

duced what he thought might be a “final” layout for Twin Warriors. He would later learn that he had unwittingly plotted tees, fairways and greens over a number of Pueblo cultural sites.

“I had a routing plan completed,” Panks says. “Then the client produced a map of some cultural sites that no one was aware of. So we had to go back to the drawing board.”

Panks, whose firm is headquartered in Scottsdale, Ariz., got a quick education in how things work on tribal lands held in trust by the Bureau of Indian Affairs. After plans for the course were announced, a group from the historic preservation office of the state of New Mexico walked the entire grounds — 200 acres at the time — positioned at arms’ length distance from one another. They searched the sacred ground for artifacts and found pottery shards and

animal bones. They also discovered about 20 previously unknown culturally sensitive areas.

As a result of those findings, the course was rerouted and its area, all reservation land, expanded to more than 400 acres. “We routed the golf course around, through and intermingled with those sites,” Panks says. “They are there in the nonplay areas.”

The result is a championship track that cost \$6.8 million for course construction and \$9.1 million with buildings included. Twin Warriors GC, which opened May 2001, is the site of the 2003 PGA Club Professional Championship. Signs identify culturally sensitive sites, including an old cave dwelling believed to have been inhabited in the 1400s and a horse corral from the 1800s.

A sacred butte with mystical meaning for the Native Americans called Tuyuna (translated as

“Snakehead”) is near holes 14 through 16. The Santa Ana Pueblos were initially concerned the course would border Tuyuna too closely, which the tribe does not want approached by hikers. Knowing that golfers would not trespass onto the sacred butte and that trespassers likely wouldn’t cross a golf course to hike there, Panks suggested a plan — and won its approval from the five tribal members on the board of directors overseeing construction — for a design that borders the holes near Tuyuna. “We suggested that the golf course become a buffer that you can have control of,” Panks says.

This collaboration between the architect and the client produced a course that protects the area’s history and educates visiting golfers about the setting. Each golf cart is equipped with a global positioning system set up to monitor the

environs. When a cart strays into protected land, a light goes on in the golf shop and notifies course management to watch its progress. A message on the individual cart’s GPS screen tells the golfers, “You are in a culturally sensitive area.” Most immediately exit the site.

A nursery operated by the Santa Ana Pueblos was used during construction to supply native, drought-tolerant plants such as sage and four winds saltbrush for nonirrigated areas on the course. Irrigation was put in to re-establish replanted native species in off-fairway areas. Then, after a year when the plants were healthy, the water was shut off. As a result of working with the tribe on course vegetation, Twin Warriors exhibits a more natural look and, at present, only 93 of the over 400 acres are irrigated, despite the high-desert climate.

“In the end, we had a
Continued on page 53

Panks designed the course to protect the area’s history and educate golfers about it.



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Real-Life Solutions

Continued from page 51
better golf course,” Panks says.

Done it before

Gary Panks Associates underwent a similar experience in designing two courses for the Gila River Indian Community at the Whirlwind GC in Chandler, Ariz. In planning the Devil’s Claw Course, the first project there, Panks personnel attended tribal meetings and learned that a goal of the Gila was to restore the Gila River to its original state; it had become choked with vegetation and suffered other environmental degradations in recent years. The idea was to let the river flow between the two golf properties and to bring back indigenous vegetation.

Gary Brawley, an associate designer with Panks, says: “Once we got the golf routing staked in the field, we took their cultural people out there. You’d be amazed — things that are so minuscule to you and I are of great importance to the Native American people. There’s a lot we can learn from them as to what the land can yield. They use every piece of what’s on the land.”

The Gilas walked the course three times prior to construction, saving each individual plant of importance to them. On one excursion, they found an arrow weed plant and salvaged it. Arrow weeds were harvested and tightly stranded to make arrows in previous centuries. A cactus about 3 inches tall was



As a result of working with the tribe on course vegetation, Twin Warriors displays a more natural look. Despite its high-desert climate, only 93 of the course’s more than 400 acres are irrigated.

also saved and replanted.

More common varieties special to the Gilas — such as squawberry plants and mesquite trees — were salvaged before construction and then transplanted back onto the course. An onsite nursery was built as a temporary home for about 300 squawberries and 80 mesquite trees awaiting transplanting.

