Table 1. **Perennial ryegrass control in overseeded bermudagrass, Knoxville, TN (2003 and 2005).**

Treatment	product/A	3 WAIT [a]	5 WAIT	8 WAIT
			% Control	
Untreated	-	0e	0g	0d
diclofop-methyl	44 fl. oz.	44 d	45 f	29 c
diclofop-methyl fb diclofop-methyl	44 fl. oz. fb 44 fl.oz.	60 c	72 cde	69b
foramsulfuron	10 fl. oz.	82 b	66 e	35 c
foramsulfuron	25 fl. oz.	91 ab	94 ab	84 ab
foramsulfuron fb foramsulfuron	10 fl. oz. fb 10 fl.oz.	90 ab	81 bcd	99 a
metsulfuron	0.5 oz.	90 ab	81 bcd	86 ab
metsulfuron	1 oz.	96 a	90 ab	93 a
metsulfuron fb metsulfuron	0.5 oz. fb 0.5 oz.	94 a	86 abc	99 a
rimsulfuron	1 oz.	93 a	90 ab	72 b
rimsulfuron	2 oz.	90 ab	91 ab	93 a
rimsulfuron fb rimsulfuron	0.5 oz. fb 0.5 oz.	90 ab	67 de	99 a
trifloxysulfuron	0.5 oz.	93 a	96 a	94 a
trifloxysulfuron	1 oz.	97 a	98 a	97 a
trifloxysulfuron fb trifloxysulfuron	0.5 oz. fb 0.5 oz.	94 a	96 a	99 a
LSD (0.05)		**10**	**15**	**19**

[a]Abbreviations: WAIT, weeks after initial treatment; fb, followed by.

compared to diclofop-methyl and natural (non-chemical) transition.

Testing herbicides

Treatments were applied at the University of Tennessee football practice field on April 14, 2003 and April 12, 2004 with sequential treatments applied on May 19, 2003 and May 10, 2004. The study was also conducted at the University of Tennessee golf practice facility on March 24, 2005 with sequential treatments applied on April 21, 2005. Tifway bermudagrass was seeded the previous September with a blend of 30% SR4200, 30% SR4220, and 40% Hawkeye perennial ryegrasses at 15 lb/1000 sq. ft., fertilized with 44 lb N/1000 sq. ft. in September and April, and 22 lb N/1000 sq. ft. in October and November, at all locations. Plots were mowed weekly at 0.5 in at all locations for the duration of the study.

Treatments included foramsulfuron at 10, 25, and 10 followed by (fb) 10 fl oz/A, trifloxysulfuron at 0.5, 1, and 0.5 fb 0.5 oz/A, metsulfuron 0.5, 1, and 0.5 fb 0.5 oz/A, rimsulfuron at 1, 2, and 1 fb 1 oz/A, and diclofop-methyl at 43.5 and 43.5 fb 43.5 fl oz/A. All treatments were tank-mixed with a 90:10 nonionic surfactant at 0.25% v/v. All herbicide treatments were applied with a CO_2 pressurized backpack sprayer calibrated to deliver 23 gal/A at 30 psi. Treatments were applied to 5 x 10-foot plots arranged in a randomized complete block design with four replications. Perennial ryegrass control and bermudagrass injury were visually evaluated 3, 5, and 8 weeks after the initial treatment (WAIT) using a scale of 0-100%, 0 indicating no control or injury and 100 equal to complete control or perennial ryegrass death. Turfgrass quality was based on color, density, texture, and uniformity of both bermudagrass and perennial ryegrass. Turfgrass quality was visually assessed 3, 5, and 8 WAIT using a scale of 0-9, 0 indicated turfgrass death and 9 equaling ideal turf.

Ryegrass response

In the spring of 2004, the average daily temperature (maximum plus minimum temperature divided by two) for May 20 to 25 was 89 F, which was 14 F above the averages for 2003 and 2005. The experiment was also placed on an experiment 3% southwestern slope and it received no irrigation or precipitation from May 14 to May 26, 2004. These factors contributed to a smooth natural transition and ryegrass death resulted regardless of herbicide treatment 5 WAIT. Therefore, the experiment in 2004 was terminated after 5 WAIT and all conclusions for ryegrass removal with herbicides were based on 2003 and 2005 data. This also indicates that ideal weather conditions may decrease the need for chemical transitions.

