THE BIRTH OF A PUTTING GREEN

A turf manager's guide for establishing a new putting green.

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The decision as to when the first mowing should occur is based on vertical growth, not turfgrass density. This bentgrass (left) is ready for the first cut 17 days after seeding. The Tif-dwarf bermudagrass green (right) is ready to be mowed 18 days after sprigging.

The green complex sod is laid. Pre-plants are applied. The putting surfaces are floated out, ready for planting. The club has invested hundreds of thousands of dollars in this project and you have the responsibility of getting the green complexes ready for play. The contractor is finished and now they're *yours* and you have little or no grow-in experience. Are you ready as the turf manager?

Growing in new greens is probably the most underestimated challenge in golf turf management. This is because superintendents rarely have the opportunity to establish a new green and, consequently, are not well versed on the subject. To bridge this gap, the key areas of a successful grow-in are presented in this article as a reference. When appropriate, this article also can serve as an educational tool to help golfers, course owners, and real estate developers appreciate the scope of work involved in establishing new greens.

A poor grow-in can have devastating consequences to both the short- and long-term success of a project for several reasons. The more familiar aspects of growing in new greens involve soil fertility and disease suppression; however, there are many other facets that are equally important and are often overlooked or misunderstood. These might include how to compact the rootzone, when and how to reduce daily irrigation, when to mow the turf for the first time, and how to manage the grow-in layer as the new turf matures. To provide helpful instruction on the subject of grow-in, this article discusses the process in chronological order, from seedbed preparation to green opening.

SEEDBED PREPARATION

The first phase of a successful grow-in is seedbed preparation, which begins well before the first seed or sprig is planted. Preparing a seedbed basically involves firming up the rootzone to minimize development of depressions and tracking after turf establishment, and applying starter materials to promote healthy seedling development.

The most effective method for settling the rootzone after it has been pushed into the green cavity, shaped, and firmed is to bring the rootzone to field capacity with extended irrigation on two occasions before planting. To reach field capacity (i.e., water flows continuously out of the drainpipe), a new green typically requires one hour or more of irrigation from all of the sprinkler heads surrounding the putting surface. The second heavy irrigation cycle is best scheduled the day before planting to insure that the seedlings or sprigs have adequate soil moisture.

The two- to three-foot-wide area at the edge of the green cavity is the most difficult to firm prior to planting. Extra attention should be paid to this critical area during the compaction step.

In addition to heavy irrigation, the rootzone should be compacted with a heavy roller. This, of course, is in addition to thorough floating (shaping) of the green, usually done with a mechanical rake and drag mat. And, in cases where the sand is inherently resistant to compaction, the rootzone should be rolled several times. In most circumstances, a 1-ton roller will produce great results despite the natural hesitation of the superintendent or project manager to operate such a large machine on new greens. Keep in mind that soft greens can also benefit from rolling *after* turf establishment.

An easy way to judge the proper firmness of a new green prior to establishment is to measure the depth of footprints in the soil. Ideally, footprints should be less than 0.25 of an inch deep. If they are deeper than 0.25 of an inch, additional irrigation and rolling are needed. When testing the firmness of a new green, give special attention to the perimeter of the cavity, where settling after establishment is most common. This zone of about 24 inches at the green cavity edge is usually the most difficult establishment area of the green to compact. Multiple passes in this zone with a mechanical rake, after irrigation, can be effective as the tires target compaction in this narrow band.

Once the rootzone has been compacted, pre-plant fertilizers are applied to create perfect agronomic conditions for seedling or sprig development. Pre-plant materials, including micronutrients and chemical soil amendments, are assembled based on soil tests. Starter fertilizers should not exceed 2 lbs. phosphorus per 1,000 sq. ft. as more will be unusable. If soil tests call for more phosphorus, apply the balance 30 days after initial pre-plant. A 1 lb. N per 1,000 sq. ft. application of slow-release nitrogen completes the pre-plant package. This provides a nitrogen source for the first 10 to 12 days after planting so that fertilizer does not have to be applied during this tender phase of germination/turf development. Readily available nitrogen is on hand in the soil solution as soon as the turf has developed enough for uptake.

EROSION PROTECTION

Erosion and sediment control are normally not considered part of green establishment, but they are essential elements. Damaging erosion can occur on a high-sand rootzone, even when the entire complex is sodded. Erosion damage is especially likely at the putting green/collar transition or sod line during establishment. Silt fencing slows and distributes runoff to prevent washing of the mix.

