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IRRIGATION & DRAINAGE

tive to note that the SAWS guidelines have water restrictions under even severe drought that allow community sports fields to be used in a safe manner.

How do good BMP-based state, water district, and site-specific water regulations evolve? They do not unless water users are politically involved. A primary hindrance

for progress in developing better state, water district, or local community water regulations for drought periods is simple: the various components of the turfgrass industry do not proactively present a plan.

It is essential that the turfgrass industry, including the sports turf component, proactively address water conservation because it is

an issue that will become increasingly important. Sports associations must start this process and provide foundational resources. ■

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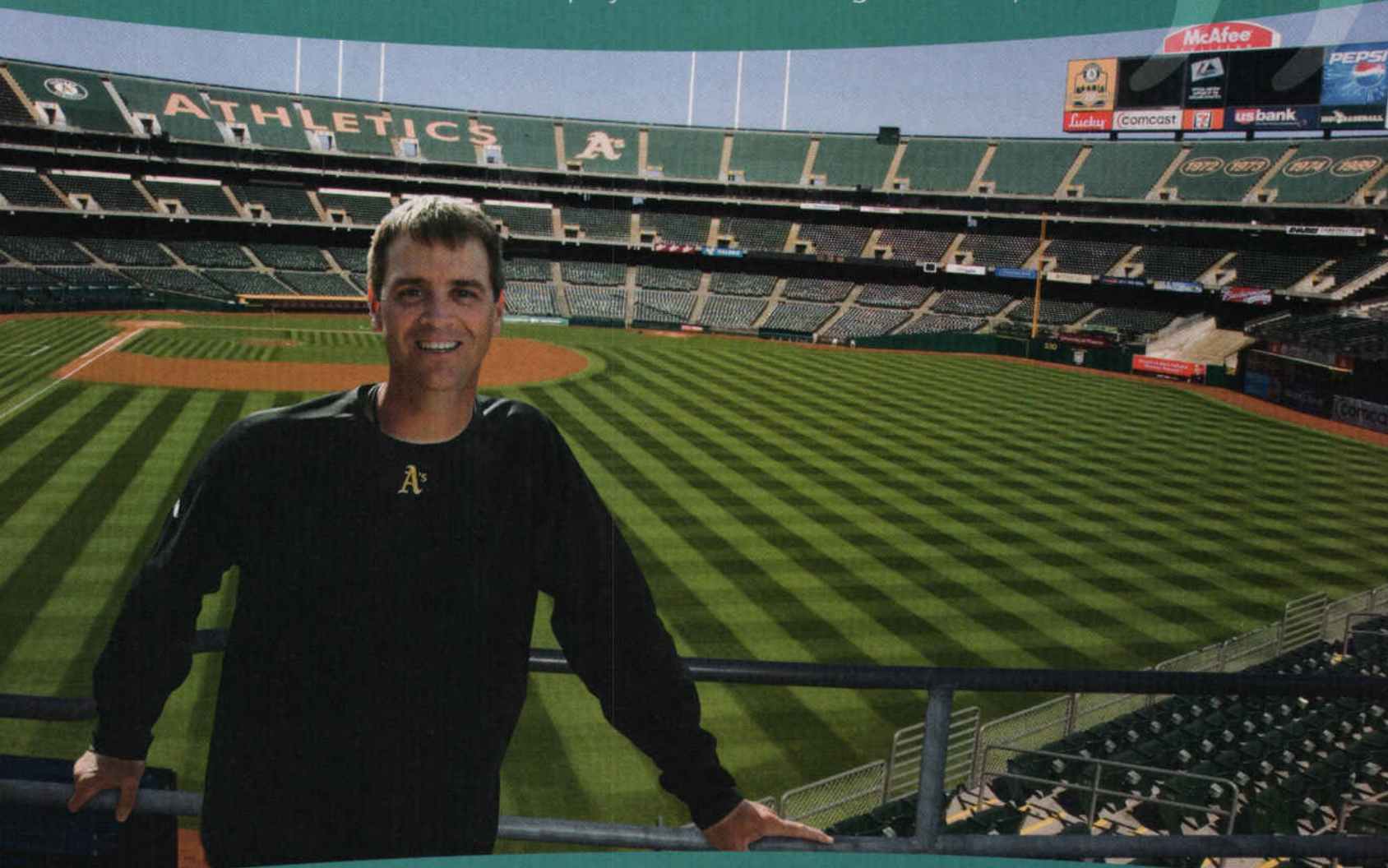
Table 2. Common urban water conservation plan