All herbicides provided > 90% ryegrass control except diclofop-methyl and foramsulfuron at 10 fl oz/A by three weeks after initial application (WAIT) (Table 1). By 5 WAIT >90% perennial ryegrass control was observed with foramsulfuron at 10 fl oz, metsulfuron at 1 oz, rimsulfuron at 1 and 2 oz, and all trifloxysulfuron treatments. However, by 8 WAIT excellent control (99%) was achieved for all treatments with a sequential application except diclofop-methyl. Also, metsulfuron at 1 oz, rimsulfuron at 2 oz, and trifloxysulfuron at 0.5 and 1 oz provided provide >93% 8 WAIT with a single application. These results are similar to others that demonstrated that foramsulfuron, metsulfuron, rimsulfuron, and trifloxysulfuron exhibited excellent control of perennial ryegrass, including Askew and Beam 2003, Askew et al. 2003, Walker et al. 1999, and Yelverton 2000.

Bermudagrass injury

There was no bermudagrass injury observed except for sequential applications of rimsulfuron at 0.5 oz fb 0.5 oz 3 WAIT in 2003.

Table 2. **Overall turfgrass quality following herbicide applications to remove overseeded perennial ryegrass from bermudagrass, Knoxville, TN (2003 and 2005).**

Treatment	product/A	3 WAIT [a]	5 WAIT	8 WAIT
		% Control		
Untreated	-	8.6 a	8 a	8 a
diclofop-methyl	44 fl. oz.	6.8 b	7.1 ab	6.9 c
diclofop-methy fb diclofop-methyl	44 fl. oz. fb 44 fl. oz.	6 bc	5.3 d	7.1 bc
foramsulfuron	10 fl. oz.	6 bc	6.3 bc	7 bc
foramsulfuron	25 fl. oz.	5.5 cde	5.8 cd	7.4 abc
foramsulfuron fb foramsulfuron	10 fb 10 fl. oz.	5.5 cde	5.8 cd	7.9 a
metsulfuron	0.5 oz.	6 bc	6.5 bc	7.2 b
metsulfuron	1 oz.	6 bc	6.5 bc	7.9 a
metsulfuron fb metsulfuron	0.5 fb 0.5 oz.	5.8 cd	6.5 bc	7.9 a
rimsulfuron	1 oz.	5.5 cde	6.3 bc	7.6 ab
rimsulfuron	2 oz.	6 bc	6.5 bc	7.6 ab
rimsulfuron fb rimsulfuron	0.5 fb 0.5 oz.	5 de	6.3 bc	7.5 abc
trifloxysulfuron	0.5 oz.	5.8 cd	5.9 cd	7.5 abc
trifloxysulfuron	1 oz.	5.5 cde	6.5 bc	7.4 abc
trifloxysulfuron fb trifloxysulfuron	0.5 fb 0.5 oz.	5.8 cd	5.8 cd	8.0 a
LSD (0.05)		**0.8**	**1.0**	**0.6**

[a]Abbreviations: WAIT, weeks after initial treatment; fb, followed by. Turfgrass quality (color, density, and playability) was evaluated on a scale of 1-9, 1 indicating turfgrass death and 9 indicating the highest quality turfgrass.

However, there was no injury in 2005 for any treatment on any observation date. The injury observed in 2003 (8%) was minimal and was mostly bermudagrass growth reduction (stunting), however bermudagrass injury was not evident by 5 WAIT.

The untreated control had the highest overall turfgrass quality observations for all observations and ranged from 8.6 to 8.0 (Table 2). This was due to the thick, dark green ryegrass cover that resulted in high quality ratings.

The lowest overall turfgrass quality observation (5.0) was from applications of rimsulfuron at 0.5 fb 0.5 fl oz at 3 WAIT. Quality for the other herbicide treatments 3 WAIT ranged from 5.5 to 6 due to the discoloration of the treated ryegrass. By 5 WAIT, the lowest overall quality observation resulted from applications of diclofop-methyl at 43.5 fb 43.5 fl oz. All other herbicides ranged from 5.8 to 7.1 at 5 WAIT. By 8WAIT, the highest quality observation (8.0) was trifloxysulfuron at 0.5 fb 0.5 oz and was similar to the untreated control. All other herbicide quality observations ranged from 6.9 to 7.9 with no statistical differences between many of the herbicides and the untreated check. Quality evaluations indicated that bermudagrass had completely grown in these plots and was again a premium turfgrass surface.

