How turfgrasses respond to *mowing*

By Dr. Doug Linde

One Saturday evening when I was 16 I had had enough with the slow putting greens at my father's golf course. I slithered into his maintenance shop and lowered the height of cut on the triplex greens mower. Although I had no idea how much I lowered the height, the test cut on the practice green seemed pretty good to me. The next few days golfers were commenting to my father on how fast the greens played. His investigation included seeing some scalp marks and asking his mechanic if he'd touched the cut height, and he soon determined what I had done. I was then given one of my first lessons on how mowing affects turf!

Here I'll share that lesson and others I've learned about the effects of mowing on turf:

Plant's response to each mowing

Mowing causes plant stress! Fortunately, turfgrasses are well adapted to this stress. There are a variety of responses that occur every time a single turfgrass plant is cut. One response is fluid exudes from the cut leaf–this includes water and organic compounds. The odor of a freshly cut turf is evidence that organic compounds are leaving the plant through the wound.

Another plant response after being cut is to repair the wound. Like a flesh wound in humans, the open wound becomes an entrance for disease-causing organisms and it's important the plant repairs it as soon as possible. Stored energy (carbohydrates) is used in the repair.

Stored energy is also used in the next plant response to cutting which is to replace the cut leaf tissue by growing new leaf tissue. Simultaneously, the plant is using extra energy for repair and regrowth while it is producing less energy for itself via photosynthesis because part of the plant's energy generator (the leaf) has been removed. As a result, an energy "dip" occurs after each cutting. The plant attempts to replenish its energy reserves as soon as its leaf tissue becomes sufficient again. Scalping, excessive defoliation, and environmental stresses can slow the replenishment and weaken the plant.

Mowing a heat and drought-stressed turf can compound problems.

Despite being well adapted to cutting, turfgrass plants are still under some stress after being mowed. In addition, when energy reserves are adequate the plant can better tolerate cutting and other stresses. When reserves are inadequate, the plant is weakened by cutting and more prone to problems, especially if under other stresses such as wear, drought, heat, disease, etc.

A final plant response to cutting is root growth stops for a period. The regeneration of new leaves takes priority over root production and energy is diverted to repair and grow the leaf.

Plant's response to regular mowing

When a turfgrass plant is subjected to regular mowing, it causes three responses. First, the plant produces more tillers that increase the density of the turf stand. This response alone is the reason to mow a stand of young seedlings as soon as possible. Second, the plant and all its parts get smaller in size. This dwarfing of the plant leads to the third response of lowering the crown closer to the soil surface.

These responses may take weeks to fully occur thus it's important to follow the "one-third rule" to determine mowing frequency. Removing no more than one-third of the leaf surface at any one mowing induces the desired responses described above without placing excessive stress on the plant. Following the "one-third rule" also reduces clippings, decreases the severity of the energy "dip" after mowing, and minimizes scalping.

Plant's response to closer mowing

The plant's response to closer mowing depends on whether or not the lower height of cut is within the plant's tolerance range. Each turfgrass species has a cutting height range it can tolerate and still produce an adequate turf cover. When mowing closer within that tolerance range, the plant becomes smaller, the rootzone shorter, tillering and density increase, leaf texture gets finer, and carbohydrate production and storage decrease.

Most of these responses result in a plant that is less tolerant to environmental and disease stress. When mowing closer but below the plant's tolerance range there are some additional responses such as scalping and/or a weakening because the plant doesn't have sufficient tissue for photosynthesis. A turf stand of these plants can become thin and overtaken by weeds. Therefore, set cutting heights within the species tolerance range.

The most significant response listed above is a smaller plant. Smaller plants produce less energy and have a shorter rootzone. Fewer roots are needed to support the smaller shoots. A turf with a shorter rootzone has a decreased capacity to absorb water and nutrients from the soil, thus making it necessary for more frequent irrigation and fertilization.

As my father taught me, lowering the height of cut on a mower

Plants that are scalped take more time and energy to recover.

