

Firm, Resilient Fairways Require a Commitment to Thatch Control

The USGA Green Section has always been a proponent of firmer, drier turf on golf courses. Controlling thatch is just one aspect of firm fairways, but it is a crucial element.

BY ADAM MOELLER

Many golf courses are adjusting their turf management philosophies to emphasize firmer surfaces as an integral part of good golf conditions. Achieving these conditions, though, is much easier said than done because there are many variables involved. Sandy soils that drain well allow for firmer conditions much more often than heavy-textured clay soils that tightly retain moisture. Automatic overhead irrigation system efficiency and hand watering capabilities (i.e., labor) also largely influence how firm or soft a golf course can be consistently maintained. Finally, organic matter content, also known as thatch, dramatically impacts golf course firmness, which is the focus of this article.

Thatch is a combination of living and dead plant material and is a natural byproduct of growing healthy turf. A reasonable amount of thatch is needed for traffic tolerance, but too much is a major agronomic and playability concern. Mismanagement of turf contributes to excessive thatch buildup, leading to soft conditions. Excessive use of fertilizer and irrigation are two controllable factors leading to rapid thatch accumulation. Grass species also plays a major role. For instance, creeping bentgrass and bermudagrass produce more thatch than perennial ryegrass or annual bluegrass (*Poa annua*). That being said, infrequent or inadequate cultivation is usually the underlying reason for excess thatch. Golfers may not care for cultivation (i.e., core aeration, vertical mowing) practices on fairways because of the temporary disruption they cause, but without them it will be difficult to control thatch and produce firm surfaces.

Golf courses less interested in firmness should still be cognizant of thatch



Excessive thatch is usually the result of insufficient core aeration or vertical mowing. Firm, reliable conditions are rarely attainable if thatch is excessive.

levels because excessive amounts can lead to serious turf problems. Along with soft conditions, excessive thatch leads to poor root development, greater disease and insect pressure, reduced pesticide efficacy, and increased mower scalping. Moisture-related issues are also common with too much thatch. Thatchy turf will stay wet and soggy following rain or irrigation because it holds moisture very tightly. During dry conditions, excessive thatch impedes uniform water movement into the soil, often leading to localized dry spots that are very difficult to rewet. Simply put, too much thatch leads to poor golf conditions and turf more vulnerable to decline.

THATCH REMOVAL WITH CORE AERATION AND VERTICAL MOWING

Core aeration and vertical mowing are routinely used on putting greens to remove thatch from the upper rootzone profile. These same tools are effective for thatch control on fairways. Both core aeration and vertical mowing physically remove thatch from the turf and soil, causing temporary surface disruption and often golfer displeasure. However, without any surface disruption, it is unlikely that thatch will be controlled effectively, and golf conditions will suffer at some point. Temporary reductions in turf quality from cultivation are a necessary part of producing



Core aeration is excellent at removing thatch and improving the soils. However, older or less powerful equipment may lack penetration depth compared to newer, better equipment. The lighter colored center portion of this fairway was core aerated with the golf course's older equipment that lacked penetration depth, while the darker colored sides were core aerated by an aeration contractor with newer equipment, resulting in a greater volume of thatch and soil brought to the surface.

high-quality playing surfaces. As the saying goes, you cannot make an omelet without cracking a few eggs, and this is also true with thatch removal programs.

Advancements in large aeration equipment have greatly improved the effectiveness of fairway core aeration and thatch removal over the past two decades. Aeration equipment for fairways can create many holes per unit area and penetrate deeper into the soil than equipment used in the past. Due to these advancements, a greater volume of soil from cores is brought to the surface, essentially serving as topdressing. However, the soil brought to the surface can be messy and challenging to work into the turf, especially

when wet. Cleaning the debris left from core aeration is also easier and more effective because of the improvements in core harvesting equipment. In the Northeast region, core aeration typically is performed once or twice annually in the spring and early fall.

Deep vertical mowing with tractor-mounted equipment (e.g., Graden, Sisis, First Products) can also be very effective in removing thatch from fairways. This process aggressively removes thatch and old plant material from the surface in addition to grooming the turf and promoting upright growth with less grain. Vertical mowing typically creates more debris than core aeration, but because the amount of soil brought to the surface is often

minimal, sweepers or blowers are commonly used with good success. Windrowing the debris towards the center of the fairway is an excellent way to efficiently clean the surface and prevent contaminating the rough with fairway grasses. Aggressive vertical mowing is commonly used once or twice annually in the spring and fall.

Other successful vertical mowing programs for thatch removal involve the use of fairway mowers set up with vertical mowing reels. Typically, fairway mowers with vertical mowing reels are less aggressive because they do not generate significant downward pressure, limiting their penetration depth. However, these units are normally used four to six times annually,



Vertical mowing is a highly effective practice to remove thatch.



Debris cleanup using modern equipment reduces the disruption time associated with core aeration and vertical mowing.

often with similar results and less surface disruption than deep vertical mowing. Vertical mowing in two directions is common and has a light to moderate penetration depth.

Regardless of the method that is used, core aeration or vertical mowing, these programs work for thatch removal and should be performed annually. Some golf courses may only need one cultivation event each year, while others with more thatch will need two or more.

Solid- and deep-tine aeration, slicing, spiking, or similar cultural practices are very beneficial programs for fairways as well. These practices do not cause much surface disruption and are quicker to perform than core aeration or vertical mowing. However, these units are not effective for thatch removal and should only be used as a supplement to a sound core aeration or vertical mowing program.

