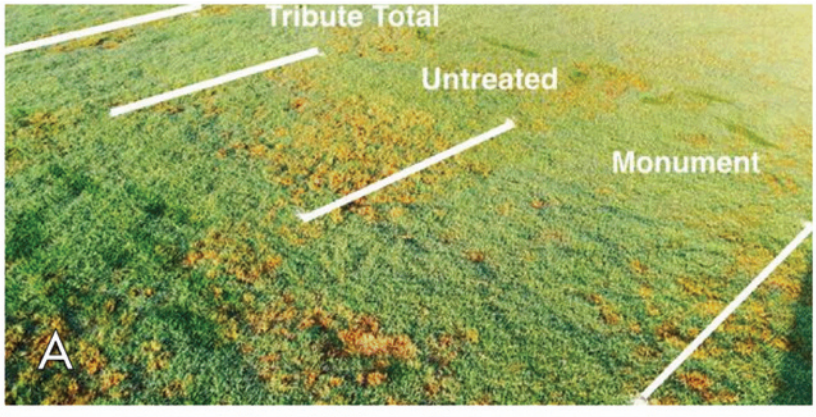
MANAGING WINTER ANNUAL WEEDS



Winter annual weeds such as annual bluegrass (*Poa annua*), henbit (*Lamium amplexicaule*) and common chickweed (*Stellaria media*) often invade cool and warm-season athletic fields subjected to traffic from fall sports such as football and soccer. Traffic can weaken both warm- and cool-season turfgrass athletic fields leaving voids in the canopy for winter annual weeds to invade.

Winter annual weeds will often become established in the most heavily trafficked portions of an athletic field during late fall and early spring once fall sports are complete and turfgrasses are less competitive. In a study conducted during the winter of 2013-2014, plots receiving simulated football traffic in fall contained 35 annual bluegrass plants per 9 ft^2 compared to less than 2 plants per 9 ft^2 those not receiving traffic (**Figure 1**).

Controlling these weeds is essential to maximizing both field safety and playability. Researc h at the University of Tennessee has found that the presence of weeds on athletic fields can reduce traffic tolerance potentially leading to greater injuries. Additionally, failure to remove winter annual weeds will allow them to persist with desirable turf the following growing season (**Figure 2**); which negatively affects field playability and safety as well. To that end, it is important to develop a plan for managing winter annual weeds on athletic field turf.

COOL-SEASON ATHLETIC FIELDS

On many cool-season athletic fields, annual bluegrass is a year round problem rather than something that is seasonally troublesome. Seedhead production

◄ **Figure 1. Top Left: Annual bluegrass** invading trafficked hybrid bermudagrass turf. Few weeds are present in non-trafficked turf.

Figure 2. Non-competitive hybrid bermudagrass growth following use of POST herbicides for annual bluegrass control (A). Additionally, clumps of ryegrass competing with bermudagrass growth on a high school football field (B).

and deposition into the soil profile ensures that annual bluegrass will be a perennial problem on these fields. For example, researchers have reported that annual bluegrass deposits nearly 2 million seeds per ft2 (185,000 seeds per m2) in the top inch of soil. In these instances, climatic conditions usually favor annual bluegrass seed germination and growth for large portions of a calendar year making permanent control with herbicides difficult.

Many field managers have had success managing annual bluegrass with applications of Tenacity (active ingredient is mesotrione). Tenacity is a carotenoid inhibiting herbicide that turns susceptible weeds white after application (**Figure 3**). Researchers have observed that sequential applications of Tenacity in the fall can remove annual bluegrass from Kentucky bluegrass (*Poa pratensis*); however, responses may vary with location, year, or annual bluegrass biotype. Individuals managing fields with high percentages of perennial ryegrass *Lolium perenne*) will need to reduce application rates because this species is less tolerant of Tenacity than Kentucky bluegrass.

In addition to having activity on annual bluegrass, Tenacity can be used to control several winter annual broadleaf weeds, including common chickweed, henbit, and lawn burweed (*Soliva sessilis*) either pre- or postemergence. Label directions allow for Tenacity to be applied for weed control on fields before being re-seeded or sodded as well. However, applications after seeding should be delayed a minimum of 4 weeks or until newly germinated turf has been mowed twice.

