



Build a new green on a shaded site that has poor air circulation and you can anticipate a slow, agonizing grow-in.

Bentgrass Putting Green Establishment

Avoid the perilous pitfalls frequently encountered during grow-in.

by BOB VAVREK

YOU HAVE decided to build a new golf course or perhaps rebuild a green or two on an existing course. From the minute the putting surface is seeded there usually will be a considerable amount of pressure from owners and members, and the pressure you put on yourself, to open the green for play.

Mistakes made during the grow-in of a sand-based bentgrass green can delay the opening date significantly. The worst-case scenario? The turf fails and the new green again must be taken out of play to be reestablished. Follow these tips and avoid the pitfalls, and you will

have the golfers complaining about difficult hole locations faster than you can say, "I'm glad I followed USGA Guidelines."

Tips For Success — Do Your Homework

Have potential root zone materials tested by an accredited lab regardless of construction method. Do not rely on old test results from the supplier or the test results obtained by friends across town when they rebuilt their greens. The physical soil testing lab should also perform quality control testing during the blending operation *before*

the root zone mixture is delivered to the green site. A list of accredited physical soil testing labs can be found at: www.usga.org/green/coned. A sample of the root zone mixture should also be submitted to a chemical soil -testing lab to determine nutrient levels. Porosity values, percolation rates, and nutrient analysis provide valuable information you can use to fine-tune the fertility program and irrigation practices during grow-in.

The adage "you can't make a silk purse out of a sow's ear" rings true when an attempt is made to build a green using questionable materials.

Following USGA Guidelines is a huge step in the right direction toward experiencing a smooth grow-in. A wealth of experience and know-how from other superintendents who have successfully established USGA greens and from the Green Section staff already exists. Review the USGA Guidelines and watch the USGA Putting Green Construction video. Tips for establishing a green are also available from the USGA website (www.usga.org) or contact your Green Section agronomist.

Don't Make The Same Mistake Twice

Why was it necessary to rebuild an old green in the first place? Dense shade, poor internal or surface drainage, restricted air movement, severe contours, a lack of putting surface to accommodate the amount of play at a particular course, and a variety of other factors can lead to the demise of a green. To help remedy the situation, cut down trees, use a construction mix that drains well and resists compaction, and provide ample putting surface for the anticipated amount of play. The formula for failure is to take a small, heavily shaded, severely contoured green out of play and build a similar small, heavily shaded, severely contoured USGA green in its place. A good tool to evaluate the overall growing conditions of the green site is the article "Helping Your Greens Make the Grade," found in the March/April 1998 issue of the *Green Section Record*.

Shade

Experience from the field strongly suggests that bentgrass greens need at least eight hours of direct sunlight each day for a consistent rate of growth and development. Expect a long, agonizing grow-in if you build on a shaded site. Greens in full sun will be ready to open weeks before shaded greens. Eliminate as many trees as possible from the south and east sides of new greens to ensure morning sunlight. Need a challenge? Try to establish turf on a green where morning sun has been limited by mature evergreens.

Timing Is Everything

Many green construction projects that are attempted across the northern tier of states suffer because the green is seeded too late in the season to provide enough time for bentgrass to grow, develop, and harden-off before winter. For example, a green that is seeded during the second week of August in Wisconsin will usually be ready to open the following spring, sometime during early June. Seed the same green during late September and the green may require the entire next season for grow-in.

Late summer or early fall generally is considered to be the best time to establish a new bentgrass green, but the specific optimal seeding dates vary with location and climate. Across the northern tier of states a new green needs to be seeded by mid-August if a June opening date is anticipated. The