“One time we found a grove of about nine mesquite trees,” Brawley says. “We actually went back and changed the design to incorporate them

rather than box them and salvage them. Now they frame the fourth green.”

The bermudagrass fairways and ultradwarf bermudagrass greens are surrounded by hearty native plants at Whirlwind, another reservation resort course, this time near a Sheraton Hotel. Brawley says working with the Native Americans has taught the designers to stress well-adapted native vegetation in future projects — and think less about forcing other grasses.

“The Native Americans have learned to use the re-

sources they have for survival, so they’ve learned what each individual plant can do for them — whether it’s for food, for medicine, for weapons or tools,” says Brawley. “I think we’ve taken that for granted.”

While the Panks group may have taught the tribe something about golf course design and construction, the Gilas and Pueblos reciprocated by educating the designers in new ways to view the landscape.

“Whenever we do a project, we’re environmentally concerned about the properties,” Panks says. “Now we also look more into the histories of the properties than we might have before. We look a little deeper.” ■

Allar is a free-lance writer from Floyd’s Knobs, Ind.

It's a given that grass people talk about grass. When you live the life of a superintendent, analysis of trends and study of direction often is veiled in what looks like gossip. So when Turfheads are talking, I like to listen to what's going on with the Mega-Issues. Here's what I'm hearing about them, and here's what I think:

Labor – It takes a special kind of courage to arm an employee with more than \$10,000 in a utility vehicle and walking greens mower and send him or her out to make (and sometimes break) today's greens.

McDonald's is often "now hiring" for more money than many maintenance workers make, and that's a bad thing. Here's the beef: Golf operations must realize that they get what they pay for. Too often, great dreams of amazing greens are covered in the nightmare of labor issues, and poor superintendents are stuck playing Atlas and trying to hold up the world. The issue of labor isn't going away, and everyone is talking about it.

Supervision – If you can find enough warm bodies to get the work done, it takes talent to constantly train and supervise those staff members. If we can't get the bucks to pay for good labor, we certainly can't find the money to pay our skilled people adequately. I'm not promoting top-heavy operations, but the days are long over when the superintendent can handle the direction of an entire staff without some leaders on the team. According to many in the field, the solution lies in paying assistant superintendents and foremen or second assistants wages that allow them to think about more than how to get superintendents' positions.

Education – We don't have vocational training for wannabe turfheads so they can learn the art of greenkeeping. Instead, we have over-technical turfgrass management programs that are fat on idealism and short on reality.

Equipment managers (mechanics) need training too, and there isn't near enough of that going on. The average bike shop wrench-turner receives more training and schooling than our equipment managers — and that's a shame. What's worse is that the mechanic at my local bike shop makes much more money than the golf course guys in the area.

My Takes on the Mega-Issues

BY DAVE WILBER



IN THE NEXT FEW YEARS, IT WILL BE VERY HARD TO FILL ALL THE OPENINGS FOR ASSISTANTS, IRRIGATION TECHS, SPRAY TECHS AND FOREMEN

Career shortages and the overages – It's no longer a desirable career goal to be anything less than a superintendent. We haven't helped this situation by paying our second-tier people low wages and spewing some babble at them about "paying dues." In the next few years, it will be hard to fill all the openings for assistants, irrigation techs, spray techs and foremen. The truth is, it's going to be 10 times harder for some of those folks to find a superintendent's position. Some are going to have to embrace the fact that they just aren't cut out to be another Paul Latshaw, no matter how hard they try to punch their tickets to the top.

Supply issues – Superintendents are talking a lot about how the sales and distribution of the items they buy has changed. Some companies don't have the local leverage and support that they once had. My hat is off to the handful of independent turfgrass supply distributors and product developers who still do business the old-fashioned way — by earning it. In the end, they will continue to be the favorite choice of turfheads.

Economic agronomics – The economy is on everyone's mind. Some superintendents are caught in the middle, and they don't like it. Their facilities have to be maintained. They won't get the revenue any other way than to try to produce the best golf day in and day out. But I see great stuff in the fact that those who can figure out how to do it cheaper and better are going to be on top. That is, if they remember to tell their owners and members that they really did fight a good battle for the money.

