

Winter Management and Recovery Tips to Optimize Athletic Field Safety and Performance for Spring Sports

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Introduction

Every spring, turf managers are faced with the dilemma of having to provide safe and aesthetically pleasing athletic fields while turfgrasses are not actively growing. Sports field managers must wait for consistently warm weather before grasses resume active growth. Although Mother Nature dictates most aspects of field recovery potential, several steps can be taken to optimize the chances of providing the best and safest playing conditions possible once the fall playing season is complete.

Develop a Plan

The best way to improve field quality in spring is to develop and implement an appropriate management plan the previous fall. Because most fields will be in the same or worse condition in the spring as they are left in the fall, the time and effort to improve and/or restore playing conditions after the fall season is over will ensure better playing conditions the following spring. Late winter and early spring growing conditions are most often unsatisfactory for standard sports-turf maintenance practices of aerifying, seeding, fertilizing, and topdressing. Scheduling maintenance during fall-use schedules is critical to preserving or improving turf quality the following spring.

Fertility

Heavily trafficked, cool-season turfs should receive up to 1 pound of nitrogen (N) per 1,000 square feet monthly from September through November. Highly water-soluble N sources should be applied at 0.5 pound

of N per 1,000 square feet every two to three weeks during this period. The benefits of an aggressive (but appropriate) fall N fertility program on cool-season turfgrasses are further realized the following spring with enhanced turf density and color.

For bermudagrass fields, apply N at 0.25 pound to 0.5 pound of N per 1,000 square feet every two to three weeks until a killing frost occurs. After a frost, additional N serves no beneficial purpose and should not be applied. In fall, the N fertility strategy on heavily trafficked bermudagrass fields is to keep plants actively growing as long as possible, without compromising winter hardiness or applying N when plants cannot utilize the nutrient.

Another common-sense strategy is to ensure that soil levels of phosphorus and potassium are adequate as determined by a soil test. Potassium deficiencies are often accompanied by increased winterkill potential, but any nutrient that is deficient will limit plant growth and development. Soil testing is important because too much of one nutrient can destroy the necessary balance of other nutrients in the soil. It is recommended that sandy soils (either native or modified) be tested on an annual basis and that heavier, textured, native soils be tested at least once every three years. Apply the recommended nutrients as indicated by the soil test prior to winter dormancy.

For soil pH adjustments, late fall and early winter can be an ideal time to apply lime to either cool- or warm-season turfgrasses. The potential for turf desiccation following the application of high levels of recommended

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lime in late fall and early winter is very low. Desirable chemical reactions to adjust soil pH occur slowly but surely over winter, resulting in improved availability of essential nutrients for the spring growing period.

On cool-season or ryegrass-overseeded bermudagrass fields, the spring N fertility program should begin after the first mowing. The need to mow often indicates that temperatures for sustained growth have arrived and the nutrients in fertilizer will be used. For non-overseeded bermudagrass fields, wait until the turf has almost completely greened before fertilizing. One of the worst things that can happen to a bermudagrass field is to encourage plant growth in early spring by applying supplemental N and then have a late-spring freeze. This scenario results in plants that have expended almost all their energy reserves for spring greening and then must initiate growth for a second time. For both cool- and warm-season fields, N applications are timed to promote balanced growth between shoots and roots. Excessive N levels most often result in a surge of shoot growth at the expense of the root system.

As turfgrasses resume growth, apply no more than 1 pound of water-soluble N per 1,000 square feet every four weeks. Cool-season fields will likely only need 1 pound to 1.5 pounds of N per 1,000 square feet during spring (remember that fall is the preferred time to aggressively fertilize cool-season turfs). Bermudagrass N fertilization should continue on a regular basis for the remainder of the spring and summer months. The application of 1 pound of N per 1,000 square feet every four weeks is a standard guideline. This N level and frequency are essential to maintaining desirable turf density when the fields are heavily trafficked. If the turf receives only limited use over the summer months, the application frequency and rate can be reduced in order to decrease the bermudagrass mowing requirement.