Overall, all of the ALS-inhibiting herbicides worked well for perennial ryegrass control in overseeded bermudagrass. In warmer, dryer years natural transition may aid herbicides or herbicides may not even be necessary depending on the individual situation. However, this work indicates that the best treatments for ryegrass removal were sequential applications of the ALS-inhibiting herbicides applied 4 weeks apart. If a single application is required for perennial ryegrass control, metsulfuron or trifloxysulfuron should be utilized for maximum efficacy. These herbicides are extremely safe on warm season turfgrasses and turfgrass managers should not worry about delayed

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bermudagrass green-up or bermudagrass injury when using these products. Diclofop is only labeled for use on golf courses and should not be used in sports fields. Most of the ALS-inhibiting products control some broadleaf weeds, so consult individual product labels for weed spectrums. Also, ALS-inhibiting herbicides will take from 1 to 4 weeks to control perennial ryegrass; be patient.

Using herbicides to aid spring transition is valuable tool for sports field managers. However, there will be a short period of time when the perennial ryegrass is dying and the bermudagrass is filling in, that overall turfgrass quality may be decreases to unacceptable level. With that said, a fertilizer application will decrease the time that it takes for the bermudagrass to fill in (assuming there is no winterkill). The use of chemical transition aids can increase the overall bermudagrass quality during the summer, which equals a better playing surface for the following fall when it is time to overseed with perennial ryegrass again. ■

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Travis C. Teuton is assistant professor, Division of Plant Sciences, University of Missouri; Christopher L. Main, John C. Sorochan, and Thomas C. Mueller are, respectively, assistant professor, associate professor, and professor, Plant Sciences Department, University of Tennessee, Knoxville. Email contact: TeutonT@missouri.edu.

John Mascaro's Photo Quiz

Can you identify this sports turf problem?

Problem: White objects on turf

Turfgrass Area: Soccer field

Location: Nashua, NH

Grass Variety: Kentucky Bluegrass/ Ryegrass Blend

Answer to John Mascaro's Photo Quiz on Page 51

John Mascaro is President of Turf-Tec International

Synthetic Turf Maintenance

The American Sports Builders Association (ASBA) is a professional resource for designers, builders, and suppliers for sports facilities, as well as for owners and operators of these facilities. ASBA has more than 350 member companies who are committed to quality construction, and the organization is recognized as a central source for technical information. Please see www.sportsbuilders.org. for publications, including the "Buyer's Guide for Synthetic Turf Field Construction," (free of charge), membership information, and a searchable member database.

Here we reprint portions of Chapter V of ASBA's new publication, *Synthetic Turf Sports Fields: A Construction and Maintenance Manual.*

A well-constructed and well-maintained synthetic turf field will offer years of play. However, synthetic turf is not, as some have claimed, maintenance free. To maximize the useful life of the field, the owner should develop and implement a regular schedule of maintenance. The goal of the maintenance program is to insure a consistent and attractive playing surface, to promote player safety and to protect the turf system. Regular maintenance is more cost effective than allowing the field to deteriorate to the point where it requires major work. A maintenance plan will include routine cleaning and grooming, as well as periodic inspection, repair of minor irregularities, testing, and topdressing.

These recommendations describe typical regimens. However, most manufacturers will provide a detailed operations and maintenance manual. In fact, some maintenance services may be included or may be provided by the manufacturer or installer as an option. Failure to follow procedures recommended by the manufacturer may void your warranty.

Cleaning

The most important step in maintaining a synthetic turf field is to keep it clean. Begin by practicing preventive maintenance. Prohibit food and beverages on the field. Even water stations should be placed off the turf to minimize contamination by spit. Prohibit smoking on or near the field. Not only are burns difficult to repair, but cigarette ash and butts must be removed.

If possible, ban chewing gum, chewing tobacco and sunflower seeds on or near the field. Removing chewing gum, though not difficult, is time consuming. Maintenance personnel should first chill the gum with ice or aerosol spray to make it brittle and, then, gently break it up to remove it.

Remove debris immediately. This will include trash – food wrappers, pompom shreds, tape – dust and dirt, and environmental debris such as leaves, pine cones, needles, pollen, bird droppings. If left in place, organic material will quickly decay and filter into the infill, where it will impede drainage and serve as a medium for the growth of bacteria, algae, and fungi.