This is an outline of common State or Water District BMPs for an urban water conservation plan to create a true culture of conservation that encourages voluntary actions by all water users; and with common sense water restrictions and triggers during times of drought that involves all water users. This approach contrasts to a rigid regulation approach with total water bans on more visible water users, while other water users do not participate in water conservation; or rigid regulations that do not consider the economic, job, environmental, and societal impacts.

- Identify water conservation goals—water district level.
- Develop water-use profiles/benchmarking for water users and forecasting for future needs.
- Identify and evaluate all water conservation measures.
- Triggers & Water Restriction Level Regulations.* A good water district BMPs plan must include well-defined, logical water restriction levels with stated triggers to move from one level to another. Usually 1-2 triggers are used and these are well publicized. Both water restriction levels and the requirements for triggers should be consistent with state and water district BMPs practices.
- BMPs for all water-users. All water users must address water conservation and not just the most visible. State-BMP policy must foster site-specific BMPs for all industrial, commercial, institutional, agricultural, and irrigation landscape water users (turf sites with a professional grounds manager such as parks, sod fields, recreational fields, and golf courses). All public owned sites that are irrigated should be models for development and use of site-specific BMPs. NOTE:
 - Pre-emptive laws that do not easily allow local communities to impose more strict water restrictions than allowed at the state or state defined water district level. If local communities can easily impose water restrictions with considering the potential adverse effects (item 9) then there essentially is not functional state or water district plan but a series of every changing local plans.
 - Public Infrastructure improvements to reduce water loss. Public system water audits, leak detection and repair. Public water delivery systems are often the source of major water loss in many urban areas. For golf courses and other water users, water audits, leak detection, and repairs would be part of their site-specific BMPs.
 - Public Infrastructure improvements to foster use of storm water and reclaimed water (treated waste water) for irrigation, fire protection, or other uses. Pipe lines, storm water retention reservoirs for capture and reuse, promote on-site public or private treatment facilities,
- Conservation policies and incentives to promote private infrastructure improvements to reduce water loss, enhance storm water retention and reuse, on-site private waste water treatment for reclaimed water irrigation use. Examples include rebates or grants for conservation devices, systems, and measures.
- Indoor water conservation measures, including all public buildings and facilities.
- Conservation pricing (demand management pricing) with water costs rising above the normal use level for a user that is operating under site-specific BMPs.
- Consideration of all Stakeholders cost and benefits. Evaluation of voluntary and regulated water conservation measures on all stakeholders, i.e., community jobs, economy, environmental. This evaluation should be not only when selecting initial conservation practices but also in terms of how fairly and uniformly different businesses are treated, especially in times of water crisis.
- Policies to encourage alternative irrigation water sources especially by large landscape areas such as sports fields, parks, or golf courses.
- Develop an on-going public information and education program based on a positive attitude that fosters voluntary actions by individuals to achieve water conservation. Avoid making every citizen a "water cop." Conservation plans and programs are long term and their nature influences the community attitudes and actions.
- School based educational programs that foster understanding of BMPs.
- Reasonable monitoring and reporting program that entails all water users. Monitoring requirements should focus on the essential information and not become burdensome for water users by requiring unnecessary information. Overall water-use efficiency and conservation are the important aspects and not monitoring every component within a site-specific BMPs plan. Public facilities should not be exempt from monitoring and reporting.

* Waltz, C., R. N. Carrow, and M. Chappell. 2008. State level BMP water conservation template: Rules for triggers, water restriction levels, and key issues. Document based on the San Antonio Water System regulations. <http://www.commodities.caes.uga.edu/turfgrass/georgiaturf/Water/Articles/State%20Wide%20Templates.pdf>

