Understanding and Managing Mechanical Damage

Are you hurting your greens without knowing it?

BY STANLEY J. ZONTEK

hat is mechanical damage? Most turf managers probably would say, "It's when I scalp the grass."They are correct. Scalped turf is the easiest form of mechanical damage to see and understand. However, there are other less obvious forms of mechanical damage that can be just as injurious to the turf, especially over time and in conjunction with other forms of stress.

Direct and indirect forms of mechanical damage are becoming an increasingly widespread problem worldwide on putting greens. For whatever reasons, golfers are demanding lower and lower mowing heights to achieve faster green speeds, and they want these speeds on a regular basis. Once these maintenance levels are achieved, it's hard to go back.

Most people are oblivious to the consequences of closely cut greens on a daily basis. Here are several definitions and some historic background on the problem of close mowing and the resulting subtle form of mechanical damage many turf managers now face.

MOWING HEIGHT TIMELINE

A number of timelines have been published over the years showing how mowing heights have gradually been getting lower. Suffice it to say, the traditional mowing height for golf greens in the 1950s to the early 1970s was $\frac{1}{4}$ inch (6mm) to $\frac{3}{16}$ inch (5.5mm).

Things began to change in the late 1970s with the development of the Stimpmeter. This device was originally developed by Edward Stimpson, a volunteer for the Massachusetts Golf Association, to help locate holes on greens at courses hosting their tournaments. Measuring green speeds was a secondary consideration. Over time, the intent obviously changed, and an unintended conse-



Triplex ring is a classic example of mechanical damage.

quence has occurred. Stimpmeter readings for putting green speeds have become the measure of how golfers perceive what is "quality" in a putting surface. There is a mistaken belief that the faster the green, the better it is.

We all know this oversimplifies a complex issue. What is not in dispute is the effect this attitude has had on green speeds and on the gradual reduction in putting green mowing heights over the past three decades. There are huge consequences from today's ultra-low mowing heights. When will it end? The first step is to recognize the problems associated with mowing greens as closely as possible on a daily basis. The second step is to manage the grass to minimize mechanical damage.

The gradual reduction in mowing height took some years to occur, and today's mowing heights are commonly ¹/₈ inch (3mm), with ¹/₁₀ inch (2.5mm) or lower on golf courses striving for championship conditions on a daily basis. The agronomic consequences from today's ultra-low mowing heights are significant, especially when combined with continuous daily mowing, periodic groomings, topdressings, double and triple cuttings, etc., along with other stresses, including low putting green fertility and the weather extremes many regions of our country now seem to be experiencing.

The elements are in place for the greens on many of today's golf courses to be weakened, albeit in a slow, gradual manner. This makes greens, especially older greens with early-generation grasses and *Poa annua*, more susceptible to disease, insect injury and weed problems.

SOME DEFINITIONS

Direct Mechanical Damage. In simple terms, it is often scalped grass. This is an acute form of turf injury. This type of damage can occur when:

The mower is not properly adjusted.

• The mower is damaged or falls out of adjustment.

• The grass becomes soft and puffy due to hot, humid, and wet weather, and/or when the grass is over-fertilized.

• The grass "rebounds" from growth regulator applications.

• The mowing height is lowered and mowing frequency is increased for special events.

Again, direct mechanical damage can easily manifest itself as scalped grass, which is easily recognized. Corrective action, including raising mowing heights, mowing less often, and beginning a recovery process is usually quickly implemented once the damage has been seen. After all, even the average golfer can recognize scalped grass! It is the indirect and more subtle forms of mechanical damage that are much harder to understand, diagnose, and appreciate.

Indirect Mechanical Damage. This is much more subtle way to weaken and injure the grass. Whereas the effects of direct mechanical damage (scalped grass) are easy to see and correct, the effects of indirect mechanical damage are almost never seen. This makes it much more difficult to realize that something is going wrong.

This type of injury is more common on older golf courses, especially compared to newer golf courses that have modern sand-based greens and new-generation grasses growing on them. Almost all of these new grasses were bred and developed to better tolerate the lower mowing heights common today. They are dwarf grasses, having greater plant density, finer blades, and greater tolerance to lower mowing heights. It can be unrealistic to compare old vs. new courses, but unfortunately it is done all the time. This contributes to indirect forms of mechanical damage.