In my travels, I hear a lot about specific grass issues. But nothing compares to the volume of these Mega-Issues.

Dave Wilber, a Sacramento, Calif.-based agronomist, can be reached at dave@soil.com.

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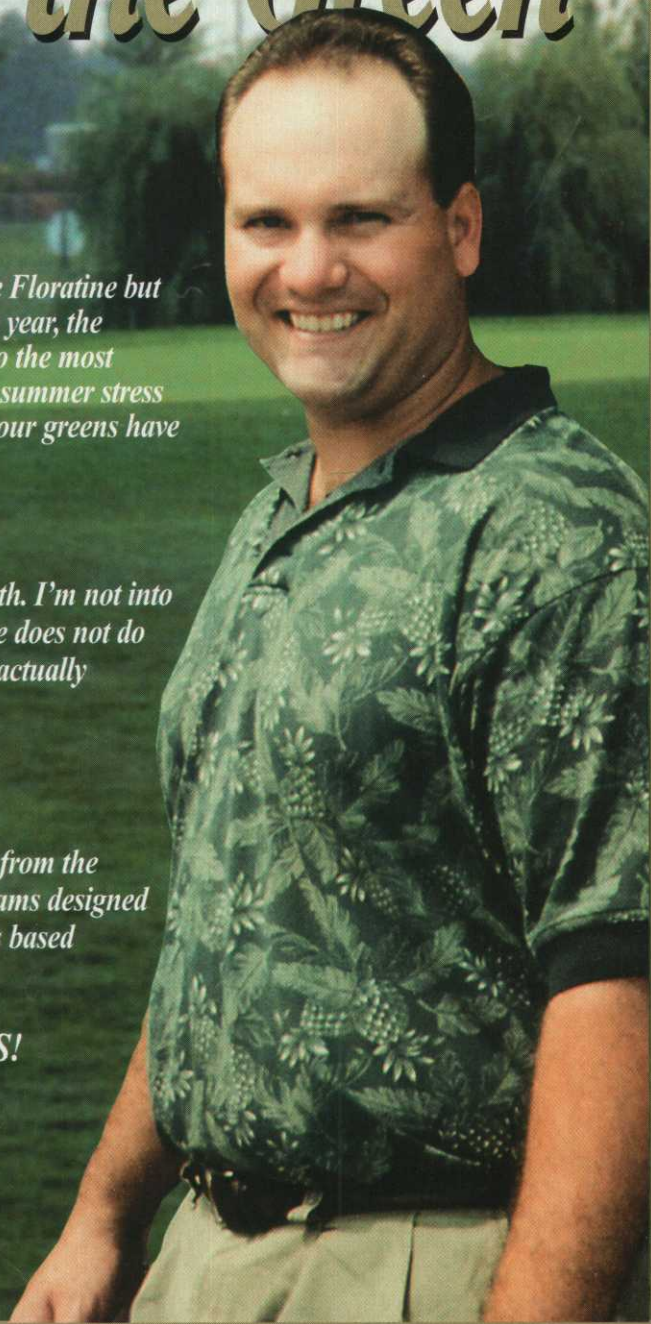
Maybe per gallon, but look at the rates and do the math. I'm not into paying for extra water and overly lush grass. Floratine does not do that. Since starting on the Floratine Program, I have actually saved money on both fertilizers and fungicides.

