Figure 1. Golf car traffic simulator ready for research at the Noer Facility.

Figure 2. Chewings fescue golf turf at Whistling Straights.

between the end of the cart path and the open fairway.

I made several visits to the BSE class and to Kevin Shinners during autumn 1998 to check on the progress of the traffic simulator and provide feedback on the construction. By December the traffic simulator was ready (Figure 1). The traffic machine has two articulated frames and will be pulled by a utility cart. Two axles of end-to-end wheels provide uniform traffic across the five-foot wide plots. The majority of the wheels and tires were graciously donated by Club Car of Racine, WI. Four 50 gallon barrels were used to provide the proper loading—when filled with water, these barrels, plus the steel frame assembly, match the weight of a typical golf cart carrying two passengers and clubs. The BSE department provided most materials while I supplied funding for a few pieces not in the BSE inventory.

When construction was completed, Kevin told me two significant pieces of information. First, if he were to build a second machine he would have to charge a minimum of $5000 to cover costs. Since it was a class project my total cost was only $500, which shows what can be done at the university if the right contacts and opportunities are found. Second, building the traffic simulator was a lot of fun. Kevin apparently told his department chair that working on turf equipment was more exciting than working on traditional agriculture equipment. This was good news for us in the turf program, as we will always need political support for our program as it competes with programs based on edible commodities for resources including funding. Kevin and the BSE department thought highly enough of the contraption they showed it at a meeting of the agriculture engineers at Dane County Coliseum (Figure 1).

The NTEP plots were planted in early September 1998. Initial mowing was at 3/4 inch. This spring we raised the mowing height to 7/8 inch and applied a broadleaf herbicide. Plots are filling in nicely and will be on display for field day. Traffic simulations will begin spring 2000. Over the next several years we hope to be able to provide crucial information about the ability of various fine fescue species and cultivars to tolerate fairway conditions in Wisconsin. Fine fescue fairways are already gaining cautious use across the U.S. Widow's Peak in Massachusetts gained notoriety in the mid 1990's for planting fine fescue fairways; the nine hole Highland Links Course at the environmentally fragile Headlands of the Cape Cod National Seashore also was planted to predominantly fine fescue fairways and roughs. In Wisconsin, Whistling Straights has pioneered the use of fine fescue fairways using Chewings fescue maintained at 15/16 inch (Figure 2).

The future of fine fescue golf turf

There is little question fine fescue fairways will play differently compared to bluegrass or bentgrass. During summer, the turf will likely be browner than most people are used to, and the non-irrigated surfaces will cause more ball bounce. The reduced thatch and dry soil will impact golfer's swings, likely resulting in shallower divots. Disease management may be an important issue, as leaf spot (*Bipolaris sorokiniana*) and net blotch (*Drechslera dictyoides*) diseases can be severe to fine fescues and little breeding has been performed with these diseases in mind. Red thread (*Laetisaria fuciformis*) and dollar spot (*Sclerotinia homeocarpa*) may also be a problem on unfertilized, non-irrigated fine fescue fairways. Still, with the public demand for more golf courses, a great market for links style courses, and a public cry for environmentally sustainable golf courses, fine fescue fairways are likely to become more commonplace. With well-drained, non-irrigated fairways in Wisconsin, some superintendents may finally have an avenue to thwart *P. annua*.

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Japanese Beetles: An Invasive Pest

By Dr. R. Chris Williamson, *Turfgrass and Ornamental Entomologist, University of Wisconsin-Madison*

History

The Japanese beetle is a native of Japan. It was accidentally introduced into the United States in 1916 near Riverton, New Jersey allegedly in root-ball nursery stock containing larvae (grubs). Since then, it has spread and is currently present from southern Maine to South Carolina and Georgia and westward to Illinois, Iowa, Missouri, and portions of Wisconsin and Minnesota as well as parts of southern Ontario. As for the state of Wisconsin, currently, Japanese beetle infestations have been confirmed in Beloit, Eau Claire, Milwaukee, and the westside of Madison.

Importance

The Japanese beetle is one of the most important and destructive pests of turfgrass and woody-ornamental plants in the eastern United States. Many millions of dollars are spent each year to control Japanese beetle adults and grubs, and for replacing and renovation of damaged turf and ornamentals. Adult beetles attack a wide range (over 300 species) of ornamental plants. To make matters worse, Japanese beetle grubs are also destructive. They typically feed on the roots of all cool-season turfgrasses and on ornamental plant roots. This feeding can cause severe damage or death to plants.

