Bad Greens Deserve a Failing Grade

Paul Vermeulen
Director Mid-Continent Region
USGA Green Section

Educating golfers on topics relating to successful course management is one of the greatest challenges faced by superintendents. At no time is this fact truer than when the turf on a bad green has a history of deteriorating during the summer season. In this instance, superintendents have the difficult task of explaining how multiple factors can interact, causing a green to deteriorate. This task is also made more difficult by the fact that golfers, as students, have little patience for learning the finer points of agronomy and just want to know who, rather than what, is responsible for the interruption in their game.

When attempting to educate a large audience that has little patience, it is always best to keep the lesson plan as simple as possible. One plan that has worked well for superintendents in the Mid-Continent Region is to assign a letter grade of A through F to each of six factors that commonly influence turf performance during the summer months. In so doing, golfers can glance at a report card and instantly appreciate the gravity of the situation. Furthermore, they can also see for themselves what steps need to be taken to restore the turf and improve its reliability in the future.

The first factor that can influence turf performance during the summer months is subsurface drainage, i.e., water infiltration rate. Good subsurface drainage is critical to the performance of closely mown turf because it prevents the root zone from remaining flooded following heavy rainfall. During periods of high-temperature stress, flooding of the root zone can suffocate the root system and lead to severe injury.

Clay soils have the poorest subsurface drainage because they have very small pore spaces between soil particles and are prone to severe compaction. When compacted, a clay soil can have a water infiltration rate of less than 0.2 inches/hour, which is a disastrous situation in anyone's book. Sandy soils have the best subsurface drainage because they have large pore spaces between soil particles and are somewhat resistant to compaction. Sandy soils that meet USGA specifications for putting green construction have a water infiltration rate between 6 and 24 inches per hour.

An example of a grading scale that can be used to illustrate subsurface drainage as influenced by soil type is as follows:

A – Sand-modified soil overlaying a bed of gravel with drainpipe (USGA or California construction).

Poor air circulation, poor surface and subsurface drainage, and poor ventilation cause bad greens to fail during the stressful summer months.

B – Sandy loam soil with drainpipe.
C – Sandy loam to loam soil without drainpipe.
D – Amended clay loam to clay soil with or without drainpipe.
F – Clay soil that remains saturated for extended periods following heavy rainfall with or without drainpipe.

The second factor that can influence turf performance during the summer months is the dominant turf species growing on the putting surface. The dominant species of turf influences summertime putting green performance because some species have greater heat tolerance than others. Species with good heat tolerance are able to maintain lower canopy temperatures through the process of evapotranspiration, whereas those with poor heat tolerance easily overheat and slowly deteriorate from fungal infection and physical wear. The slow decline of older creeping bentgrass varieties with poor heat tolerance during the summer months is commonly referred to as summer bentgrass decline (SBD).

A list of newer creeping bentgrass varieties that have good summertime performance in the Mid-Continent Region includes, but is not limited to, A-4, Cato,

(continued on page 28)

Mowing in the dew helps employees cut straight lines on the putting surface, but a lack of morning sunlight weakens turf and causes severe thinning during the peak golfing season.

Bad Greens Deserve A Failing Grade
(continued from page 3)

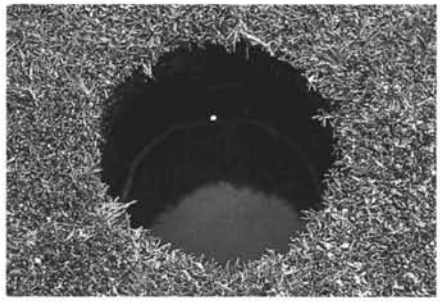
Crenshaw, G-2, L93, Providence and SR 1020. Older creeping bentgrass varieties that have poor summertime performance include Penncross and Toronto. On a grading scale, annual bluegrass (*Poa annua*) rates below the older creeping bentgrass varieties in terms of both heat tolerance and disease susceptibility.

An example of a grading scale that can be used to illustrate dominant turf species is as follows:

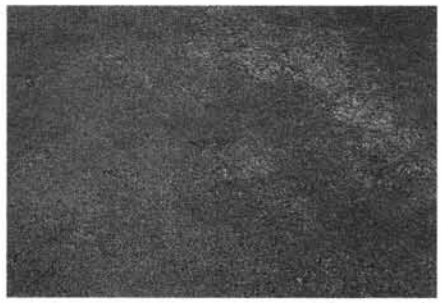
A – Dominant stand of a new, heat-tolerant creeping bentgrass variety.
B – Mixture of new and old creeping bentgrass varieties with a very small percentage of annual bluegrass (*Poa annua*).
C – Mixture of new and old creeping bentgrass varieties with a small percentage of annual bluegrass (*Poa annua*).
D – Dominant stand of an older creeping bentgrass with a significant percentage of annual bluegrass (*Poa annua*).
F – Dominant stand of annual bluegrass (*Poa annua*).

The third factor that can influence turf performance during the summer months is sunlight exposure. Sunlight exposure influences turf performance because it is the driving force of photosynthesis. Without adequate sunlight exposure, the process of photosynthesis is retarded and the turf cannot produce ample amounts of complex carbohydrates to fuel vigorous growth. When forced to grow slowly, turf cannot recover from routine mowing and pedestrian traffic and it gradually loses stand density.