Xonerate (active ingredient is amicarbazone) is a new herbicide labeled for use on many mature warm- and cool-season turfgrasses that has efficacy for annual bluegrass control on golf course turf with sequential applications. Despite significant interest among athletic field managers, Xonerate use on cool-season fields is limited because current labeling does not allow fall applications due

▼ **Figure 3. Annual bluegrass bleaching** after treatment with Tenacity

to injury to desirable turf. Additionally, applications in spring must be made before air temperatures reach 85°F. Moreover, applications to Kentucky bluegrass must be delayed a minimum of 12 months after seeding. Research trials have shown some benefit to tank mixing Tenacity and Xonerate for annual bluegrass control in cool-season turfgrass; however, more information is needed before this mixture becomes a labeled option that athletic field managers can legally apply to their turf. At the current time, the best use of Xonerate on athletic field turf is for annual bluegrass control on warm-season fields overseeded with perennial ryegrass for spring football and baseball.

Pylex (active ingredient is topramezone) is a new herbicide for use in turfgrass that is also safe for use on many cool-season turfgrasses including Kentucky bluegrass, perennial ryegrass, and tall fescue (*Festuca arundinacea*). Pylex works similar to Tenacity in that it inhibits carotenoid production, turning susceptible weeds white after application. Pylex is an option for postemergence weed control in established turf and can also be used when establishing new cool-season turfgrass stands from seed. However, applications after seeding should be delayed a minimum of 4 weeks. Although Pylex has**no activity** on annual bluegrass, it can be used to select winter annual broadleaf weeds such as common chickweed, speedwell species, Shepherd's-purse, hairy bittercress, and henbit.

Drive XLR8 (active ingredient is quinclorac) is often thought of as an herbicide for postemergence crabgrass control. Many athletic field managers are unaware that Drive XLR8 controls a wide spectrum of broadleaf weeds including many winter annual species. Drive XLR8 is also safe for use during the establishment of cool-season species used on athletic fields. Applications to newly seeded Kentucky bluegrass can be made 4 weeks after seeding; on perennial ryegrass, Drive XLR8 can be applied at seeding and 4 weeks thereafter as well.

Athletic field managers should be advised that many products containing quinclorac are available under different trade names. Always check the product label to determine if a particular herbicide can be applied to newly established turf. For example, SquareOne Herbicide (active ingredients are quinclorac + carfentrazone) can be applied to Kentucky bluegrass and perennial ryegrass 7 days after emergence. Comparatively, applications of Q4-Plus (active ingredients are quinclorac + sulfentrazone + 2,4-D + dicamba) must be delayed until at least 28 days after emergence.

WARM-SEASON ATHLETIC FIELDS

Winter annual weed management is a critical issue on warm-season athletic fields. As temperatures cool throughout fall and winter, warm-season turfgrasses grow less aggressively and often enter dormancy in many locations. This renders warm-season athletic fields non-competitive against winter annual weed invasion.

There are several factors that make winter annual weed management on warm-season athletic fields complicated including decisions regarding overseeding and managing the evolution of herbicide resistant weeds.

Overseeded Fields. Many warm-season athletic field managers chose to overseed fields with cool-season species such as perennial ryegrass during fall. This practice ensures that fields will remain green throughout the winter and early spring, which can be important for sports like baseball that often begin early in the calendar throughout much of the southern United States. It also serves to protect dormant bermudagrass crowns from the negative effects of foot traffic during dormancy. However, inputs of irrigation water and fertilizer nutrients required to establish a successful stand of overseeded turf on warm-season athletic fields can encourage invasion of winter annual weeds, particularly annual bluegrass. Much like controlling the winter annual weeds; overseeded perennial ryegrass must be removed in the spring for warm-season turfgrasses to recuperate.

One option for annual bluegrass management in these scenarios is to apply a preemergence herbicide like Barricade (active ingredient is prodiamine) 8 to 10 weeks before overseeding. However, in most climates annual bluegrass pressure will likely be quite low during this 8 to 10 week period before fall overseeding. Additionally, this practice may not provide complete control in most environments because multiple flushes of annual bluegrass germination can occur throughout the fall.