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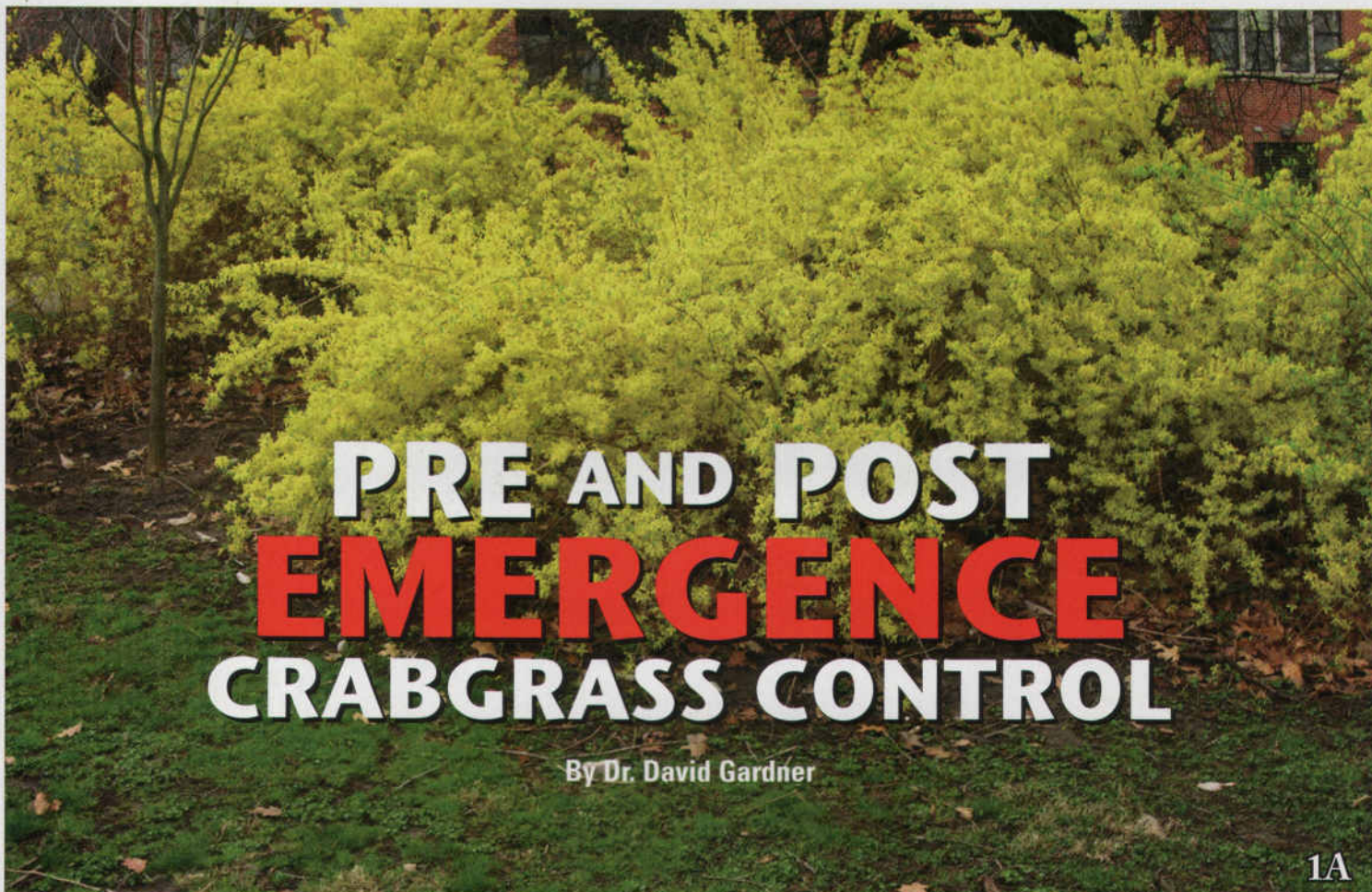
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PRE AND POST EMERGENCE CRABGRASS CONTROL

By Dr. David Gardner

1A

Crabgrasses (Genus *Digitaria*) are very common warm season weedy grasses on athletic surfaces. There are several species that infest turf, including smooth crabgrass and large crabgrass (see Figure 1B & C). Crabgrasses begin to germinate when soil temperatures reach about 55 degrees Fahrenheit. Other warm season weedy grasses such as goosegrass germinate when soil temperatures are in the mid 60's, which can be several weeks later.