The impact of sunlight exposure on turf performance is a function of duration, intensity and whether full exposure occurs during the morning or afternoon. The best turf performance can be expected on greens that are fully exposed to the sun from dawn to dusk. The worst turf performance can be expected on greens that sit in partial or deep shade from dawn to dusk or are only exposed to the sun in the afternoon. Intermediate turf performance can be expected on greens that are exposed to full sun from dawn to late morning. A premium value is placed on early morning full exposure because it (1) removes dew and frost, (2) reduces disease incidence, (3) encourages root development, (4) encourages greater photosynthetic activity and (5) encourages dense canopy formation.



Standing water in the hole after a green has been deep-tine-aerified is a clear indication of poor subsurface drainage and the need to rebuild.



A clear sign that a green is too small and/or too severely contoured is concentrated traffic scars around the three to four level hole locations.

An example of a grading scale that can be used to illustrate sunlight exposure is as follows:

A – Full sunlight exposure from dawn until dusk.
B – Full sunlight exposure from dawn until mid-afternoon.
C – Full sunlight exposure from dawn until late morning.
D – Full sunlight exposure from late morning until dusk.
F – Shade to partial shade cover from dawn until dusk.

The fourth factor that can influence turf performance during the summer months is cross-ventilation. Cross-ventilation influences turf performance during the summertime because it encourages water escaping from microscopic pores on the leaf surface to evaporate. As water evaporates from the leaf surface, it dissipates heat from the turf canopy, thus preventing overheating during warm, sunny afternoons.

As a point of reference, creeping bentgrass greens with good cross-ventilation are usually able to maintain a canopy temperature below 105°F on a sunny afternoon when the thermometer reads 95°F at the nearest airport. During the same climatic conditions, poorly ventilated greens typically have a surface temperature of over 120°F. It can be safely assumed that maintaining greens with a canopy temperature of 105°F is infinitely easier than maintaining ones that are almost in flames.

An example of a grading scale that can be used to illustrate cross-ventilation is as follows:

A – Unrestricted cross-ventilation across the entire putting surface.
B – Partial restriction of cross-ventilation across a small portion of the putting surface.

(continued on page 30)

Bad Greens Deserve A Failing Grade
(continued from page 28)

C – Partial restriction of cross-ventilation across the entire putting surface.
D – Significant restriction of cross-ventilation across the entire putting surface.
F – Severe restriction of cross-ventilation across the entire putting surface.

The fifth factor that can have an influence on turf performance during the summer months is traffic distribution as influenced by the number of hole locations. Even distribution of pedestrian traffic over the entire surface of a green is influential on turf performance because it prevents signs of physical wear from developing in isolated areas. Greens that have six or more level hole locations of approximately 250 square feet tend to show few signs of concentrated traffic at an average Stimpmeter reading of 9 feet 6 inches. Greens with five or fewer level hole locations tend to show clear signs of concentrated traffic by the end of a summer season.

An example of a grading scale that can be used to illustrate traffic distribution as influenced by the number of hole locations is as follows:

A – 8 or more hole locations.
B – 7 hole locations.
C – 6 hole locations.
D – 5 hole locations.
F – 4 or fewer hole locations.

The sixth and final factor that can influence turf performance during the summer months is surface drainage. Good surface drainage is critical to turf performance as standing water can suffocate turf within hours during a warm, summer afternoon. Additionally, surface water that cannot escape from the putting surface without delay can cause the soil to become super-saturated for extended periods, thus mimicking the effects of poor subsurface drainage and resulting in a high incidence of disease activity.

Ideally, greens should be contoured in a manner that allows surface water to drain off the putting surface in multiple directions. Greens with a single exit point for surface drainage or, worse yet, greens that have water flowing onto the putting surface from the surrounding rough during heavy rainfall, have a high risk of turf loss during the summer season.

Great greens with poor cross-ventilation usually lead to disappointing putting conditions during July and August.

Standing water on greens that requires squeegeeing following heavy rainfall is an obvious sign of poor surface drainage.

An example of a grading scale that can be used to illustrate surface drainage is as follows:

A – Surface water flows off of the green in three or more directions.
B – Surface water flows off of the green in two directions.
C – Surface water flows off of the green in one direction.
D – Surface water flows onto the green from the surrounding rough and exits off in one direction.
F – Surface water flows onto the green from the surrounding rough and exits by percolating through the root zone.

Once a letter grade has been assigned to each of the six factors that influence summertime turf performance, a final letter grade can be given to reflect the overall reliability of the turf. In many instances, this grade is heavily influenced by two or more failing grades for the six factors that influence turf performance. An example of a report card for a bad green that has poor subsurface drainage and is covered by morning shade, but has a large surface area that sheds water in multiple directions and has good cross-ventilation, would be as follows:

Green No. 13
Subsurface Drainage . . .F
Turf Species . . . . . .D
Sunlight Exposure . . . . .D
Cross-Ventilation . . . . .B
Traffic Distribution . . . .A
Surface Drainage . . . . . .B
Overall Reliability . . . . .D-

As can be seen, a report card with multiple failing grades quickly gives golfers the impression that something is very wrong. Furthermore, they can see that improving turf performance will involve more than just rebuilding the green in accordance with USGA specifications. If you have a bad green on your course, try giving it the failing grade(s) that it deserves.