ESTABLISHMENT

Once the ground has been prepared, the second phase of a successful grow-in is to establish the turf. Bentgrass seeding is best done in two directions with a drop seeder. It is often mixed 50:50 with a granular material such as a greens grade organic fertilizer to increase volume for easier distribution. Rates for seeding creeping bentgrass should not exceed 0.75 lb. of pure live seed (PLS) per 1,000 sq. ft. in each of the two directions. Sprigging rates for the ultradwarfs should be 25 bushels (Georgia bushel measure) per 1,000 sq. ft. minimum or 8-12 live sprigs per sq. ft.

After seeding, tracking with the knobby-tire mechanical rake is the most common process. Extra tracking at the green cavity/collar transition, before and after seeding, with good soil moisture, usually provides adequate firmness. Again, careful attention to compaction at the green well edge will save much work later trying to smooth this transition from collar to putting surface.

Tracking-in seed is efficient, but another option is to lightly rake with the *back* of a leaf rake, helping ensure good seed/soil contact. This is done with no down pressure to prevent planting the

seed too deep. *Light* rolling completes the finishing task of seeding. This firms the surface, maximizes seed/soil contact and removes the "fluff" at the surface, which reduces the tendency for drying out in the upper 0.25 of an inch. Rolling often is not utilized enough when seeding.

With the seed or sprigs planted in the ground, the next key element of establishment is water management. During the first eight to ten days, the emerging turf will require frequent irrigation to prevent desiccation. The key to water management during grow-in is stepping down water frequency and amounts properly after initial rooting or germination to enhance maturity. The question of when to start this water reduction is a common query of inexperienced grow-in managers. It is usually not the timing of water reduction that creates problems, but instead it is the manner in which water reduction is initiated.

It is vitally important that in the initial stages of water reduction, the *run* times of irrigation cycles be reduced first and not the *start* times. For example, a program is set up for new bentgrass green establishment in which five to six start times a day are programmed, and generally about 20 to 22 minutes per *green* (3-4 minutes per head) is the desired run time. The initial thought might be to first reduce the number of *start* times after significant establishment to assist with root development. However, this can create drought stress on the bentgrass, especially on a late spring seeding. The same is true with bermudagrass sprigging, particularly in August. Remember that the grass is quite immature and there is not enough root system exploitation of the soil volume to allow for adequate moisture recovery. This is especially true in a new high-sand or straight-sand green profile, which initially is more susceptible to drying out at the surface. Significant drought stress can occur within the plant before visual signs are apparent with this type of water reduction versus proper initial reduction.

The proper reduction sequence is to first reduce the *run* times of each cycle to achieve a reduction in the amount of water being applied. It is much more efficient to reduce *run* times — the amount of each application — with the number of applications remaining the same. This reduces the chances of drought stress because the tender seedlings or new sprigs do not go too long between irrigation cycles, and the upper half inch of soil moisture is more adequately maintained. After some hardening of the plants, *start* times can be reduced to achieve further maturity and rooting.

Remember also that *start* times are not necessarily evenly spaced over the 24-hour clock. The *start* times, especially on bentgrass spring seeding, must be concentrated during the late morning and early and late afternoon periods because of the greater tendency for drought stress during the heat of the day. Commonly, the first watering occurs about 7:00 AM - 8:00 AM, and concentrated water begins about 10:30 AM - 11:00 AM. The last cycle is set for about 6:00 PM - 7:00 PM, with no water applied during the night. Night irrigation is not needed and can promote disease activity.

SPRAYING

Initial pest- and disease-control products and nutrient applications should be made with a walking boom. Freqently, new greens are too soft for a self-contained sprayer for the first six to eight weeks after seeding. If the superintendent is not prepared with a walk-type boom, he may be forced to rut the greens to apply a control product in the event of a disease outbreak. This specialized piece of equipment should not be overlooked for this phase of green development.

A fungicide application after planting is usually made to prevent damping-off. This can be a very active and devastating pythium disease problem if environmental conditions are favorable. The fungicide can be applied in spray or granular form at this stage. Also, treated seed is preferred, if available.

Improperly firming the rootzone mix prior to planting results in severe scalping of the turfgrass.

MATURATION

The third and final phase of a successful grow-in involves nurturing newly established seedlings or sprigs into a mature turf canopy that will hold together under the rigors of daily play. The key to this endeavor is the light application of fertilizer on a frequent schedule. It is commonly thought that fertilizer is applied during grow-in on a seven-day frequency, with about 1 lb. nitrogen or potassium per 1,000 sq. ft. per application as the standard rate. Grow-in is accomplished at a much more successful and rapid rate when this frequency is, in

the initial phases, reduced from a seven-day application rotation to a five-day rotation at lighter rates, usually 0.3-0.6 lb. N per 1,000 sq. ft. Rates depend on turf species and weather.