Predisposition. Predisposed turf is weakened turf. The grass can be weakened by one of a long list of factors by itself or working in conjunction with other factors. It generally is recognized that once the grass plant or stand of grass has been predisposed or weakened, it suffers from reduced disease resistance, lower thresholds for nematodes, shallower roots, reduced turfgrass vigor, slower recovery/recuperation from traffic and other injury, reduced tolerance to heat, drought, shade, poor drainage, and poor grass growing environments associated with poor air circulation.

Turf predisposed by mechanical damage can also be more easily invaded by moss, algae, and weed grasses like *Poa annua*, crabgrass, and goosegrass. Weakened turf lacks color and density and looks unhealthy. Predisposed turf, once infected with a disease, does not always respond well to fungicides. Thus, disease control is harder to achieve.

Predisposed turf almost never occurs at reasonable mowing heights and when a good putting green maintenance and management program is in place. This problem of predisposition is becoming a common occurrence on turf cut at low to ultra-low mowing heights. True, some grasses growing in some soils in some parts of the country and under some careful (and expensive) maintenance practices can tolerate many predisposition factors. However, this is true Management On The Edge.

SHORT-TERM OPTIONS

An important role of a golf course superintendent is to know when to be *aggressive* in terms of mowing heights, green speeds, and overall putting green maintenance, and, equally, when to be careful and *conservative* in managing the grass on the course. The average golfer or course official sometimes does not appreciate this important fact.

Following are a number of options golf course superintendents and the management team should consider when managing direct mechanical damage.

Prevention. It is important to recognize that mechanical damage generally is a problem only on closely mown turf, and its effects are preventable. That is, to an extent, it is possible to prevent the grass plant from becoming predisposed and weakened. Do the obvious.

• Establish reasonable mowing heights and mowing frequency *for the grasses you have*, not for some other course to which you might be compared.

 Exercise good water management. Do not over-water, and maintain reasonable surface and internal drainage.

• Grow healthy grass. Provide the turf with enough hours of sunlight, good air circulation, drainage, and enough balanced fertility, etc.

• Manage the zone of organic matter accumulation. Topdress and surface aerate frequently, at least once a month, to encourage root growth, promote water movement in the soil, relieve surface compaction, and allow the soil to breathe.

• Modify the soil in greens that were not built well. Core aerate to remove the old soil, topdress with sand to fill the holes, and maintain a good topdressing program. Deep aeration can also benefit old, tight, and slow-draining soils.

• Apply plant protectant chemicals when necessary to control damaging diseases, weeds, and insects. These chemical applications can also include commonly used plant growth regulators that maintain healthier, denser, and slowergrowing grass.

Thus, the first step in managing mechanical damage is to prevent it from happening in the first place. Some might call this Common Sense



Turfgrass Management. It is not cutting edge, but it works.

MANAGING STRESS

Once the grass is under stress, there are many options the turf manager can consider to relieve stress and encourage turf recovery.

• Raise Mowing Heights. Oftentimes, this is the first thing to do. And although it also is the simplest, easiest, and most cost-effective option, it is sometimes the most difficult for golfers to accept.

• Mow Less Often. When weather extremes occur or when casual water exists on the surface of a green, raise mowing heights and defer mowing until the grass and soil can tolerate the traffic. Mechanical damage almost certainly will occur when the mowers are pushing water as they attempt to cut the green.

• Roll Greens. Rolling a green rather than mowing a weak or wet green may be a good compromise to maintain smooth greens with good speed without damaging the grass. Research has shown that rolling greens up to three times per week has little long-term effect on the grass or soil.

• Growth Regulators. Various plant growth regulators, including Primo (Trinexapac-ethyl), Trimmit, TGR (Paclobutrazol), and Cutless (Flurprimidol), are commonly used tools to help achieve healthy grass at higher mowing heights and smooth, fast greens. Slower growing, chemically dwarfed grass, in theory, may allow higher Mowers must be carefully adjusted to avoid direct mechanical damage. A new, heavier walk-behind greens mower was used. Although the settings were the same, the result was scalped turf.



When expanding the putting green, extra care must be taken to avoid injury caused by scalping.

cutting heights and less-frequent mowing. Contact your regional USGA agronomist, university turfgrass extension specialist, or company technical representative for more information. • Topdressing. A dedicated program of light, frequent topdressing creates a situation where the grass plant grows upward through this topdressing as it accumulates. This can insulate and protect the important growing points of the grass, its stem and crown. When the grass grows through the topdressing, the mower clips the grass blades, not the stems and crowns. This helps avoid scalped turf. Topdressing also helps manage surface organic matter and any puffiness, if or when it develops. Topdressing is a form of preventative maintenance, but improperly scheduled summer topdressing has the potential of creating its own form of mechanical damage. Be careful.