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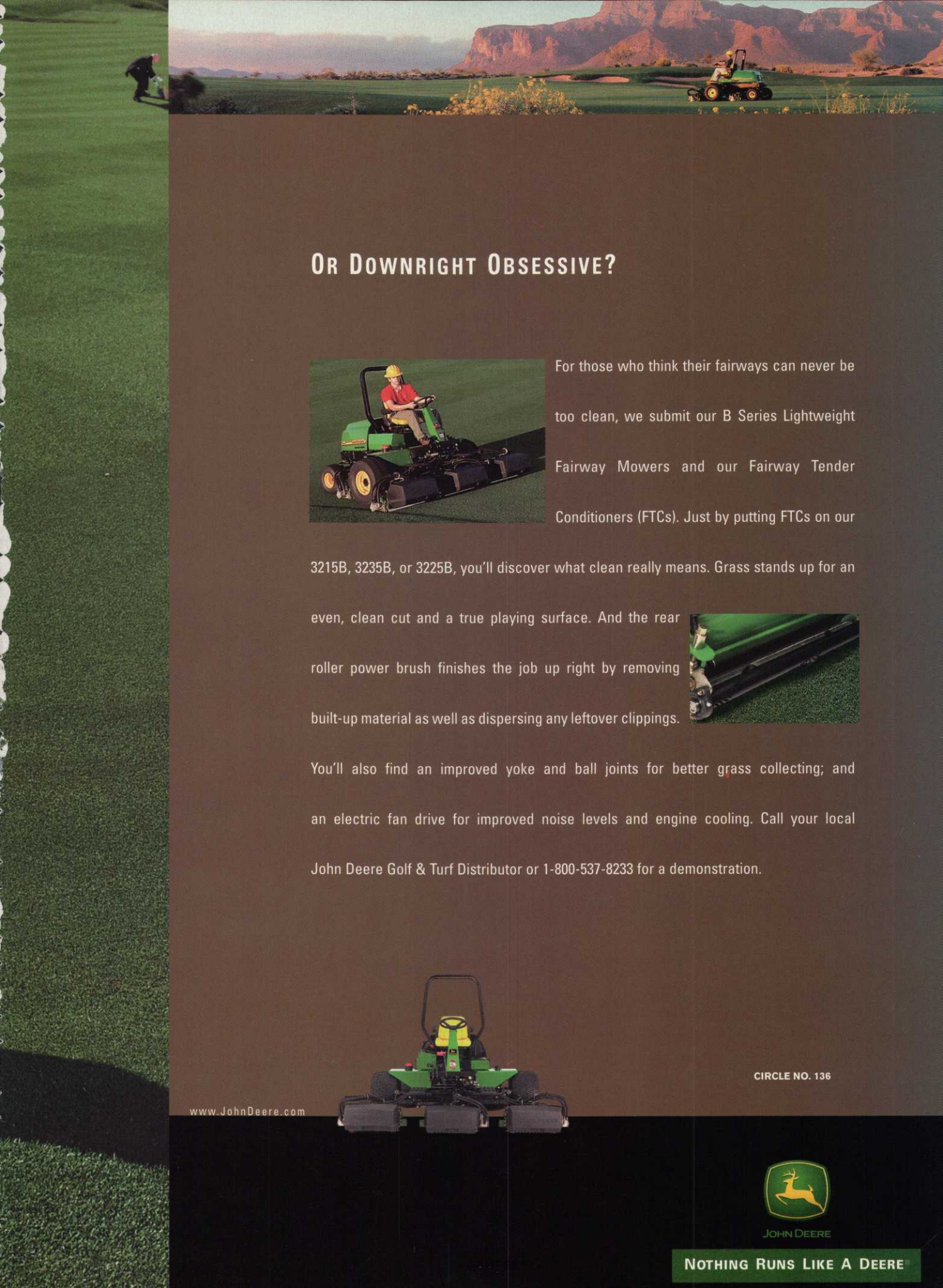
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A high-angle photograph of a golf course green. In the foreground, a man in a dark tuxedo, white shirt, and white gloves is bent over, sweeping the grass with a broom and a grey dustpan. His shadow is cast long and dark on the grass. In the background, two other men in dark suits are also bent over, working on the green. The grass is a vibrant green with visible mowing stripes. The text "PARTICULAR ABOUT YOUR FAIRWAYS?" is centered in the upper half of the image.

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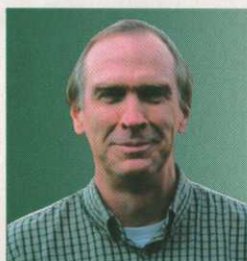
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Does Turf Affect Runoff?

