TURFGRASS TRENDS

WEED CONTROL IN SEEDLINGS

Season, Zone Dictate Weed Control in Seeded Tall Fescue and Bluegrass

By Scott McElroy, John Sorochan and Greg Breeden

Weed control during establishment of tall fescue and Kentucky bluegrass from seed is difficult for many reasons. First, many herbicides normally considered safe on fully established stands of both grasses can be detrimental to newly developing seedlings. Herbicides containing broadleaf herbicides, such as 2,4-D and dicamba, can injure developing seedlings so severely that if applied to seedlings under the wrong conditions, a delayed turfgrass development can occur.

Second, failure to control weeds from the onset can out-compete developing seedlings and devastate stand development. Weed competition is especially destructive in seeded conditions in spring. The high-density tillering and rapid spread of crabgrass (*Digitaria* spp.) can out compete and eventually kill tall fescue and Kentucky bluegrass seedlings. Weed competition during fall seeded establishment is less competitive. However, weeds like common chickweed, mouse-ear chickweed and speedwells (*Veronica* spp.) also can slow the developing turfgrass.

Through common agronomic practices and the timely use of herbicides, weeds can be successfully managed during establishment of tall fescue and Kentucky bluegrass from seed.

Cultural practices and competition

The competitive advantage in a developing turfgrass stand can be shifted easily from the developing seedlings to the developing weeds. First, get the seeding rate right.

Tall fescue should be seeded at about 6 pounds to 9 pounds per 1,000 square feet. Kentucky bluegrass should be seeded at 2 to 3 pounds per 1,000 square feet. Being frugal on seed can leave a thin, open turfgrass canopy that is easier for weeds to encroach. Overapplying seed can cause the turf to be thin and immature making the seedlings more susceptible to disease. Diseased seedlings can die quickly leaving empty areas for weed invasion.

Second, improper fertilization timing and rates can shift the competitive advantage from the turf to the weeds. Fertilization at seeding should focus mainly on phosphorus (P), potassium (K) and the micronutrients — in other words, fertilize at seeding according to soil test. Nitrogen fertility is not needed until two to four weeks after emergence because nitrogen can be lost to the environment in bare soil conditions. Nitrogen fertility then can be supplemented on a month-by-month basis depending on your climate zone and the time of year you are seeding. Northern climates can fertilize more through the summer months while those in the mid-South

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Tupersan (siduron) is used as a pre-emergent herbicide for control of germinating warm-season grasses, such as crabgrass, goosegrass and foxtails.

Drive is a postemergent with limited pre-emergent activity. It controls crabgrasses and some broadleaf weeds, but has no goosegrass control.

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should avoid nitrogen fertility in the summer due to brown patch severity.

Last, mowing practices play a crucial role in shifting the competitive advantage from turf to weeds. Tall fescue should be mowed at approximately 3 inches, while Kentucky bluegrass should be mowed at a height no lower than 1.5 inches.

Decreasing below these heights can cause the turf stand to self thin and can be harmful to a developing turfgrass stand. Similarly, mowing excessively high can cause the lower leaves to senesce (turn brown), decreasing the density of the turf stand. Infrequent mowing can lead to scalping of the turf. Remember sticking to the "1/3 Rule" (remove no more than one-third of the leaf tissue at each mowing) can save the turf a lot of stress.

Chemical weed management

Despite your best efforts of managing weeds using the best cultural practices, you are still going to have to deal with a certain level of weed infestation more often than not. The weed spectrum will vary according to the time of year you choose to establish tall fescue or Kentucky bluegrass from seed.

In the mid-South and for many other northern climates, seeding in late August to early September is best. With a late-summer to early-fall seeding, your primary weeds will be primarily winter annuals with some late-germinating crabgrass. Herbicide options are available for control of these weeds during a fall seeding.

But spring seeding is more challenging. Crabgrass species and goosegrass can be highly competitive under these conditions if not controlled. While herbicide options are available, timing of the herbicides are critical. First, let's review your best herbicide options.