Crabgrass begins to germinate in January in the extreme southern U.S. The germination date is later as in the northern states, with the upper Midwest typically seeing crabgrass germination in mid April. Early germination mostly will occur along sidewalks and other areas that warm up more quickly in the spring. Oftentimes however,

this early germinating crabgrass is killed by late season frosts and freezes. For example, in the Midwest we may see some crabgrass germination in April, but we sometimes don't see the first surviving crabgrass until about the second week of May.

Our first lines of defense against crabgrass infestation are the preemergence herbicides. These products form a barrier in the soil and once a germinating seedling contacts it, the weed is controlled. For a preemergence herbicide to be effective, it must be applied before weed seed germination that occurs after the last killing frost of the season. Typically the herbicide must be applied before a rainfall or watered in within a certain period of time. Check the label for specifics. Because of this, we usually like to allow for about a 3-week window of safety and prefer to target the application accordingly. In the Midwest it is common to time

the application by when Forsythia come into full bloom. Forsythia is the common shrub that flowers bright yellow on bare wood and serves as a remarkably effective indicator for when to apply preemergence herbicides (Figure 1A). Other indicator plants are used in the southern U.S., including dogwoods and rhododendrons.

Preemergence herbicides are effective only for a finite period of time after application (weeks or a few months). After application, the herbicide barrier will begin to degrade, at first quickly and then more slowly over time. Once the herbicide has dissipated to a certain minimum threshold in the soil, crabgrass and other weed seeds will begin to break through.

One of the reasons that we try to avoid applying the herbicide too early is to maximize the chance of the herbicide barrier lasting through the season. There are

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numerous factors that influence the overall performance of a preemergence herbicide and how long it will remain effective following application: 1) timing of application, 2) product chosen, 3) application rate and whether the application is split, 4) climate and weather post application, and 5) the amount of thatch and organic matter in the turf/soil profile.

Climate and weather cannot be controlled. The warmer the temperatures or the higher the rainfall, the faster the product will degrade or leach and lose effectiveness. Similarly, the amount of thatch and organic matter can usually only be slowly altered

over time. Higher amounts of thatch and organic matter will increase the rate of degradation of the product. Unlike these two factors, however, you do have a choice of product selection, application timing, and the method in which it applied.

You can increase your chances of getting effective season long control by:

- 1) Selecting a product with a long last-

ing active ingredient, such as prodiamine or dithiopyr. Both provide 90% control for up to 16 weeks. Dithiopyr also has early postemergence activity for those cases where some crabgrass may have already emerged.

- 2) To increase duration of control, increase the application rate (within label limits). The more product that is applied, the longer it takes for it to dissipate to below the minimum threshold level. Also, split applications, the practice of applying once at a lower rate followed again 6-8 weeks later, is not always effective and generally not recommended in the northern U.S.

Figure 1. In the northern U.S., the best time to apply a preemergence herbicide for the control of crabgrass is when *Forsythia* is in bloom (A). In the southern U.S., blooming of either dogwoods or azaleas is often used to indicate proper timing. Smooth crabgrass (B), which lacks pubescence on the leaf sheath, germinates when soil temperatures reach about 55°F. Large crabgrass (C) and most of the other crabgrasses, have pubescent leaf sheaths.

John Mascaro's Photo Quiz

Can you identify this sports turf problem?

Problem:

Low spot on turf void of grass encircling field

Turfgrass Area:

High school football field

Location: Hollywood, FL

Grass Variety: 419 Bermudagrass

Answer to John Mascaro's Photo Quiz on page 41

John Mascaro is President of Turf-Tec International



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Generally speaking, in the northern U.S. you should make one application and increase the duration of control by increasing the application rate. If you are in the southern U.S. and you are going to make split applications, you should wait 60 to 90 days (or according to label directions) before making the second application. Also, consult your state's extension literature, because some products benefit from sequential applications and some do not.

What if it's too late to apply?

You have a couple of options. You can wait and treat the crabgrass with a postemergence herbicide. Or, if you are within about 4-6 weeks of the traditional preemergence herbicide application deadline for your area (so about April 15 to June 1 in the Midwest) and your emerged crabgrass has not yet tillered, you can apply one of the products that offers pre-

and early postemergence control. Dimension (active ingredient Dithiopyr) has traditionally served this niche in the market. It is an excellent preemergence herbicide but also will control 1-2 leaf crabgrass postemergence. A new product from FMC, called Echelon, combines the herbicides sulfentrazone and prodiamine and also will afford excellent preemergence control and some postemergence control of 1-2 leaf crabgrass.