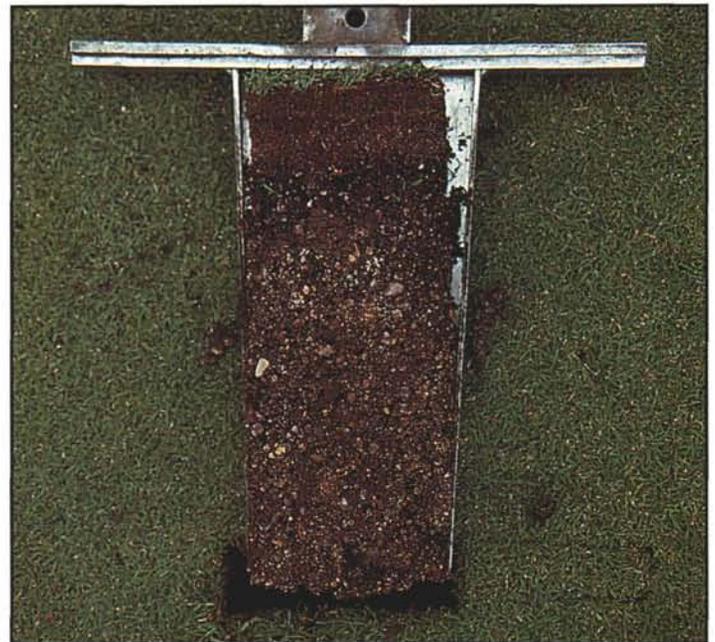
recommended seeding date can be pushed more into early to mid-September in some parts of the transition zone.

Soil temperatures generally are high during late summer, and bentgrass will germinate quickly, usually within five to seven days. Heat and drought stress become less of a concern as the days become shorter. Seedling diseases, such as damping off, that accompany extended periods of heat and high humidity are less likely to occur in late summer as daytime and especially nighttime temperature/humidity moderates. In addition, weed encroachment is much less of a problem during fall compared to spring.

A spring seeding results in the most challenging grow-in because the immature seedlings must survive heat stress, weed pressure, and erosion from washouts that accompany afternoon thunderstorms. A relatively dense stand of crowded immature bentgrass seedlings is especially susceptible to turf diseases. Also, mechanical stress from mowing and topdressing applications is more of an issue during summer compared to fall.

Seedbed Preparation

Use soil test results as a guide to determine how much starter fertilizer to incorporate into the seedbed during the final grading operations. A rule of thumb used with success by many superintendents is to incorporate a 1-2-1 ratio starter-type fertilizer at a



Don't step up to the plate with two strikes against you. Always have the physical properties of a potential construction mix tested by an accredited lab and use sound construction techniques such as the USGA Recommended Guidelines for Putting Green Construction.

rate of approximately 1 lb. nitrogen per 1,000 sq. ft. of turf into the upper root zone just prior to seeding. Incorporating Milorganite or another source of natural organic nitrogen into the seedbed is also a common practice. Use a rate of approximately 5 lbs. of Milorganite per 1,000 sq. ft. of putting surface and lightly till the fertilizer into the top few inches of root zone during final grading.

Seeding Rate

Seed most modern varieties of bentgrass at a rate of 1 to 1.5 lb. per 1,000 sq. ft. of putting surface. Use a 1 lb. rate when using the ultra-dense varieties of bentgrass such as G-2 or A-4. Seed in at least two directions to ensure uniform coverage across the entire green. Mix bentgrass seed with a lightweight carrier such as a natural organic fertilizer to facilitate a more uniform distribution of seed through a drop spreader.

Maximize Seed-to-Soil Contact

A common practice is to use the knobby tires of a motorized sand rake to press the seed into the soil. Invariably, the first seedlings to germinate are those at the bottom of the tire depressions. Various types of light rollers also have been used to press the seed into the construction mix. The importance of adequate seed-to-soil contact cannot be overemphasized.

Mulch

Applying a clean straw mulch or hydromulch to a green after seeding is a technique that is rarely considered anymore. Mulching to prevent washouts and to maintain more consistent moisture levels in the upper root zone after irrigation was once a common practice. Perhaps the presence of more sophisticated irrigation systems that can be programmed to deliver frequent, light irrigation to turf in a uniform pattern has eliminated the need to mulch, and maybe not. Even a light straw mulch would be worth its weight in gold if it prevented just one washout of a recently seeded green.

Extremely lightweight geotextile fabric, such as Seed Guard, can be used in place of straw or wood fiber mulch. These polyspun fabrics allow free movement of air and water through the cover and do not trap an excessive amount of heat during a sunny day. They are inexpensive and disposable. Covers have been used with varying degrees of success to extend the grow-

ing season later into the fall and initiate turf growth earlier in spring.