Basically, for seeded establishment of tall fescue and Kentucky bluegrass, you have three main herbicides — Tupersan, QuickSilver and Drive (Table 1, p. 44). Tupersan (siduron) is used as a preemergence herbicide for control of germinating warm-season grasses, i.e., crabgrasses, goosegrass, foxtails and others. It has limited to no postemergence activity, which limits its usefulness. For Tupersan, remember: It's a pre-emergence that controls only warm-season grass seedlings.

Quicksilver (carfentrazone) is the exact opposite of Tupersan. It is used as a postemergence herbicide for control of broadleaf weeds only. Quicksilver has no pre-emergence activity and is safe on almost all grasses. Quicksilver is a great fit for the seeded establishment arena because it is very effective on newly germinated broadleaf weeds. Larger broadleaf weeds require multiple applications of Quicksilver for effective control. For Quicksilver, remember: It's a postemergent that controls only small broadleaf weeds.

Drive (quinclorac) is somewhat between the other two herbicides. Drive has both postemergence and some pre-emergence activity. It is active on some warm-season grasses and some broadleaf weeds, but not all.

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TABLE 1

Table 1. Key information related to the use of Drive, Tupersan and QuickSilver during seeded establishment of tall fescue and Kentucky bluegrass.

Herbicide	Active ingredient	Use rate	Use timing during seeded establishment		Weeds controlled
			Tall fescue	Kentucky bluegrass	
Drive 75 DF[1]	quinclorac	1 lb/a (0.75 lb ai/a)	at seeding, 7, 14, 21, 28 days after emergence	7 day prior to seeding, 28 days after emergence	postemergence (some pre-emergence) control of crabgrasses, foxtails, some broadleaf weeds
Tupersan 50 WP	siduron	6 to 12 lb/a (3 to 6 lb ai/a)	at seeding	at seeding	pre-emergence warm-season grass control
QuickSilver	carfentrazone	1 to 2.1 fl oz/a (0.015 to 0.031 lb ai/a)	7 days after emergence	7 days after emergence	postemergence control of small broadleaf weeds

[1] *According to Drive label, no adjuvant should be added to Drive postemergence applications until 28 days after emergence.*

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Drive is very effective in controlling crabgrass species, but where it falls short is in goosegrass control. Finally for Drive, remember: It's a postemergent and with limited pre-emergence activity, and it controls crabgrasses and some broadleaf weeds but has no goosegrass control.

Recent research

Research at the University of Tennessee has evaluated the use of these three herbicides for their injury to tall fescue and control of various weeds species. For spring seeding, Tupersan or Drive must be used during the establishment phase; otherwise, the amount of desirable turfgrass cover will be unacceptable by the end of the summer.

The deciding factor for which herbicide to use will be based on the amount of goosegrass present. If you suspect that goosegrass will be a problem, then Tupersan is the herbicide to use. If not, postemergence applications of Drive can be utilized according to label recommendations.

Drive and Tupersan are both useful for fall seedings as well, especially if you are opting for an August seeding time to get an early jump on fall. Crabgrasses and other warm-season grasses can be problematic in this type of fall seeding scenario, albeit only for a short time into the fall.

Quicksilver can be integrated into both spring and fall seeding scenarios. In our experience, many different broadleaf weeds such as pigweeds, morning glories, ragweed and your normal compliment of turf broadleaf weeds can germinate in a newly seeded turfgrass stand. It is unknown how these weeds affect the development of the turfgrass stand if left unchecked. But if control is desired, Quicksilver can be highly effective with no injury to tall fescue or Kentucky bluegrass seedlings.

At the University of Tennessee, effective treatments for general weed control during spring- and fall-seeded establishment have been Siduron (12 pounds per acre) applied as a pre-emergence followed by QuickSilver (2.1 fluid ounces per acre) 14 to 28 days after emergence, or simply a tank-mixture of Drive (one pound per acre) plus Quicksilver (2.1 fluid ounces per acre) applied 28 days after emergence.

Both scenarios provide effective general weed control during seeded establishment.

Scott McElroy and John Sorochan are assistant professors of turfgrass management, and Greg Breeden is a research and extension associate in turfgrass management. All are at the University of Tennessee.