Clumps of clippings can smother the turf.

is rather easy and inexpensive to do, but mowing a turf closer can become expensive. For example, lowering the height of cut of a Kentucky bluegrass baseball field from 2 inches to 1.25 inches would result in the following additional costs: If the "one-third rule" is followed, at least one additional mowing per week would be needed. Assuming it takes 2 hours labor to mow and clean-up, $15/hr labor cost, and a 6-month growing season; it would take an additional 48 hours per year and cost $720.

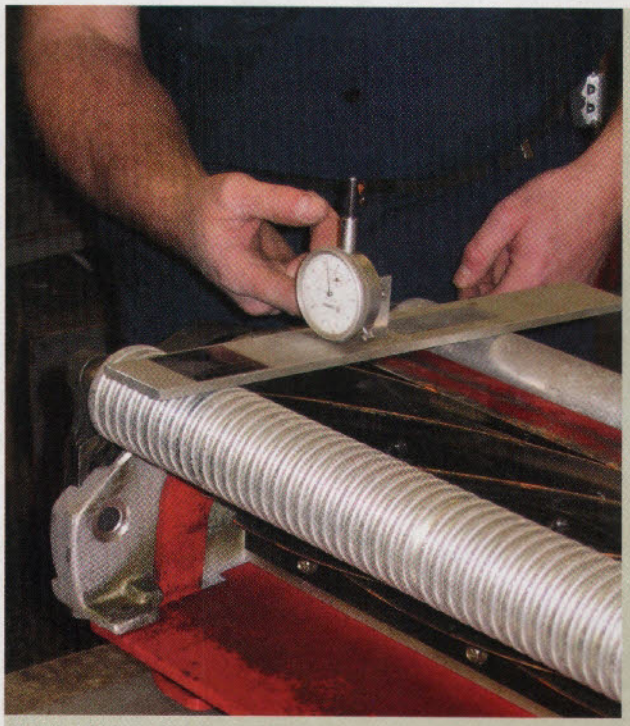
That's only the direct cost however; there are numerous indirect costs. As mentioned earlier, a smaller plant requires more frequent irrigation and fertilization. In addition, a smaller plant is more susceptible to disease, thus fungicides may need to be applied regularly. Finally, a smaller plant requires a higher level of expertise to maintain. These indirect costs can be high, especially if the field has no irrigation system, no sprayer available for fungicides, and limited expertise. This is what I learned when I lowered the height of my father's greens mower.

Plant's response to the mower

Mowers cause plant stress! Not only do mowers cause a cutting-induced response in the plant but can cause the entire turf stand to respond in a variety of ways. For example, excessive clippings can smother the turf, dull blades lead to chewed leaves, mowing too fast can lead to bobbing and a washboard turf appearance, mowing through active fungal mycelium or seed-producing weeds spreads disease and weeds, and uneven terrain and/or thatchy turf can lead to scalping.

There are also various mowing situations and management practices that lead to additional stress. They include mowing when the plant is drought stressed, mowing when the turf is excessively wet, tire wear when turning, bedknife wear, hydraulic oil leaks, improper mower setup, grain, frost injury, triple mowing, and use of heavy mowers. These are all undesirable responses or situations. Fortunately, most are related to management issues and can be easily corrected.

Dr. Doug Linde is Professor of Turf Management at Delaware Valley College. When not teaching and advising students, he can be found consulting for sports fields and golf courses and conducting research. ■



Although lowering the height of cut is easy and inexpensive, mowing a turf closer can get expensive.

Recommended mowing practices

Turf managers that can incorporate as many of these practices as possible into their management program should be able to produce a more playable and aesthetically pleasing turf at a lower cost:

1. Regularly sharpen and adjust mower.
2. Operate mower properly.
3. Set cutting height within plant's tolerance range.
4. Follow the "one-third rule."
5. Limit double & triple cutting.
6. Avoid mowing when:
   - Disease is active and turf is wet.
   - Turf is drought and/or heat stressed.
   - Turf is saturated and heat stressed.
   - Turf has a frost.
7. Raise cutting height just before environmental stress periods.
8. Lower cutting height in small increments.
9. Mow a stand of young seedlings as soon as possible.
10. Use lightweight mowers.
11. Reduce thatch.