Potassium nitrate (KNO_3) has been utilized for bentgrass grow-in with excellent success using the above outline. Ammonium sulfate (NH_4SO_4) should be a primary nitrogen source for bermudagrass, along with adequate iron, magnesium, and manganese. This is rotated every third application as a complete material. After four to five weeks, the strategy changes by reducing the frequency. Micronutrient sprays and/or chemical soil amendments are applied as needed to assist in turf maturity. A complete analysis, granular, slow-release material should be the foundation to address soil and plant nutrient needs during this high-input phase of development. This also combats the tendency for nutrient depletion from the higher irrigation cycles still being utilized. Remember, watering in fertilizer materials is vitally important, and applications during the heat of the day are to be avoided.

Grow-in fertility rates are considerably higher than maintenance rates for obvious reasons. Generally, on a USGA spec green the nitrogen rate the first year after seeding will be approximately 8-11 lbs. of N per 1,000 sq. ft., depending on region, rainfall, physical properties of the greens mix, and water management. Research has shown relatively little leaching loss of fertilizers when good water management is utilized. Straight-sand construction requires more fertility because of reduced water retention and nitrogen holding capacity.

Grow-in managers often struggle with applying this high rate of fertilizer on establishing bentgrass greens when they have been utilizing maintenance levels of 1-3 lbs. N per 1,000 sq. ft. for so long. Young seedlings can develop stress from inadequate nutrition very quickly in new sand rootzone environments, and proper levels must be maintained. The same, of course, is true with bermudagrass sprigs. Nitrogen levels will approximate 9-12 lbs. of N per 1,000 sq. ft. for the first year on Tifdwarf or ultradwarf greens.

A 1:1 ratio of nitrogen:potassium has been the usual approach in the first year of fertility management. Routine phosphorus and minor elements are applied according to soil and tissue tests. Follow-up soil tests are very helpful at about 4 months and 10 months after planting. Tissue analyses during grow-in can help monitor nutrient availability. Nitrogen levels during grow-in should be 5.25-6.5% in bentgrass and 6-7% in bermudagrass as benchmarks for monitoring. These levels are higher than is ideal for maintenance. A slow-release, granular fertilizer with a complete analysis should also be included in the fertilizer schedule during turf maturation to offset the rapid leaching of nutrients caused by frequent irrigation. When applying granular fertilizers, make certain to avoid the heat of the day and irrigate immediately afterwards to prevent burn.

With the turf properly fed and watered, it usually does not take long for it to require mowing on a regular basis. The act of mowing should never be underappreciated during the grow-in of new greens, as it can have a direct impact on turf quality. The most common mistake with respect to mowing is waiting too long to mow the turf for the first time and doing so at too high a cutting height.

The determining factor for when to mow a new green for the first time should be the height of the turf, not its density. However, it is easy for the turf manager to look at a green and believe it is not quite ready. Grow-in managers often allow density to be too great a part of the equation of determining when mowing is needed. Density has nothing to do with mowing new greens — it is strictly vertical growth development. Remember this in evaluating when mowing should commence.

As a guideline, mowing should begin when the height of the turf just surpasses the upper limit of its preferred cutting height range. For example, many of today's creeping bentgrass and hybrid bermudagrass varieties have a cutting height range between 0.120 and 0.180 of an inch. Using the upper limit of 0.180 of an inch as the height adjustment for the mower, the first mowing should commence when the turf reaches a height of approximately 0.200 of an inch. Within four to six weeks after the first mowing, the cutting height should be whittled down to the midpoint of the turf's cutting height range or, in our example, 0.150 of an inch.

This guideline may not be appropriate if the rootzone is prone to rutting after mowing begins. In this instance, the turf has to be protected from scalping while it is trying to mature. Nonetheless, the objective for any grow-in should be to work the cutting height down to the middle of the turf's cutting height range as quickly as possible to promote lateral growth and stand maturity. The

mowing rule of thumb has been to never remove more than ⅓ of the leaf at any mowing. During establishment this target is better set at ¼ to reduce the chance of scalping or shock.

Late morning or afternoon mowing is also important in the early stages. A dry turf will mow cleaner and have less likelihood of pulling seedlings out of the ground. Frequent mower back-lapping will be required. Solid front rollers should be used on the putting green mowers for the first months, as the grooved rollers are too damaging. They can also dig into the somewhat exposed rootzone surface. The first two to three cuts are done without baskets to reduce weight; after that, baskets are used.