Aeration and Topdressing

It is recommended that heavily trafficked areas receive periodic core aeration during the turf's primary growing season while working around field-use schedules as much as possible. Ideally, cool-season fields should be aerated in late summer to early fall (and perhaps early to mid-spring), while bermudagrass should be aerated from late spring through mid-summer. Even if the timing of aeration falls outside the ideal period for optimum turf recovery, core cultivation is recommended to relieve severe soil compaction immediately following the last scheduled fall event (figure 1). Where budget and time are limited, focus efforts on the heaviest trafficked areas

of the field (perhaps between the hash marks and 40-yard lines of a football field). Although it is considered ideal to remove cores following aeration of turfs growing in heavy clay soils, core removal may be either cost- or labor-prohibitive. The cores can still benefit the field by allowing them to dry and dragging them back into the turf with a drag mat. Mixing soil with thatch may speed the breakdown of organic matter.

Another great management tool is topdressing with sand – even on native soil fields (figure 2). On sand-based fields, apply a similar size and composition sand to the



Figure 1. Upon completion of fall sports, core aerate heavily trafficked athletic fields where soil compaction can restrict turf recuperation. (Photo courtesy of Ben Ewing.)



Figure 2. Topdressing fields with sand helps level the playing surface, fill divots, and insulate turfgrass crowns from extreme winter cold.

existing field. On heavier-textured, native soil fields, the general rule is to apply a topdressing material with soil particles larger than those of the existing soil base. Topdressing application depths of 0.25 inch to 0.38 inch of medium to coarse sand are standard. This application extends the effectiveness of core aeration holes and slowly changes root-zone soil texture to one that provides better drainage and resistance to compaction. However, the improvements from sand topdressing will only be realized by committing to the program for several years. Dragging the topdressing materials and/or aeration cores across the field may also help level the playing surface, fill divots, and enhance cold tolerance of the turfgrass.

Another potentially beneficial topdressing source on heavy-textured, native soil fields (NOT sand-based fields) is compost (figure 3). Compost has a very low nutrient value and is not intended as a substitute for a sound fertility program. However, it stimulates soil microorganism activity and improves soil structure and water-holding capacity. As with sand topdressing (and there is no reason that compost could not be uniformly mixed and applied with sand during fall renovation efforts), depths as little as 0.25 inch to 0.38 inch work well. Compost can be topdressed one to two times per year. The effectiveness of topdressing compost is further increased when applied in conjunction with core aeration, because this increases organic matter levels deeper in the soil profile. The benefits of a fall compost application are often realized the following spring as an enhanced turf greening and growth response similar to that of a fall N fertility response (figure 4).



Figure 3. As little as 0.25-inch depth of a quality compost product applied in the fall can improve the physical and chemical properties of athletic field soil. (Photo courtesy of Ben Ewing.)



Figure 4. The spring greening and growth response of a tall-fescue football field receiving a fall compost application (right) versus an area receiving no compost (left). (Photo courtesy of Ben Ewing.)

Seeding

On cool-season fields, fall-established turfgrasses are generally much stronger than those established in the spring. Plants growing from seed in the fall usually have a more mature root and shoot system prior to the first serious encounters with summer pests and environmental stresses. However, turf establishment and persistence under heavy traffic is, and always will be, a difficult challenge – even during the optimal establishment period.

One strategy being implemented with significant success on heavily trafficked cool-season fields is “seed banking” (Rossi 2004; Minner 2008). Seed is routinely applied throughout the fall playing season. Although the approach works well for rapidly germinating species such as tall fescue and perennial ryegrass, it is less effective when seeding slow-establishing grasses like Kentucky bluegrass. The premise in seed banking is that some seed will germinate and the seedlings will be destroyed by foot traffic, some seedlings will persist, and some seed will remain dormant and germinate at a later date (i.e., the seed in the “bank”). Seed is only applied to heavily trafficked areas and is planted on a one- to two-week interval at rates of 5 to 10 pounds per 1,000 square feet throughout the playing season. These higher-than-normal seeding rates help to offset the loss of turfgrass seedlings from heavy foot traffic.

Many managers broadcast seed before scheduled field use to allow the athletes’ cleats to work the seed into the soil. Remember: this approach is intended to be applied to the highest traffic areas only and is no guarantee of a high-quality playing surface. However, the seed-bank

approach provides the potential to maintain some green cover during the playing season and improves the possibility for turf recovery.

Where Kentucky bluegrass is desired, dormant seeding may still be appropriate to benefit turf coverage the following spring – especially if a turf blanket is used to modify soil moisture and temperatures in winter. Seed Kentucky bluegrass at 1 to 2 pounds of pure live seed per 1,000 square feet to areas of the field that receive the heaviest traffic. As for the seed-bank strategy just detailed, most of the seed won't germinate until the following spring, and some new seedlings will be killed by spring sports traffic. Still, some of the seedlings will likely survive, and with the creeping growth habit of Kentucky bluegrass, there is potential for significant lateral growth from rhizomes during the spring.