Part 2 of 2

Visit www.turfgrasstrends.com for Part 1 of this study, or search our archives for other drainage articles.

Computer Simulation Tracks Water Flow in Greens

Root zones of USGA, California greens connect directly to subsurface system for better drainage

By Ed McCoy and Kevin McCoy

In the December issue, we reviewed the need for a more accurate method for evaluating water flow in the three common types of greens: USGA (United States Golf Association), California and push-up. This month, we look at the results from the simulations.

Putting green soil profiles are classified into three general categories: USGA, California and push-up style greens. The USGA and California profiles are purposely constructed with each documented by written guidelines (USGA Green Section Staff, 1993; Davis et al., 1990). Push-up green soil profiles, on the other hand, have evolved from decades of sand topdressing applied to native soil. Whereas each has a sandy surface layer, or root zone, the thickness of this layer and the type of material underlying the sandy root-zone varies for each particular category.

The USGA green

The upper surface of the perched water zone occurs at the interface between green and blue or at water contents of about 27 percent by volume. This perched water, however, accumulates only to a limited extent in a USGA green so that the continued rainfall (from 3.5 to five hours) simply displaces an equivalent volume of water into the gravel layer. This implies that if the 1-inch per-hectare rain rate were to continue indefinitely, there would be no further accumulation of water within the soil profile, and an equivalent volume of water would just as rapidly be drained from the soil.

Water flow through the gravel starting at 3.5 hours is evident by the large water content values within the gravel layer just above the interface with the subgrade. This distribution of water within the gravel layer reaches its maximum extent at four hours with the characteristic pattern of lower water contents adjacent to the drainage trenches and (within the flat reaches) higher water contents in between. This pattern remains stationary during the final hour of rain indicating a steady rate of water flow from the gravel into the drain. Finally, during the rain period, the subgrade transitions from very wet to nearly saturated.

Although there is a slight decline in root zone water contents the hour following the rain, the results clearly show the establishment of a uniformly thick perched water layer from hours six to 12. This perched water layer appears to be only about 3 inches thick, characteristic of the lesser water retaining root zone employed in this simulation. If the simulation were to have used a root zone mix with smaller air-filled porosity values and greater capillary porosity values, then this would have resulted in a thicker perched water layer.

The uniformity of water perching across the green is, however, rather short-lived as down slope, lateral water flow in the more steeply sloped sections removes the perched water from the crest of these slopes. This becomes apparent at 24 hours by lower water contents above the root zone/gravel interface at the crest of the terrace face and (to a lesser degree) at the high point of the green and the crest of the false front. Down slope lateral water flow in sloped, USGA greens has been experimentally observed by both Prettyman and McCoy (2003a) and Frank et al. (2005).

After 24 hours, lateral flow has substantially slowed so that for the remaining hours of the simulation (from 24 to 162 hours) the root zone simply becomes progressively drier due to water uptake by the turf. It is interesting to observe during this period that the organic-enriched layer maintains greater water contents than the adjacent portion of the lower root zone. This is because the soil of the organic-enriched layer has greater water-holding properties than the lower root-zone layer.

Also, the progression of drying appears to be independent of root-zone depth. This is interesting in that water uptake is shown to occur in the 6- to 12-inch depth increment even though roots were not present below 6 inches. Seemingly the water retained at these deeper depths was adequately "wicked" nearer the surface and taken up by the roots. Consequently, perched water occurring from 9- to 12-inches deep can apparently serves as a reservoir for subsequent turf uptake in these systems.

Viewing the progression of drying across the green, however, shows more intense root-zone drying in regions of the green where the perched water was removed at 24 hours. Thus, the crest of the terrace slope, the high point of the green, and the crest of the false front all show more extreme drying throughout the root zone than other areas of the green. This is consistent with experimental observation of

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putting green slope effects on root-zone water content by Prettyman and McCoy (2003b) and Frank et al. (2005).