Desiccation on mounds or green slopes occurs very quickly when the time between the irrigation cycles is lengthened too quickly after planting.

Scouting during the early stages of development is a critical part of grow-in management, to keep a close eye on disease development and insect activity. When establishing new greens, scouting is actually so important that it should be a daily routine. If left unchecked, there are numerous pathogens that can literally destroy a stand of young plants in a matter of hours.

Daily scouting is also essential for monitoring weed contamination. *Rouging* is a term used by superintendents in the South and refers to checking greens for weeds on a daily basis. The most common weeds found in southern greens are nutsedge and off-type bermudagrasses. Creeping bentgrass greens can also become contaminated with invading bermudagrass from the surrounding area or by *Poa annua* blown in on the wind.

Topdressing completes the management circle when it comes to producing a smooth, successful grow-in. Throughout the grow-in of a new green, topdressing should be applied at a light rate of 0.5-0.7 cu. ft. per 1,000 sq. ft. Working the sand into the young turf without bruising, however, is often a bigger issue than rate and frequency of application. Herein is the great value of a spin-type topdresser capable of applying sand evenly enough to work down into the turf with irrigation alone. As maturity progresses, the turf will become more wear resistant, but not so much that one should consider using a steel dragmat to work topdressing into the turf canopy.

The first topdressing application for creeping bentgrass greens can normally be scheduled four to six weeks after seeding. Hybrid bermudagrass greens are usually ready for the first topdressing application three to four weeks after sprigging. Light topdressing applications on sodded collars and approaches should be scheduled within five to six weeks for cool-season grasses and two to three weeks for warm-season grasses.

AERIFICATION

One of the goals of early turf development is to maximize the growth rate by using relatively large amounts of water and fertilizer. Under these conditions, the turf unavoidably produces thatch at an accelerated rate. Moreover, due to early topdressing restraints, the thatch layer is less porous and denser in composition, producing a layer more subject to hydrophobic or anaerobic conditions. This unique thatch condition gives rise to the term *grow-in layer.*

The grow-in layer begins developing on new greens in a matter of a few weeks and is often underestimated in terms of its long-term impact on turf performance. The high accumulation of organic matter just beneath the turf surface is not readily evident to the eye, but rather to the touch. The detrimental effects of a grow-in layer usually become apparent after a green has been opened to daily play, as would a similar layer created by sodding a new green. The principal detriment is the sealing off of the soil surface that, in turn, causes water to stagnate in the grow-in layer. This is why scheduling aerification a few months after the establishment of a new green is often critical to its long-term success.

This early aerification may seem radical, but compaction relief is not the reason for aerification at this point. The goal is to permanently break up the surface tension created by this newly developed grow-in layer of thatch. It is not only critical to aerify new greens at this early stage, but hollow tines must be used to physically remove a core from the green. Solid tines are not beneficial in this case.

On the whole, the first two aerification treatments of seeded creeping bentgrass greens are done with ⅜-inch-diameter hollow tines on 2-inch centers. Afterwards, greens develop greater firmness and surface stability and can be aerified with larger tines on 1-inch centers. The same general principle also would be true for hybrid bermudagrass greens.

TOUCH-UP

As is often the case, some things tend to go astray despite the best-laid plans. During the grow-in of new greens, there are always spots on the putting surface with poor or no turf coverage that will require touching up. This occurs for many reasons, such as vandalism, animal damage, erosion during a severe storm, etc. The most common area is the collar/putting surface transition edges because of the instability reasons described above. If firmness was not achieved prior to the first mowing, severe scalping will occur. A grooming reel from a putting green mower attached to a handle makes a great tool for roughing up bare areas that need to be reseeded or resprigged.

OPENING THE GREENS

Before the grow-in is complete, it will probably be necessary to withstand golfer pressure to open up the green(s) ahead of schedule. Understandably, the pressure arises when the putting surface(s) appear mature to golfers. Remaining patient for an additional four to six weeks, however, is critical to give the new turf time to produce horizontal stems that bind the plants together and allow them to survive concentrated foot traffic around the hole locations.

Growing in a new putting green is a long and arduous process and requires a high level of management skill. Plenty can go wrong without careful monitoring. With knowledgeable planning and quality control management, however, most problems can be avoided. The craftsmanship and the enjoyment of the project will certainly be the better for it. Good luck!

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The grooming reel is an excellent touch-up tool to use for spot seeding or breaking surface algae formation.