Another proven cool-season turfgrass-renovation strategy that is particularly effective with perennial ryegrass is to prepare a pregerminated seed and sand mixture for filling divots or for broadcasting over thinning, heavily trafficked areas (Andresen and Minner 2005). Pregermination helps speed the establishment process and may allow seedlings to become better established before they receive traffic. On higher-maintenance fields, it has become standard practice after games to fill divots with a sand/pregerminated seed mix. The basic approach prior to germination is to soak water-permeable bags of seed in a large trash can for eight to 12 hours, oxygenate the seed by lifting and dropping it back into the water a few times, and exchange the water every one to two days. Seed is then removed from the bag; uniformly spread on a clean, dry surface; and stirred periodically to encourage drying. Within a few days, the dry, pregerminated seed can be mixed with sand and applied to the turf. Remember that the germination process has now begun, and this seed needs to be applied within a few days. Time required for seedlings to emerge from seed is reduced to a matter of hours rather than days or weeks. The new seed should be kept moist during the establishment period just as for a standard seeding event.

University of Arkansas researchers report that dormant seeding of bermudagrass can accelerate spring bermudagrass establishment by six to nine weeks (Shaver et al. 2006). When bermudagrass seed was applied as early as mid-February and mid-March (rather than mid-May), vegetative coverage was nearly complete by mid-June; at this time, the plants establishing from the mid-May seeding had just started to spread. This technique has great potential to be effective on low-traffic bermuda-

grass fields in the spring. Although young seedlings will likely be severely injured before they reach maturity, this strategy may be worth exploring on the most heavily trafficked areas of bermudagrass fields, and it is certainly beneficial if the field receives no or very little traffic during late spring and early summer.

In some instances, sod is superior to seeding for rapidly fixing relatively small, worn areas that range from 100 to 1,000 square feet or more. Sod provides an almost instant solution for worn sidelines, goalmouths, and the area between hashes (figure 5). The key to success for late-season sod installations (either cool-season turf or bermudagrass) is to install the sod before the soil freezes. Sod installations require soil tillage to promote satisfactory turfgrass rooting. Also, using a sod cutter to govern the soil depth and shape of the area to



Figure 5. This soccer goalmouth is ready for spring use after being sodded in the fall.

be repaired can improve field playability by maintaining surface smoothness. Although a turf management calendar may indicate that the date is well past ideal growing conditions for the turfgrass species, if the sod can be cut and delivered (or harvested from an on-site nursery), then sod can be successfully installed as long as the soil is not frozen.

Bermudagrass sod that is overseeded with perennial ryegrass will usually root during winter and deserves consideration if there are concerns regarding the playability of a bermudagrass turf early the following spring. Experience has shown that even though the sod may not root completely in the fall, given minimal winter traffic (and if a turf blanket can be installed after the sod is in place, this technique works even better), overseeded bermudagrass sods provide acceptable footing and stability for spring sports.

Turf Blankets

Many turfgrass managers use breathable covers or grow blankets to extend the fall playing season and to accelerate spring green-up (figure 6). Research has shown that turf blankets can be used to extend color at least four to six weeks in the fall and encourage spring greening by one to two months (Goatley et al. 2005). On newly planted or renovated fields, turf covers can also enhance seedling development and sod rooting in winter. Covers may also help protect turfgrasses from frost or freeze damage. Besides cost, covers should be selected based on their ease in handling, installation, and removal; their light penetration, water and gas permeability; and their durability over time. In windy conditions, something as simple as being able to keep covers in place might be the biggest challenge associated with a cover installation.

The use of turf covers requires that athletic field managers consistently monitor the turf for growth and/or possible pest problems exaggerated by increased temperature and moisture. Depending on environmental conditions and the blanket's characteristics, a fungicide treatment might be necessary on cool-season or ryegrass-overseeded bermudagrass fields that remain covered for several weeks. Remember that turfgrasses and many other living organisms in the soil are responding to the "artificial" climate created by the blanket. It is possible – and often very likely – that warm-season diseases such as *Rhizoctonia* blight can occur in the middle of winter under turf blankets.



