuage Angry Golfers!

If you are having a significant, or abnormal, amount of ball-mark damage, there are two main reasons this is happening. One, the initial strike of the ball is seriously harming the turf, or two, it takes an inordinate amount of time for the ball-mark damage to heal. If you can identify which issues are causing the damage or slow recovery rate, addressing those issues should alleviate the ball-mark problem and assuage angry golfers.

Immature or poorly developed turf, lack of sufficient mat, or too much sand at the surface can lead to severe ball-impact injury on greens. Low nitrogen rates or other fertility or soil-salts problems also could be contributing to weak turf. Striving to keep greens "firm and fast" by with-

holding water or nutrients (or piling on sand) may contribute to excessive ball-mark injury and slow recovery—especially in the heat of summer. Maintaining a balance between what is good for green speed and what is good for turf is part of the "art" of putting green management. Having a robust, healthy, resilient turf will not only ease ball-mark damage, but will help with other turf issues, like traffic stress, heat stress, diseases, etc.

And what about ball-mark repair? Are golfers really to blame—either for not fixing marks, or for fixing them incorrectly and increasing the damage to turf? It is always easy to point the finger at someone else, but in this case, most of the complaints about golfers are accurate. An unrepaired ball mark, or one that sits for several hours in the sun (or overnight), is going to heal much more slowly than a well-repaired mark. Mowing machines with bench settings of 0.1 to 0.15 inches will usually scalp unrepaired or poorly repaired marks, thus adding insult to injury—and this is why many crewmen repair ball marks before cutting greens in the morning.

And what about ball-mark repair tools and the prescribed methods we have today? Are some golfers, who are attempting to do the right thing, actually doing it all wrong? Poking a tee or two-inch fork in the ground under a mark and lifting it straight up will usually tear roots from

shoots, and could lead to some mower injury. If performed carelessly, the GCSAA-backed method (see page 17) of poking the fork in the sides of the mark and twisting the turf toward the center could also be quite damaging, not only to roots, but also to stems and stolons. Gentler methods are needed, especially on newly established greens, or those with thin, weak turf (and especially in the hands of the gorillas and beer-cart hounds who play a lot of golf around here!).

A new ball-mark repair system has been developed by Danny Edwards of Royal Grip and PGA Tour fame, called the GreenFix Golf System (no, this is not a paid endorsement). A small, more oval-shaped "fork" is attached to the butt end of a putter grip, and a short, non-twisting jab around the mark is the recommended action to repair turf without tearing roots. Getting golfers to use this tool effectively before putting out will be the trick, but at least they don't have to BEND OVER any more!



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