Disease Control

Use seed treated with Apron to prevent damping off disease if the green is seeded during a period of hot, humid weather. Treating a new green for diseases is a challenge since most common golf course sprayers are too heavy and would cause wheel rutting across a putting surface during grow-

be much more important after seed germinates. A seed probably will not die if the surrounding soil dries out, but a seedling will.

The importance of dependable, uniform irrigation coverage is often underestimated during establishment because most superintendents believe the automatic irrigation system can always be supplemented with hand watering or roller-based sprinklers. Unfortunately, a sprinkler head that does not



Walk-behind mowers equipped with solid front rollers are recommended to minimize stress to the immature stand of bentgrass during grow-in, especially along the perimeter of the green where the constant turning of grooved rollers usually injures turf.

in. Use granular fungicides on new greens and be sure that the materials chosen for disease suppression are safe to use on immature bentgrass. Be sure the person using the spreader is comfortable with the equipment and that the spreaders have been carefully calibrated. Another option is to have a walk-behind boom-type sprayer available for use during grow-in. This type of sprayer could also be used to apply light rates of soluble fertilizer to spoon feed the new greens. In fact, some superintendents prefer the walk-behind boom sprayer to the more common motorized sprayer for putting green management.

Irrigation

Opinions vary greatly regarding the proper method of irrigating a new green. Too much irrigation is the tendency prior to seed germination. Frequent, light irrigation is believed to

function properly may not be discovered soon enough to prevent seedling dieback, and wind may disrupt the uniformity of irrigation coverage even when the system is functioning properly. Moisture levels across the entire surface of a new green need to be checked several times a day during hot, dry weather.

How one interprets light and frequent irrigation can have a significant influence on the rate of turf growth and development. The weather dictates irrigation needs, since more frequent irrigation cycles are needed during a dry, windy day and less irrigation is needed during a humid, cloudy day. Consequently, the irrigation clocks may need to be adjusted to accommodate changes in the weather patterns. Irrigation frequency can be reduced as the stand of turf matures. Check the depth of the root system and adjust irrigation cycles accordingly.



Neglect the topdressing program and uneven areas on a new green will often be severely scalped as the height of cut is lowered throughout the establishment period.

Sand-based greens typically are over-watered during the grow-in because porous root zones accept water readily without puddling. Heavy irrigation cycles will do little more than move soluble plant nutrients beyond the root zone and encourage disease activity. Granted, immature bentgrass seedlings cannot tolerate much drought stress, but soaking greens several times a day is counterproductive.

Should an extended dry period occur during grow-in, it may prove necessary to periodically water more deeply. The combination of frequent applications of fertilizers and frequent, light watering can result in a buildup of salts in the upper root zone. These can usually be flushed by a 0.25- to 0.5-inch rain or irrigation application.

Fertility

Use the initial soil test results for the root zone mix as a guide for how much fertilizer to add to the upper inch or two of the green just prior to seeding. Once the turf begins to grow, a good rule of thumb is to apply about ½ lb. of nitrogen every 7 to 10 days for the entire first season of establishment. Use turf color as a guide to fine-tune the fertilizer rates. When the bentgrass needs to be mowed on a consistent schedule, the amount of clippings per mowing also can be used as a guide for fertilizer applications. If soil temperatures are above 60 degrees, try to supplement the more readily available forms of nitrogen with Milorganite or

some other form of slow-release nitrogen. A monthly 1 lb. rate of slow-release nitrogen can serve as the foundation of the fertility program during grow-in, and the weekly light applications of soluble fertilizers sustain vigorous bentgrass growth and development.