Research shows turf absorbs pesticides, but doesn't filter them

BY BRUCE BRANHAM AND DAVID GARDNER

Like it or not, turfgrass management is considered a close cousin of production agriculture. Problems identified in production agriculture are assumed to apply to turf as well. Turf is also managed more intensely than a typical corn crop, which seems to be the measuring stick for production agriculture. So it may be logical for government regulators, environmental activists and concerned citizens to assume that highly maintained turfgrass sites present more risk to the environment than production agriculture.



Bruce Branham



David Gardner

will likely yield higher microbial populations than under a normal fallow soil condition.

What did we discover?

After completing these experiments with five different pesticides, some trends emerged.

Our most illuminating finding is that pesticides classified in

the immobile or moderately mobile category tend to have shorter half-lives in turf than in bare soil (Table 2). The more rapid dissipation is because of the high levels of microbial activity found in thatch.

For pesticides that are immobile, the faster rate of dissipation

Continued on page 60

The USGA supported a research project at the University of Illinois for the past three years to document pesticide dissipation in turf vs. bare soil. These side-by-side studies were designed to determine exactly the role of turfgrass and associated thatch on the fate of pesticides applied to turf.

We examined the dissipation rate and leaching of five pesticides used in turf. We focused on newer pesticides where little previous information on dissipation rates and leaching existed. The five pesticides we chose (Table 1) consisted of three fungicides, one insecticide and one herbicide. These pesticides were chosen to have a range of physical characteristics that result in differing potentials to leach.

Each pesticide was applied to bare soil or to the same soil covered with a bentgrass turf. Thus, we were able to directly compare the effect of turf with the same soil type, irrigation and natural precipitation rates. The bare soil was created by stripping the sod cover prior to pesticide application.

We acknowledge that even this comparison may be flawed since stripping the sod from a turf does not give the same kind of soil as would be found in a row cropping system. The higher level of root mass associated with turf

Table 1


Physical properties of pesticides used in dissipation studies

Pesticide	Soil absorption coefficient	Water solubility (PPM)	Previously estimated half-life (days)
propiconazole	650	110	110
halofenozide	—	510	—
ethofumesate	340	50	30
cyproconazole	—	140	90
mefanoxam	50	26,000	70

Table 2

Half-lives (in days) determined in turf or bare soil from experiments conducted in Urbana, Ill., from 1996-1999.

Pesticide	Bare soil	Turf
propiconazole	29	12-15
halofenozide	> 64	> 64
ethofumesate	51	3
cyproconazole	128	8-12
mefanoxam	7-8	5-6



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It's Academic

Continued from page 58

tion has few benefits, from an environmental perspective, since these products tend not to leach. Decreasing soil or turf residence times could reduce the likelihood of runoff of these pesticides, since they will be present in the environment for shorter periods of time. Pre-emergent herbicides, which need to remain present for several months to provide effective control, are often applied at higher rates in turf than in row crop agriculture. For this group of pesticides, field experience has already shown that pesticides break down faster in turf than in bare soil.

The real value of turf appears in the case of pesticides that are moderately mobile. These products may leach to groundwater when conditions favorable for leaching are present, such as sandy soils, high rainfall or irrigation following application, or low soil organic carbon content. In other systems, the potential for leaching of these pesticides does exist, but it appears unlikely that these products would leach to a significant extent because of the capacity of turf to sorb and degrade these compounds.