Another option is to apply an acetolactate synthase (ALS) inhibiting herbicide such as Revolver (active ingredient is foramsulfuron), Monument (active ingredient is trifloxysulfuron), or Katana (active ingredient is flazasulfuron) closer to overseeding. These herbicides can safely be applied 7 to 28 days before overseeding species such as perennial ryegrass into bermudagrass athletic fields. Be advised that re-seeding intervals vary by product and field managers should consult the herbicide label for more specific information. Applications of ALS inhibiting herbicides will control any annual bluegrass plants that may have emerged before overseeding and provide some residual control of those germinating thereafter.

Some field managers chose to follow-up these applications with postemergence treatments after overseeding. As previously mentioned, Xonerate is a new herbicide that fits this use pattern. Prograss (active ingredient is ethofumesate) is labeled for postemergence annual bluegrass control in overseeded perennial ryegrass turf on

▲ **Figure 4. Many warm-season athletic fields** are not overseeded during the winter and enter full dormancy.

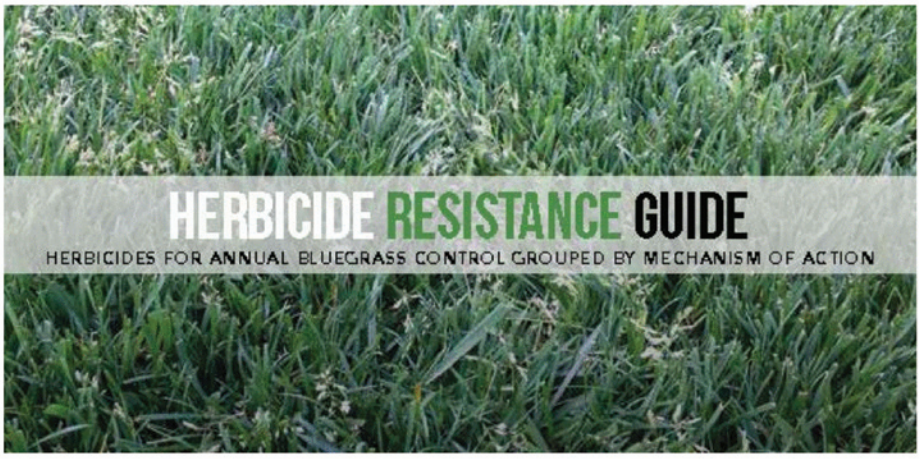
golf courses. Applications are usually made once the overseeded stand has emerged to a height greater than 1 inch and has been mowed at least a single time. Research trials have found that sequential applications of Prograss at this timing in Tennessee effectively control annual bluegrass in overseeded perennial ryegrass fairways. However, Prograss is for use by professional applicators only and does not have specific labeling for use on athletic fields.

Non-Overseeded Fields. Many facilities do not have the resources to overseed their warm-season athletic fields and turf remains dormant throughout the winter and mid-spring (**Figure 4**). In these situations, pre- and postemergence herbicides can be used to manage winter annual weed infestations.

There are numerous preemergence herbicide options for controlling annual bluegrass and other winter annual weeds on non-overseeded bermudagrass including: Pendulum AquaCap (active ingredient is pendimethalin), Barricade (active ingredient is prodiamine), Dimension (active ingredient is dithiopyr), Echelon (active ingredients are prodiamine + sulfentrazone), Specticle Flo (active ingredient is indaziflam), Ronstar (active ingredient is oxadiazon), and Princep (active ingredient is simazine). Most of these herbicides are applied in early fall to provide residual control of annual bluegrass plants not yet emerged from soil for several weeks after application. Specticle Flo, Echelon, and Princep can be applied later in the fall to control newly emerged annual bluegrass plants in addition to offering residual control of plants that have not emerged from soil. Consult a local Extension specialist for specific information about best application rates and timings for these herbicides.