Furthermore, there is practically no chance of burning the turf or causing a flush of growth using natural organic sources of nitrogen. Skips or overlaps are rarely a concern because low nitro-

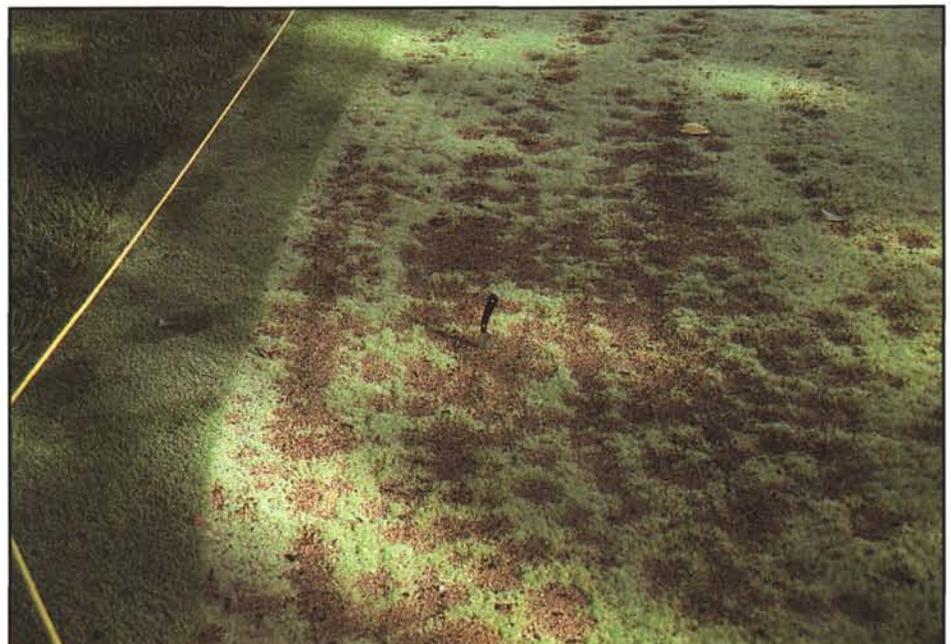
gen analysis fertilizers can easily be divided and spread across a green in two or three directions. Most natural organic fertilizers also provide slow-release micronutrients to the root zone.

Phosphorus levels also must be monitored. Typically, 1 lb. of phosphorus per month for the first couple of months during grow-in is sufficient. Micronutrients are easily applied through one or two applications of a micronutrient package such as O. M. Scotts' STEP product.

Poor fertility management of sand-based greens is probably the number one mistake made by superintendents during establishment. Oftentimes, heavy applications of soluble fertilizers are made at infrequent intervals. Then the rate of nutrient release is expected to last as long as the same fertilizer application to a mature green. The implications of frequent irrigation or heavy rainfall over an immature turf growing on a sandy root zone are not considered or understood. The unfortunate result is thin, wide-bladed, off-color turf that is starving for nutrients.

Topdressing

Some superintendents are successful using high-quality straight sand for topdressing throughout the grow-in. Washed mason sand that has a majority of its sand particles between 0.25mm and 0.5mm in diameter (medium sand) is a safe bet for topdressing greens. Medium sand has a desirable balance between moisture-holding capacity and



Frequent irrigation and high rates of nitrogen applied to an immature stand of turf will invite damping-off disease during extended periods of hot, humid weather.



A poor grow-in effort . . . can you find the putting green in this picture?

drainage. Other superintendents are equally successful using the original root zone mix during the first year of establishment and then switching to a compatible straight sand once the stand of turf matures and begins to recycle organic matter into the upper root zone.

The straight sand option is strongly recommended if the sand component of the root zone possesses a relatively high percentage of coarse and very coarse sand particles. A coarse root zone mix that meets USGA Guidelines may or may not be suitable as a topdressing material. When in doubt, seek advice from a USGA agronomist.

Topdressing applications during the grow-in serve several purposes. Light applications of sand level out uneven spots across the slope of a green that could become scalped by mowers when the cutting height is decreased throughout the grow-in. A common practice is to apply a relatively heavy application of sand to greens just prior to lowering the height of cut. The sand supports the mower a little higher and slightly raises the effective height of cut

for a few days until the sand settles into the turf. As a result, frequent topdressing reduces the potential for scalping seedlings as the height of cut is slowly lowered.

Topdressing helps prevent excessive thatch from accumulating in the upper root zone during establishment. A little thatch or cushion is desirable and is one of the signs that a green can be opened to play. However, a distinct layer of dense thatch should not be allowed to develop. Too much thatch, a common occurrence during grow-ins, can slow the movement of water through the green and cause other concerns when the putting surface matures.