Figure 6. The spring greening and color response from covering a Kentucky bluegrass turf with permeable turf blankets for three weeks in the spring.

Pest Management

Except for the use of blankets and the previously mentioned concerns with increased pest pressure resulting from the modification of moisture and temperature conditions underneath the cover, pest activity in the fall and winter should be minimal. If history indicates high pest pressure (e.g., spring dead spot on bermudagrass, excessive *Poa annua* weed pressure), pest-control measures, including pesticide application(s), may be required. Remember that some pesticides negatively affect the establishment and development of turfgrasses; in particular, consider how the fall application of a pre-emergent herbicide might prevent turfgrass seed germination. Pesticides are no substitute for appropriate management strategies. Be sure to carefully read and follow the product label before applying a pesticide.

Traffic Control

Managing athletic fields requires a great deal of coordination among administrators, coaches, and field managers. The first step in controlling traffic on an athletic field is to educate facility users about the advantages of distributing wear rather than concentrating it – especially in late fall and early winter when turfgrass growth is limited. Even when employing the strategies detailed here, the ideal management program for protecting and/or restoring desirable field playing conditions is to control traffic and to maintain acceptable turf density.

Practice Versus Game Fields

While it is desirable to have separate practice and game facilities, spatial and budgetary constraints do not always allow it. When calculating how often a natural grass athletic field is occupied for multisport uses; varsity, junior varsity, and grade school teams (both practices and games); physical education classes; band practice; and other events, it is easy to understand why many facility administrators have opted to install synthetic turf. For those managers fortunate to have practice fields, it is important that concentrated traffic is moved from one area of the field to another. Coaches must make a conscious effort to regularly rotate drills on both game and practice fields in order to maintain desirable turf density for playability and safety. Field safety on practice fields should never be compromised simply because the games are not played there.

One technique to help distribute wear on both natural grass and synthetic turf is to use different colored mark-



Figure 7. Multiple field marking lines result in the possibility of this artificial field being used for several winter/early-spring sports.

ing paints or strips of turf to distinguish the boundaries specific to various sports (figure 7). This strategy can also be applied on fields that support both practice and game events by using different colored marking paints to differentiate between practice and game fields.

Another useful strategy is to periodically rotate the field orientation for practice to prevent the development of turfgrass wear patterns. For example, rather than marking a single traditional “game field” running north to south, try marking two “short field” practice layouts that run from east to west on the same turf area. While this method may require portable goals/goal posts and the cooperation of coaches, it is well worth the effort in order to prevent excessive wear on high-traffic areas of the field. This strategy can be improved by rotating among different practice areas and allowing for “rest periods” for turf recovery.

For facilities with multiple practice fields, consider developing a field-rotation program that incorporates scheduled “rest periods” into the maintenance schedules. This is a luxury situation for most athletic facilities, but where possible, it is a valuable tool for optimizing field playing conditions and safety. The off-season may be an ideal time to meet with coaches and administrators and discuss field usage and the benefits of rotating field-use patterns. Synthetic turf fields offer almost unlimited use potential in inclement weather and can support multiple sports. As a matter of fact, one of the greatest challenges facing many administrators who manage synthetic turfs is in scheduling their use. However, one very important consideration when managing outdoor artificial fields specific to the offseason is

snow removal. Because many of the new infill artificial fields contain crumb rubber, special care must be taken not to remove the crumb rubber when removing snow with a blade. Recently, Virginia Tech’s sports field managers solved this problem with a simple but innovative technique of securing a split piece of PVC pipe to the bottom of the snowplow blade (figure 8). This keeps the blade from pushing the crumb rubber infill out of the turf when pushing snow. Finally, consider that in addition to its use for winter protection and expanding favorable growing conditions, a turf blanket can also serve as a traffic control device. Many turf managers cite the effectiveness of a blanket installation in keeping people off the field during turf recovery to be as important as the expected temperature modifications due to blanket application (figure 9).



Figure 8. Attaching a split piece of 2-inch-diameter PVC pipe to the blade of this snowplow prevents the rubber infill material from being inadvertently removed from the artificial field when pushing snow. (Photo courtesy of Jason Bowers.)



Figure 9. This blanket not only provides winter temperature protection to the bermudagrass playing surface, it also serves as an effective deterrent to winter traffic.