Cleaning will require at least some hand labor. A soft broom or rubber-tined rake may be used for removing surface debris. A mechanical leaf blower or sweeper or a vacuum, specially designed for this purpose, if approved by the manufacturer, is especially efficient. A soft-

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bristled broom pulled behind a golf cart or Gator also may be used. The goal is to remove the debris without picking up any of the rubber infill. This may take care. Both manual and mechanical cleaning equipment will tend to remove some infill during the first few months. As the infill settles and the fibers fibrillate, this will cease to be a problem. In the first year, litter removal also may include some loose fibers.

The amount of maintenance required by a particular synthetic turf facility will vary depending upon the geographic location, the amount and type of use, player conduct and alternative use, if any.

With light use, monthly full cleaning, coupled with occasional spot pickup, may be sufficient. With heavy use, cleaning may be required bi-weekly or more. Mechanical sweeping should include 5-6 passes in opposite directions, sometimes longwise, sometimes across the field, and may take 2-3 hours.

The owner should develop an appropriate maintenance plan, ensure that maintenance is performed correctly to avoid damaging the surface and keep records of maintenance procedures and problems noted. The need for excessive maintenance may be an indicator of more serious problems.

Spot clean spills as soon as they occur. Because the rubber infill holds heat, most liquids dry quickly. Removing them while still wet is recommended. For that reason, careful post-game inspection and cleaning is optimum.

Most spills are easily removed with hot (not boiling) water and a mild soap, such as liquid dishwashing detergent. Oily marks may require a small amount of mineral spirits, if approved by the manufacturer, but in general solvent cleaners should not be used. Once the spill is loosened, rinse the area thoroughly as any residue remaining may serve as a growth medium for bacteria, algae and/or mold.

Blood, vomit, urine, sweat and spit

Grass fields contain billions of naturally occurring beneficial organisms which break down organic contaminants including blood, vomit, urine, sweat and spit, as well as insect, bird and animal droppings. Synthetic turf fields contain few if any such beneficial bacteria. For that reason, organic contaminants must be cleaned and the fiber and infill must be disinfected.

First, pick up any solid material that can be removed. To remove any remaining material and disinfect the field, apply an organic or enzymatic cleaning agent or one of the proprietary products now being developed specifically for this purpose. Mix up a fresh batch of cleaner according to the manufacturers' instructions for each cleaning. Apply the solution with a low-pressure sprayer to thoroughly wet the surface. Allow the surface to remain wet for at least 10 minutes and rinse thoroughly. The goal is to wash the contaminant and the cleaning solution all the way through the surface.

Just as wrestling programs regularly disinfect their mats, some synthetic turf owners are beginning to disinfect their fields on a regular schedule, as often as twice a month. Some programs also are disinfecting the sideline areas, where contamination concentrates, more often, even after each use.

Metal objects in the field are hazardous. Part of the grooming routine should include regularly dragging a magnet over the field to remove such objects.

Buy it

Synthetic Turf Sports Fields: A Construction and Maintenance Manual is available for $44.95 plus shipping from the American Sports Builders Association. Go to www.sportsbuilders.org and click on "ASBA Publications" on the left side.

Health and hygiene

Those responsible for athletic facilities and programs should be sensitive to the general societal concern regarding transmission of infections, some of which are resistant to antibiotics and very difficult to treat. Such infections are being seen more frequently in a wide variety of settings, including hospitals, nursing homes and athletic facilities, and in other circumstances where the source of exposure cannot be identified. Infections may be spread in athletic programs by skin to skin contact; by sharing of uniforms, towels, pads and equipment; or by contact with a contaminated surface.

While modern synthetic turf products are only half as abrasive as older versions, it appears that players still suffer more abrasions on synthetic turf than when playing on well-maintained natural grass. A greater number of abrasions provide more avenues for entry of infectious organisms. Additionally, as previously mentioned, these fields must be disinfected because they lack the beneficial bacteria found in natural grass fields; those bacteria break down organic contaminants, which might provide a growth medium for infectious agents.