THATCH DILUTION WITH SAND TOPDRESSING

Sand topdressing is another option for thatch control on fairways through dilution and increased microbial degradation. Golf courses in the Pacific Northwest have been topdressing fairways extensively for two decades to control thatch, but mostly because of the drainage and firmness benefits (Gilhuly, 1990). In recent years, fairway topdressing has become more common across North America. Fairway topdressing programs are most beneficial when they are used in a fashion similar to putting green topdressing programs, through light and frequent applications to uniformly dilute thatch accumulation, which is based on turf growth rate during the growing season. Heavy, infrequent topdressing applications to fairways will create many layers in the soil profile, which reduces the benefits of the program.

Fairway topdressing application rates vary slightly, but research and field observations suggest sand applied at 5-10 tons per acre for each month of active turf growth, totaling 30-60 tons per acre over the entire season in the Northeast region, thoroughly dilutes thatch and improves drainage significantly over time (Zontek, 2005;

Skorulski et al., 2010). Research performed at the University of Connecticut has shown that topdressing sand particle size distribution is not overly important to achieve benefits in surface firmness or soil moisture retention compared to total volume of sand applied annually (Skorulski et al., 2010). This research is very useful because sands with finer particles (e.g., mason sands) are often less expensive than sands used to topdress putting greens (generally slightly coarser with wider distribution of particle sizes) but can still provide positive results. However, it is prudent to thoroughly test the native soil and topdressing sand for compatibility and avoid switching to topdressing sands that have a particle distribution that is finer than fairway topdressing sand used previously.

The costs of fairway topdressing programs vary widely, depending upon sand availability and shipping costs. On average, fairway topdressing sand may cost between \$10 to \$25 a ton. In order to achieve an adequate amount of sand on an annual basis (30-60 tons per acre), the cost of sand alone could be around \$7,500 to \$37,500 for a golf course with 25 acres of fairways. Large topdressing equipment is also a necessity, and these machines can easily range between \$20,000 to \$30,000.

Obviously, a large expense is required to topdress fairways, but the benefits are significant and justify the program for many facilities. Unfortunately, golf courses occasionally fail to plan for the long-term costs of fairway topdressing, which can lead to the program being abandoned after a few years. Once a fairway topdressing program is started, it should be con-

tinued annually. If the program isn't sustainable long term, topdressing until a two- to three-inch sand layer has been created will allow for sandy soil brought to the surface from core aeration to be used as topdressing. However, it likely will take five or more years before this layer is created. If there are concerns with the long-term



Fairway topdressing is a great program to improve thatch control, drainage, and surface firmness.

costs of a fairway topdressing program, topdressing the approaches or particularly soft, wet fairways before expanding the program to all of the fairways is a good place to start.

CORE AERATION AND SAND TOPDRESSING

A primary goal with fairway topdressing is to build a layer above the native soil with improved drainage and resistance to compaction. Assuming the native soil drains poorly, aeration cores brought to the surface that are dragged back in will reduce the drainage properties of the developing sand topdressing layer. Clearly, this would reduce the positive effects of the fairway topdressing program, and at least temporarily replacing core aeration with solid-tine aeration is often the best approach. Once a sufficient sand layer (at least two to three inches in depth) is created, core aeration can resume, but the goal should be to avoid intermixing

soil cores into the sand topdressing layer. Again, it may take five-plus years until a sufficient sand topdressing layer develops, so other practices to promote rooting, remove thatch, and alleviate compaction become of greater importance since core aeration is temporarily suspended. Deep-tine aeration does not remove thatch, but it improves

rooting and alleviates compaction, so this is a good practice to use as a complement to solid-tine aeration. Vertical mowing to remove thatch is another important supplement to solid-tine aeration. However, for the reasons mentioned above, the vertical mowing depth should be shallow enough to avoid intermixing the native soil and the sand topdressing layer.

One potential concern with fairway topdressing is

creating a distinct layer between the native soil and the sand topdressing layer. In agronomy, layers in the soil profile often are detrimental, but the goal of fairway topdressing is to build a better soil above the poorly draining native soil. Properly implemented, this layer should only have positive implications.

For those who want to avoid a distinct layer between the native soils and the sand topdressing layer, creating a zone of transition may be an option. A zone of transition is a gradual shift from the native soils to the sand topdressing layer. This is created fairly easily but is only an option for those with native soils that drain reasonably well. Core aeration can be performed for the first year or two of the fairway topdressing program, intermixing these soils together. After a period of time, core aeration is suspended while topdressing resumes, adding straight sand on top of the layer of intermixed

native soil and sand topdressing. Many golf courses have had excellent results without creating a zone of transition, so it is not a necessity. Furthermore, if the native soils do not drain reasonably well, creating a zone of transition will only delay the developing benefits of fairway topdressing.

Keep in mind, what works for one facility is not always right for others. If questions arise on any of these complex points, work with your local USGA Green Section agronomist to develop and monitor these programs.

CONCLUSION

The USGA Green Section has always been a proponent of firmer, drier turf

on golf courses. Controlling thatch is just one aspect of firm fairways, but it is a crucial element. Core aeration, vertical mowing, and topdressing are tools to help maintain firm, healthy, and resilient fairways. The intricacies of these programs are variable across the country, but the golf courses that have been successful at producing firm, healthy fairways are the ones that have committed to these programs.

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Deep-tine aeration does not remove thatch, but it is often used in conjunction with a fairway topdressing program to avoid intermixing native soils with topdressing sand.