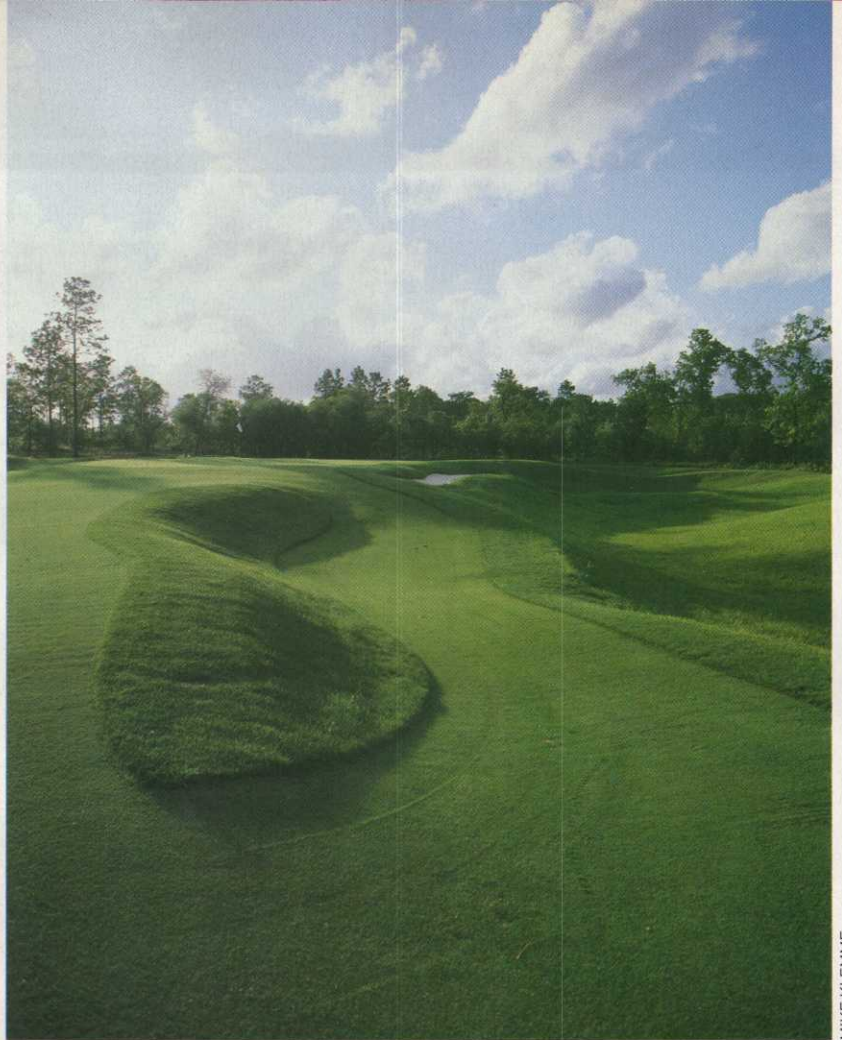
On a less positive note, pesticides classified as mobile tend to behave the same regardless of whether they are applied to turf or bare soil. We believe this is because the thatch does not retain these mobile pesticides, and so they bypass the beneficial environment of the surface layer of turf. Two mobile pesticides, mefenoxam and halofenozide, were tested and both products quickly reached the lowest layer we sampled, 6 to 12 inches, by four days after application.

These products may dissipate more rapidly in thatch than in soil but tend to move through the layer quickly and aren't there long enough to derive the benefit of thatch on pesticide dissipation. While small percentages of the total pesticide application rate leached to the lower soil depths, these are important amounts because once they reach these depths there's little likelihood they will be transformed before reaching groundwater.

One practical result of this research is the recommendation that irrigation following application of a mobile pesticide be light and infrequent as practical. While rainfall can't be controlled, irrigation should be light enough that it doesn't move these products through the thatch for the first four to seven days after application.

Does turf influence pesticide leaching?

Perhaps the best way to view turf is not as a wonderful filtration system that degrades everything we apply to it, but



MIKE KLEMME

Superintendents shouldn't view turf as a filtration system that degrades pesticides. Instead, it should be viewed as a sorptive layer that reduces potential problems rather than eliminates them.

rather a highly sorptive layer of organic matter teeming with microbial activity that will reduce the potential problems caused by the introduction of pesticides into environment. It will not eliminate these problems, but will dampen their impact on water resources.

Special care should be exercised when using pesticides that are considered mobile in soil. These products are most likely mobile in turf. Irrigation practices should be modified to retain these pesticide within the thatch layer as long as possible.

When a choice exists, choose pesticides that are classified as moderately mobile or immobile over those classified as mobile.

It is the responsibility of the superintendent to make wise choices regarding pesticides use and selection that minimize the risk of ground or surface-water contamination. You have a good system to manage, but it still must be managed well. ■

Branham is an associate professor in the turfgrass program at the University of Illinois-Urbana Champaign. David Gardner is an assistant professor in the Department of Horticulture and Crop Science at The Ohio State University in Columbus, Ohio.