The California green

Early in the simulation, as with the USGA green, water infiltration results in the formation of perched water; in this case occurring above the root zone/subgrade interface. Unlike the USGA green, however, continued rain results in the perched water zone progressively (from three to five hours) approaching the soil surface till at the end of the rain the soil is nearly saturated to the surface. This progressive wetting of the root zone, however, does not occur uniformly across the green but mostly forms a pattern relative to the gravel-filled drainage trenches. In this case, water perching approaches the green surface midway between the drainage trenches yet remains deeper over the trench. A lateral pattern of water contents coincident with drainage trenches in a California-style green was also observed experimentally by Prettyman and McCoy (2003a). This pattern forms because a California green lacks a gravel layer underlying the root zone so that water must travel laterally rather long distances through the root zone before entering a drainage trench.

Following the rain, however, the zone of perched water recedes rapidly at first and then more slowly so that by 30 hours, the drain trench-induced pattern has disappeared and the perched water zone has a thickness of about 3 inches distributed somewhat uniformly across the green. The exception to this is the absence of perching at the crest of the terrace face and a 5-inch-thick perched water zone at the base of the terrace face.

For the remaining hours of the simulation (from 30 to 162 hours) the root zone simply becomes progressively drier due to water uptake by the turf. During this period, the dynamics of water flow in the California green is similar to that seen in the USGA green. The principal difference between these simulations is that the upper 6 inches of the California green is much drier for the same time slice than the USGA green. This is due to the smaller capillary porosity values and reduced water retention of the California root zone sand as compared with the USGA root-zone mix.

Drainage in the California green began 3.1 hours into the simulation and achieved its maximum rate of 28.3 cubic inches per hectare just as the rain ended. The drainage rate subsequently declined, rapidly at first and then more slowly. The California green required 31 hours before the drainage rate had slowed to a rate two orders of magnitude less than its peak. In the California green, the maximum drainage rate was about 60 percent of the rainfall rate, implying that had this rain rate continued indefinitely, water would have ponded on the green. The slower maximum drainage rate in the California green versus the USGA green is in agreement with the measurements of Prettyman and McCoy (2002).

The Push-up green

Water infiltration into the push-up green and the interruption of flow at the root zone/clay loam interface resulted in a virtually saturated soil profile when the rain ended at hour five. This situation remained virtually unchanged until hour 24 when water contents declined to the 25 percent to 35 percent range at the crest of the terrace face. It was not until hour 42, however, before most of the remaining areas of the root zone followed suit, opening up air-filled pore space for adequate soil aeration. The exception was the base of the terrace face and low point of the green where the soil remained wet. This overall result is substantially different from the USGA and California observations and is due to the 8-inch thick layer of fine textured native soil between the base of the root zone and the drainage trench.

This disconnect between the sandy root zone and the drainage system results in long-lived water accumulation following the rain. It is also important to note that this water saturation occurred with just 1 inch of rainfall.

After 68 hours, all regions of the surface 4 inches deep had dropped below a water content of 35 percent, opening air filled porosity for adequate gas exchange. This led to a laterally uniform drying of this layer throughout the remainder of the simulation. At the end of the simulation, water contents were greater across the surface of the push-up green than the USGA or California greens because of the increased water retention of the push-up green root-zone layers.

Drainage rates were roughly similar for the USGA and California greens, but drainage behavior in the push-up green was quite different from the others. Drainage in this green began at 14 hours, well after the end of the rain; and it peaked at a rate of 0.064 cubic inches per hectare at 35 hours. Because no drainage occurred during the rain event, it is inevitable that surface ponding would occur if this 0.25-inch-per-hectare rain had continued. This demonstrates how a relatively impermeable fine-textured soil can be a disconnect between rainfall and drainage in push-up greens.

Finally, the decline in drainage rate following the peak in this push-up green was gradual; unlike that seen in the USGA and California greens.

Conclusions

Throughout the seven days of this simulation, 70 percent, 63 percent and 9 percent of the total rainfall drained from the USGA, California and push-up greens, respectively. Thus, even though the amount of rainfall occurring on the push-up green was 25 percent of the others, a disproportionate small
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fraction of the rainfall found its way to the drainage trenches in the push-up green.