Develop a Safety Checklist and Implement Field Usage and Playing Condition Indices

The offseason is also a perfect time to evaluate the safety and functionality of fields and facilities. A safety checklist is a great tool for field managers to evaluate many aspects of each field, ranging from the turf and infield skinned areas to the bleachers, fences, and lighting. The Sports Turf Managers Association (STMA) has developed a safety checklist for athletic facility managers that can be found on their website (www.stma.org); use this as the framework to design your own. The key is to develop a thorough list of items, evaluate them on a frequent basis, and solve problems as quickly as they arise. Keep records of all repairs for future documentation and review.

A newer trend in sports field management is the use of an athletic field usage index. In particular, the STMA's Playing Condition Index (PCI) is available at the aforementioned website. Periodic use of the PCI by sports turf managers provides a representative rating of field playing conditions based on a numeric scale. This index combines usage data with rankings of turf density, etc., into a standardized scale. The values developed indicate if a field is being overused for the resources that are available for its maintenance. This tool provides sports turf managers with factual information to use with supervisors and field users when pursuing a larger budget for field maintenance or better field-use scheduling in order to optimize field safety and playability.

Sports-Specific Tips

Nearly all of the previous tips and strategies can be applied universally to all fields, whether they are used for football, softball, baseball, or lacrosse. However, due to the nature of the games, baseball and softball fields offer additional areas that might require attention during the offseason. Just like its turfgrass counterpart, the infield "skin" or dirt of a ball field needs regular maintenance. Considering that six of the nine players (seven of 10 if you count the batter) on the baseball or softball field spend most of their time on the skinned area, it's not surprising that problems can arise quickly. The offseason months are a perfect time to evaluate problems in the skinned area and correct them. Fill in low spots by bringing in additional material or dragging the material from high spots where it has accumulated. Focus on areas receiving the most use, such as the base cutouts and player position zones. Off times allow for



Figure 10. A stiff-bristled broom can be used to sweep infield mix back into the skinned area in order to reduce the formation of a lip on baseball or softball fields. (Photo courtesy of Jason Bowers.)

reconditioning or rebuilding mounds and batter's box areas. Simply fix them as needed and then cover them with a tarp for the winter.

"Lips" formed at the junction of skin and grass areas can be leveled during the offseason. For relatively small lips, the gathered material might simply be pushed back into the skin with a high-pressure water hose or stiff-bristled broom (figure 10). More extensive lips might require cutting sod, removing material, and replacing the sod at the desired grade. Areas with heavy precipitation or high winds may call for installation of a silt fence or some other form of erosion control to prevent infield material from being moved to other areas of the field. Due to their rapid, sod-forming plant growth habit, fields grassed in bermudagrass often require much more edging than cool-season fields. Generally, the turf won't grow much during the winter, so the field will have sharp, crisp edges throughout the offseason. All of these steps are huge time savers when spring practice resumes.

A field may require rolling in order to provide a smooth and safe playing surface. This publication has detailed the multiple benefits of core aeration to relieve soil compaction, and this maintenance strategy must remain a major part of an annual management program. How-

ever, uneven playing surfaces – caused by winter frost heave from regular cycles of wetting, freezing, and drying of the soil – can compromise field playability and safety. Many fields constructed from heavy textured (clayey) native soils have a significant amount of frost heave each winter and may develop elevated pockets of soil, resulting in poor playability and potential safety hazards for footing or ball bounce for spring sports. A 2,000- to 3,000-pound roller is often one of the best tools available to smooth the soil surface and provide a safe and true playing surface (figure 11). Avoid using a roller on saturated soils, as it can do more harm than good; try to roll when the soil is slightly moist. Any surface compaction from rolling can be addressed later in the year by the previously detailed hollow-tine core aeration strategies.



Figure 11. Periodic rolling of an athletic field can significantly improve surface smoothness, playability, and safety characteristics on soils that have experienced frost heave from winter temperatures and moisture. (Photo courtesy of Jason Bowers.)

Summary

None of these strategies is foolproof, but with careful planning, attention to detail, and a little extra effort at the end of the fall season, the goal of providing high quality and safe athletic fields for spring sports can be realized. Don't just walk away from athletic fields at the end of the growing season and expect the turf to recover and be ready for the next sport. Take advantage of the vast array of tools and techniques available to restore a game field outside the primary periods of turfgrass growth and field use. The most important step is to develop a plan and follow through with its implementation using all available resources.

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