If you have or are thinking of applying a product that contains a preemergence herbicide to control crabgrass on thin spots that you are also planning to overseed or reseed,



you had better think again. Almost all of the preemergence herbicides on the market are very effective at controlling not only weed seedlings, but also the seedlings of our desired turfgrasses.

Use the recommended reseeding intervals for the active ingredients used as preemergence herbicides where cool season turfgrasses are grown. These can be found on the label of a product that contains the herbicide. Note that most of the intervals are long enough that, were they to be applied in March or April, you would not be able to safely overseed until summer. And we all

know that summer is not a real good time to overseed.

If you have small areas that are thin or bare, you may wish to apply the preemergence herbicide and attempt to manage the existing grass to fill in the bare spot. If it is a large area, then you are probably best off overseeding and avoiding the use of the herbicide. Alternatively, note that the herbicide siduron is safe for use on seedling turf. Follow the label directions carefully. When used properly, siduron will reduce crabgrass, goosegrass, foxtail, and many summer annual broadleaf weeds by about 80%.

A (possible) new option when overseeding

Tenacity herbicide is a new product from Syngenta that contains the active ingredient mesotrione. This active is in a unique class of chemistry and this product has

a very diverse label, including pre- and post emergence control of both broadleaf weeds and annual grasses. It also controls sedges preemergence and certain perennial weedy grasses postemergence.

Unfortunately, it is not yet labeled for use on commercial turf or sports fields. But, the product was recently labeled for use on golf courses and the label changes are pending to allow its use on other turf areas. When this product becomes labeled for use on sports fields, one of its key uses will be the preemergence control of annual grassy and broadleaf weeds in newly seeded turfgrass. When used

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as directed, Tenacity will result in nearly complete control of crabgrass, goosegrass, foxtail, and many summer annual broadleaf weeds. But it will not affect the growth and development of the seedling turf.

Postemergence control options

With the recent cancellation of the arsenical herbicides MSMA and DSMA, the use of preemergence herbicides becomes more important for the control of weeds such as dallisgrass and goosegrass. However, there are several options for postemergence control of crabgrass. Quinclorac was introduced in 2000 and reliably controls crabgrass even after it has tillered. Fenoxaprop-ethyl is another herbicide that offers good to excellent postemergence control of crabgrass. However, it is generally less effective than quinclorac on crabgrass that has til-



Figure 2. Control of crabgrass, goosegrass, yellow foxtail, yellow nutsedge, pigweed, and purslane was nearly 100% when Tenacity herbicide was applied at seeding. Perennial ryegrass was seeded into the area, lightly incorporated and then Tenacity was sprayed over the top on July 25, 2007. Photos taken on August 8. Tenacity's use on athletic fields is pending.

lered. Other options on warm season turfgrasses include fluazifop, metribuzin, and sethoxydim. Regardless of the choice of herbicide, control of crabgrass is better if applied to young plants that have not tillered. Also, since crabgrass is an annual that returns yearly from seed, steps should be taken to avoid the production of seedheads by any crabgrass that is present.

Crabgrass is a nearly ubiquitous weed in turfgrass. In athletic field management, its presence has been particularly challenging because spring time overseeding often precludes the use of a preemergence herbicide. However new herbicides, such as quinclorac, and, hopefully, mesotrione, should make the athletic field manager's job easier when it comes to controlling this weed. ■

Dr. Dave Gardner is Associate Professor in the Horticulture & Crop Science Department at The Ohio State University.

How to use this info

Crabgrass is most effectively controlled with preemergence herbicides. You can increase your chances of getting effective season long control by selecting a product with a long lasting active ingredient, such as proflam or dithiopyr. Both provide 90% control for up to 16 weeks.

Preemergence herbicides can not be used, in most cases, on areas that you plan to overseed or reseed during the spring and summer.

Dithiopyr, or a combination product that contains sulfentrazone and prodiamine, has both pre- and early postemergence activity for those cases where some crabgrass may have already emerged but has not yet tillered.

Best results with a postemergence herbicide are achieved if the crabgrass is still young (<2-4 tillers) and before it has set seed.