Cumulative evapotranspiration during the seven-day simulation was 27 percent in both the USGA and California greens as contrasted with 106 percent in the push-up green. The reason why evapotranspiration in the push-up green exceeded 100 percent was because some water initially present in the soil profile was used in evapotranspiration over the seven days. These facts, together with the other simulation results, emphasize that water flow in USGA or California greens are relatively similar when compared to a push-up green. This is principally because both USGA and California greens employ deep (12 inch), sandy root zones that establish a direct connection with the subsurface drainage system and displace layer interfaces well below the ground surface.

Differences in water flow that did occur between the USGA and California greens included the progressively deepening pattern of water perching during rain in the California green when, at the same time, water perching thickness was self-limited in the USGA green. Associated with this is the slower maximum drainage rate in the California green. Another difference was that the California green showed an earlier onset of drought stress than the USGA green.

These differences are principally due to the presence of a gravel drainage layer in the USGA green and the lesser water holding capacity of the California green root zone. Yet, both systems perched water that in both cases was short-lived at the crest of the steeper slopes. Further, perched water that was retained in the root zone was taken up by the turf in both systems even though rooting did not extend into this zone. Consequently, the first onset of drought stress in both cases was localized to the crest of the terrace face and, to a lesser degree, the high point of the green and the crest of the false front.

Finally, although there is substantial evidence that the simulations accurately depict water flow in these greens, it is important to remember that the greens were subject to extreme environmental conditions and that the simulations used a root zone with emphasized transmission attributes.

Ed McCoy and Kevin McCoy are turfgrass soil physics professors in the School of Natural Resources at The Ohio State University.

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TURFGRASS TRENDS

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The Buckeye Doesn't Fall Far From the Tree

One Ohio State graduate replaces another as golf course superintendent at the Scarlet and Gray courses. Both say a job just doesn't get any better

By Larry Aylward
Editor in Chief

Gary Rasor recently retired from his dream job. Dennis Bowsher recently began his. Both men have The Ohio State University Golf Club to thank for their pinch-us-to-make-sure-we're-not-fantasizing careers in golf course maintenance.

The 60-year-old Rasor retired last June from Ohio State after 36 years, the last 20 as superintendent of the club's Scarlet and Gray courses. Rasor went out in style, leaving the club shortly after completing a $4.2-million restoration of the Alister MacKenzie-designed Scarlet Course directed by Columbus-born Jack Nicklaus.

"I felt lucky to be at a place this great," Rasor says. "Very few people get to do the jobs that they absolutely love to go do every single day."

The 46-year-old Bowsher feels lucky to be at Ohio State. In fact, Bowsher, who graduated from Ohio State in 1983 but has been working outside the state for almost 20 years, uses terms like "destiny" as a reason he landed the job. "It's coming home for me," he says.

But Bowsher's vast agronomic experience might have something to do with his getting hired. Most recently he was the superintendent for five years at Virginia Oaks Golf Club in Gainesville, Va.

"Ohio State is extremely fortunate to recruit a superintendent with Dennis' experience, technical skills and commitment to excellence," said Richelle Simonson, Ohio State's associate director of athletics.

Bowsher began his tenure at Ohio State in May while Rasor was finishing up his. The two men had never met before Bowsher's first day on the job. But because the two spent a few weeks together in the same maintenance facility, Bowsher was able to learn the ins and outs of the job from Rasor, who got a glimpse into his successor's turf-management style.

"He's certainly capable of taking the club to the next level," says Rasor, who wasn't involved in selecting his replacement.

Bowsher acknowledges he has Shaquille O'Neill-sized shoes to fill in replacing Rasor. In his 20 years as the superintendent, Rasor never lost a green or fairway on the Scarlet or Gray, a feat that amazes Bowsher. "It's a testament of his can-do attitude," Bowsher says.

Rasor's "can-do attitude" was formed at an early age. Growing up on a farm in Tipp City, a small town in southern Ohio, Rasor learned the value of hard work as a kid. He also learned to be resourceful, something that helped him in his job at Ohio State.

Rasor graduated from Ohio State in 1969 with a degree in agriculture/agronomy. Ohio State is the only place he has ever worked in his career, except for a nine-month stint at a municipal golf course.

Rasor began his career as assistant superintendent in 1970 and was named superintendent in 1986. Rasor says he never wanted