Experts say that good hygiene throughout the athletic program is the key to preventing the spread of infections. In addition to field hygiene, experts recommend that players and coaches in all athletic programs thoroughly wash and disinfect any open wounds or abrasions, no matter how minor, as they occur and keep all wounds covered until they heal. Proper cleaning and maintenance of locker rooms, whirlpools, and other facilities used by the athletes is necessary. Additionally, players should shower thoroughly after every practice and game, and should avoid sharing uniforms, towels, or personal equipment, including soap and razors. Any athlete with a skin wound that leads to fever, muscle pain, fatigue, or develops a blister, boil, redness or swelling should seek prompt medical attention.

Moss, mold, and algae

Clean synthetic turf fibers and infill will not support the growth of moss or algae. However, over time, if organic material (including food spills) filter into the infill and, if conditions are right (dampness, shade) moss, mold, or algae may appear. Generally, such growth will be limited to less used areas of the field.

Many manufacturers can supply appropriate products to remove such growth. Any product that is not oil-based may be used. Moss, mold and algae should be treated immediately. If allowed to become established, removing such growth can be very difficult. Even if all the living organisms are killed and removed, spores will remain. Therefore, successful treatment may require several applications. In the worst case, eradication may necessitate removal of the infill, sterilization and replacement.

While a clean synthetic turf field will not support the growth of grass or weeds, seeds which fall or blow onto the field may germinate, especially if the field is regularly irrigated. Small numbers of weeds can be removed by hand without damaging the surface. Care should be taken to remove the full root. If weeds are deeply rooted, such that they cannot be pulled by hand, commercially available weed killer may be used, as long as it is not oil-based.

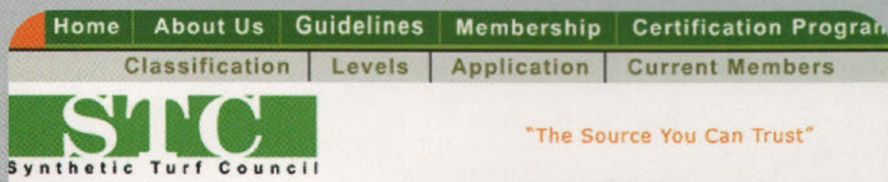
Problems may develop where synthetic turf fields abut natural grass areas. Grass and/or weeds may invade the edge of the synthetic turf, especially when the grass is reseeded. Fertilizer, pesticide, and other chemical overspray may contaminate the turf. In fact, the synthetic turf may look so much like grass that inexperienced grounds personnel may even attempt to mow or trim it. A divider strip of pea stone, mulch or other material between synthetic turf and natural grass will help to delineate the boundary.

Grooming

While an ungroomed surface may be usable, regular grooming can prolong the useful life of the surface and keep it looking fresh and inviting. The recommended frequency of grooming depends on the schedule specified by the manufacturer and often on the amount of use the field receives and its location. It may be advisable to groom more frequently if the field is heavily used, shaded or subject to pollution.

Regular grooming helps to maintain the performance characteristics of a synthetic turf surface as well as the appearance of the field. On the other hand, overly frequent or overly aggressive grooming may cause excessive wear. For that reason, each owner should carefully track grooming practice, observe the results and establish an appropriate grooming regimen. Failure to follow your manufacturer's guidelines regarding grooming may void your warranty.

Grooming serves a number of purposes, including preventing and/or breaking up compaction, redistributing and re-leveling infill, and,



Synthetic Turf Council guidelines coming soon

The Synthetic Turf Council (STC) was expecting final approval from its membership to publish its *Suggested Guidelines for the Maintenance of Infilled Synthetic Turf Surfaces* at its Member Meeting late last month. When approved, the Suggested Maintenance Guidelines will be published and posted to the their website (www.syntheticturfcouncil.org) says STC president Rick Doyle.

importantly, restoring fibers to vertical. Fibers in synthetic turf have a tendency to lay over in use, especially with repetitive traffic. Fiber layover may lead to poor footing, decreased drainage, compaction and poor appearance. Once the fibers are bent all the way over, it may be difficult to get them to stand up again.

One form of grooming is dragging, in which a piece of synthetic turf or soft brush is dragged behind a small tractor, golf cart or utility vehicle. Dragging, if recommended by the manufacturer, can be used to redistribute infill, reduce static electricity and give the surface an attractive striped effect like new mown grass.

Brushes that have a rotary action, mounted in front of a power unit, are effective for standing up the pile. The bristles should be hard enough to lift the fibers, but soft enough not to cause excess fibrillation. If fibers in the turf are completely laid over, power brooming may be necessary; however, all brooming causes some fibrillation. Wetting down the