Concerns over traffic tolerance and recovery often result in many athletic field managers avoiding use of preemergence products in fall when fields are subjected to traffic. As a result, postemergence herbicide applications for winter annual weed control are more common on athletic fields. ALS inhibiting herbicides such as Revolver (active ingredient is foramsulfuron), Monument (active ingredient is trifloxysulfuron), or Tribute Total (active ingredients are thiencarbazone + foramsulfuron + halosulfuron) are often applied in spring once turf begins actively growing. Katana (active ingredient is flazasulfuron) is another ALS inhibitor that can also be used for annual bluegrass control in spring if applied following an application of quickly available nitrogen fertilizer at greater than 0.5 lb N/1000 ft2. ALS inhibiting herbicides can be used at low application rates to control annual bluegrass and a wide spectrum of winter annual broadleaf weeds when soil temperatures exceed 60°F. They are commonly applied with non-ionic surfactants at a 0.25% v/v ratio to improve performance.

A common practice in the transition zone is to treat dormant bermudagrass athletic fields with applications of the non-selective



TIMING	ACTION	ACTIVE INGREDIENT*
Pre/Post	Mitotic inhibition	Dimethenamid (Tower**)
		Pronamide (Kerb)
	Photosystem II inhibition	Amicarbazone (Xonerate)
		Atrazine (Aatrex)
		Metribuzin (Sencor)
		Simazine (Princep)
	Cellulose biosynthesis inhibition	Indaziflam (Specticle)
	Lipid biosynthesis inhibition	Ethofumesate (Prograss)
	Carotenoid biosynthesis inhibition	Mesotrione (Tenacity)
	Protoporphyrinogen oxidase (PPO) inhibition	Flumioxazin (SureGuard)

▲ **Figure 5. University of Tennessee,** for selecting herbicides for annual bluegrass control.

herbicide Roundup Pro (active ingredient is glyphosate) to control annual bluegrass and other winter annual weeds. Roundup Pro is labeled for use on dormant bermudagrass turf at rates of 5 to 44 fl oz/A and provides a more economical alternative to many of the ALS inhibitors. Applications must be made to **completely dormant** turf (i.e., no green leaves or stolons present) early in the year at air temperatures > 50F. Be advised that applications under cooler conditions will not be as effective and those made to partially dormant turf can severely stunt spring green-up. Other non-selective herbicides that fit this use pattern include Finale (active ingredient is glufosinate) and Reward (active ingredient is diquat). Be advised that burndown products such as Reward may require sequential applications to provide acceptable control.

Herbicide Resistance. A major factor complicating programs for managing winter annual weeds (particularly annual bluegrass) in warm-season climates is the increasing incidence of weeds exhibiting herbicidal resistance. Weeds are deemed "herbicide resistant" when they are no longer controlled by a rate of a particular herbicide that was once normally effective. Over the past several years there have been first reports of annual bluegrass populations developing resistance to commonly used herbicides including Barricade, Monument, Revolver, Princep, and Roundup. In nearly all of these cases, resistance developed as the result of using the same herbicide for a series of consecutive years without rotation. This all-to-common process essentially removes annual bluegrass plants that are sensitive to a particular herbicide and selects for those with some inherit level of resistance. Recently, populations of annual bluegrass with resistance to multiple herbicidal modes of action have been identified in the southeastern United States.

An increase in herbicide resistant annual bluegrass will result in field managers having fewer herbicide options for annual bluegrass control. Several turf managers are already struggling with the stark reality that resistance brings to light. Imagine annual bluegrass that could not be controlled with Revolver, Monument, or Princep. What about annual bluegrass that remained on dormant bermudagrass fields after an application of Roundup? Continued use of the same weed management strategy for multiple years will eventually lead to this result at some point in time. It is critical that field managers diversify their strategies for annual bluegrass control now and rotate their approach regularly. The University of Tennessee has developed a guide to assist field managers in rotating herbicides for annual bluegrass control in an effort to reduce the rate at which herbicide resistance in turf has been increasing. This document essentially groups products for annual bluegrass based on optimal application timing (i.e., pre- or postemergence) and color codes herbicides by their mode of action (**Figure 5**).

Winter annual weed management is an important issue for individuals managing both cool- and warm-season athletic fields. Failure to control winter annual weeds can negatively affect field safety and playability. Winter annual weeds left uncontrolled often can persist into the following season, competing against desirable turf for valuable water, light, and nutrient resources. It is critical that field managers developing a plan for managing winter annual weeds and commit to rotating their approach regularly to mitigate to the development of herbicide resistant weeds. ■

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