• Balanced and Adequate Fertility. The grass plant needs a balance of nitrogen, phosphorus, and potassium in general ratios of 4-1-2, 3-1-2, or even 4-1-4, and soil tests remain the best tool to monitor soil fertility levels. At one time, it was a trend to maintain "hungry grass." Today, there is the realization that this practice can be taken too far. Putting greens need adequate fertilization. Some diseases, including anthracnose and dollar spot, are recognized as being diseases associated with low nitrogen use. Contact your local USGA agronomist or university turfgrass extension specialist for unbiased answers to your fertility questions.

• **Spoon Feeding.** The application of light amounts of fertilizer sprayed onto the grass is a good way to manage plant growth in the summer and stimulate recovery of damaged, stressed turf when bad weather conditions subside. Biweekly, weekly, or sometimes even twice weekly applications can be scheduled.

• Aeration. It might seem counterintuitive, but aeration can be a good tool to manage mechanical damage! Remember that grass roots grow in the soil in the presence of air. Tight soils with few large pores restrict rooting. Also, water drains through the soil in these same large pores. Shallow-rooted surface growth is inherently more prone to mechanical damage. Aeration in conjunction with topdressing helps alleviate this condition.

• **Proper Irrigation.** Do not over-irrigate or severely under-irrigate the grass. Although drier grass and soil are always preferred, there needs to be a balance between too much and too little soil

water. One extreme is wet wilt from too much water in the soil, and the other extreme is dry wilt from too little water in the soil. When grass is cut while it is under wilt stress, be it dry wilt or wet wilt, mechanical damage can result.

• **Defer Regular Maintenance.** That is, if you suspect the grass is being stressed due to weather extremes, close mowing, double or triple cuttings, too much topdressing, aggressive grooming, etc., don't add extra stress. Defer these treatments. Trust your agronomic intuition and common sense. Be conservative. Defer maintenance in the short term until the stress period passes and the turf is healthier and better able to handle this maintenance.

• **Communicate.** Direct and indirect forms of mechanical damage on the golf course are not problems for the golf course superintendent to endure quietly and alone. There needs to be good communication within the management of the golf course. People want to know how their course is doing. Post notices and keep the golf shop, course administration, and decision makers informed. Emails, course newsletters, and course websites are all effective communication vehicles. This helps bring everyone "into the loop" so informed decisions can be made on what is best for the course.

The goal of all this work is to manage your existing greens without major regrassing or reconstruction. In essence, you are "working with what you have."

LONG-TERM OPTIONS

An increasing number of older golf courses recognize the fact that the soil in the greens is not good, green sizes are too small, green contours and slopes are too severe, and the grass the staff is trying to grow on the greens is a problem. It's a fact. In most regions of the country, modern sand-based greens are better than older soil-based greens. New and better grasses have been developed to tolerate closer mowing and have better density, better rooting, finer leaf blades, and improved disease and stress tolerance.

• Putting Green Regrassing. Many courses choose to regrass existing greens. This occurs when the base soil in the greens is deemed acceptable, when the greens enjoy classic design with subtleties in movement, when climatic stress factors are deemed less severe, etc. The goal of regrassing is to replace early-generation grasses with newer varieties without a complete reconstruction of the greens. For guidance on regrassing vs. reconstruction, consult your regional USGA agronomists or other courses in your area that have regrassed.

• Putting Green Reconstruction. Many scenarios can lead to the conclusion that it is time to rebuild old greens to modern specifications. Turf managers need to discuss the pros and cons with their owners, course officials, consulting architects, and their USGA agronomists. New grasses and new fresh soils are not panaceas, but they are better in many ways.

CONCLUSION

Historically, when greens were being cut at ¼ inch (6mm) or even at 5/32 inch (4mm), lowering the mowing heights a few thousandths of an inch seldom produced many ill effects to the grass. Today, this has changed. Our ultra-low mowing heights have themselves become a stress factor that can trigger all kinds of problems that can threaten the health and playability of greens. There is little margin for error with today's low mowing heights and high golfer expectations.

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Poorly timed verticutting can result in direct mechanical damage to the putting green turf.