Use a spinner-type fertilizer spreader when topdressing to keep the unstable root zones from rutting during the first few weeks of grow-in. Once the surface firms up, try to use more conventional topdressing equipment, but only fill the hopper full enough to topdress one green. Keep brushing and other abrasive operations to a minimum. Try to water-in the topdressing or use a very light cocoa mat or a piece of upside-

down artificial turf to work sand into the green.

Inadequate topdressing or no topdressing at all probably is the second most common mistake made during establishment. Try to match topdressing applications to the growth of the turf. Another common mistake is placing a full load of sand into the topdresser and then trying to sand four or five greens at a time. The heavy unit usually causes severe rutting that may take weeks, months, or years to smooth out. For every green where too much sand is applied to the putting surface during establishment, there are over a hundred greens that receive inadequate topdressing applications.

The Initial Mowing Operation

Hand mowing is necessary during grow-in. Keep the cutting units sharp. Use solid rollers to reduce physical damage to the seedlings, especially along the inside perimeters of the green. Roll the green to firm up the playing surface before the initial mowing. Walk-behind units can be run across the green with the reels off to roll the

putting surface prior to the initial mowing.

The most common height of cut for the first mowing is approximately $\frac{1}{4}$ " for the ultra-dense varieties of bentgrass and about $\frac{3}{8}$ " for other bentgrass varieties. Mow the greens during the afternoon when the turf is dry. Start mowing when a small amount of clippings will be removed from most of the green at the initial height of cut. Collect the clippings during the initial mowing and then return clippings in subsequent mowings to recycle a little organic matter to the surface of the green, which serves as low analysis fertilizer and lightweight mulch. Maintain the green at a height of cut not lower than $\frac{5}{32}$ " for the entire first season. The exception would be a lower initial season mowing height of $\frac{1}{8}$ " when establishing the ultra-dense varieties of bentgrass.

Superintendents generally err on the side of waiting too long to initiate mowing. Rarely is a green mowed too soon. The initial mowing often removes too much leaf tissue and the growth of the turf is set back for several weeks. If the mowing height is adjusted, for example, to $\frac{1}{2}$ " to account for excessive growth, it may take the entire season to safely lower the height of cut to a playable $\frac{3}{16}$ ".

The other mistake is trying to maintain the turf during establishment using a triplex mower equipped with grooved front rollers. The symptoms of the injury this practice causes to a weak stand of bentgrass seedlings are unmistakable. The perimeters of the greens are thin or bare, along with turf across humps and along severe slopes. Triplex mowers also can cause rutting of the new green before a dense stand of turf develops.

When is the Green Ready to Open?

This is the question that you will be asked throughout the grow-in, and there is no clear-cut answer. A very general rule of thumb for bentgrass greens is to allow at least three months of good growing conditions before opening to play. Most greens are seeded during fall and opened the following season. How many of the marginal growing days during late fall, winter, and early spring account for the "three months of growth" is impossible to determine. My personal, unscientific criteria for opening a green are as follows: If a wedge is cut from the green and is difficult to tear apart due to (1) the knitting of bentgrass stolons and (2) the development of a thin layer of thatch in the upper root zone, then the green is ready to open.

Unfortunately, pressure from golfers or financial considerations usually result in the green or greens being opened for play too soon. Very few superintendents have had the luxury of seeding a green during fall and having the entire next season to grow-in and groom the turf before opening to play the following spring.

Finally, avoid setting a specific date for the opening of a new green, because that date will likely be chiseled in stone by the golfers. The weather during establishment will have a considerable influence on how quickly the stand of bentgrass develops. Make sure the golfers understand the influence of weather conditions and the risks of playing a green too soon. It always will be very difficult to close a green after it is finally opened to play. Avoid the need to even consider such an unpopular decision by following the advice in this article to stack the odds in your favor for achieving a rapid grow-in.

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Supplement automatic irrigation with careful hand watering to maintain consistent levels of moisture in the root zone. Avoid one of the more common pitfalls during the grow-in: overwatering the putting surface.