Description

Japanese beetle adults are shiny, metallic green, oval, and approximately 1/2 inch long. They have coppery-brown wing covers with five patches of white hairs along the sides of their bodies. Male Japanese beetle adults are

usually smaller than females, but otherwise look similar. The eggs are approximately 1/16 inch long, oblong, and pearly white. Upon absorbing moisture from the soil, they double in size within a couple of days becoming spherical in shape. Thereafter, larvae emerge from the embryo. Japanese beetle grubs have three pairs of jointed legs, and a yellow-brown head capsule. Like other white grub species, Japanese beetle grubs assume the C-shape position in the soil. They can be readily identified by their distinctive arrangement of hairs on the ventral (underside) of their abdomen (rear) near their anus. The arrangement of hairs includes two rows of short spines that are arranged in the shape of a truncated V pattern.

Damage Symptoms

Japanese beetle adults usually feed from the upper leaf surface, leaving only a lace-like skeleton of veins. Feeding damaged caused by adults beetles results in leaves turning brown, dying, and eventually falling-off. Certain plant materials are preferred over others. Preferred hosts include lindens, grapes, Norway maples, purple-leaf plums, and roses to name a few. Adult beetles are particularly attracted to flowers and fruits.

The Japanese beetle grubs are below-ground feeders that feed on the roots and rhizomes of all commonly used turfgrass species, cultivars, and varieties. They can eliminate the plant's entire root system. Where abundant, grubs can destroy large areas of turf in a relatively short period of time. First evidence of injury by grubs is localized-patches of pale, discolored and dying turfgrass that displays symptoms of drought stress. The small damaged areas rapidly enlarge and coalesce as grubs grow and expand their feeding range. Such areas of turf will have a "spongy" feel under foot and can be easily lifted or rolled much like a carpet. Raccoons, moles, and skunks are highly attracted to white grub infested turf, and the foraging of these animals are strong indicators of white grub activity. Also, flocks of birds, especially starlings, feeding are potential indicators of possible white grub infestations.

Life Cycle

The Japanese beetle has a one-year life cycle. Adults emerge from the soil beginning mid to late-June, and peak adult activity occurs in mid-July in Wisconsin. Mating and egg laying begins soon after emergence. Virgin females produce a pheromone (air-borne sex attractant) that attracts males. Greater than 20 males may aggregate on the ground around a single female. Japanese beetle adults typically feed in direct sunlight in groups on foliage that has been damaged by other Japanese beetles. Adult feeding usually begins at the top of a tree or shrub and progresses down until most of the plant foliage has been fed upon. Adults prefer to feed in groups in direct sunlight on foliage that has been damaged by other adults. Once mated, females leave host plants in the late afternoon and fly to suitable sites to begin laying eggs. They prefer to lay eggs in areas with moist, loamy soils covered with turf or pasture grasses, particularly when sites are located near preferred food plants. Females will lay their eggs in irrigated turf rather than in dry, compacted soil. Each females lays between 1—4 eggs in the upper three inches of soil, and this cycle is repeated every few days until the life-span of the female is completed. A typical life-span ranges from 30—45 days and as many as 60 eggs can be laid by each female.

Eggs usually hatch in approximately two weeks depending upon environmental conditions. Thereafter,

the young grubs (first instar) begin feeding on the fine roots and organic matter in the upper three inches of soil where the eggs were laid. Grubs go through a physiological process called molting, whereby the insect grows from a certain life stage (instar) to an advanced or larger stage. Japanese beetle grubs remain in the second instar for approximately 2—3 weeks and the third instar for 3—4 weeks. Later in the summer (late August), most grubs will feed in the upper two inches of the soil, however they will burrow deeper during periods of drought. The grubs will continue to feed and grow until late fall, or around the first frost. Thereafter, the grubs will begin to burrow deeper as soil temperature fall below 60 degrees Fahrenheit. Most grubs will overwinter 2—8 inches in the soil. However, grubs will continue to burrow further into the soil profile as soil temperatures continue decrease. As soil temperatures begin to reach 50 degrees Fahrenheit in the spring, grubs will move back into the root zone and resume feeding vigorously for another 4—6 weeks. After this event, the grubs will burrow slightly deeper to begin preparation of a earthen cell which is created for the Japanese beetle to transform (pupate) from the grub stage into the adult beetle whereby it begins its life-cycle over again.

Management

Adults

Plant Selection

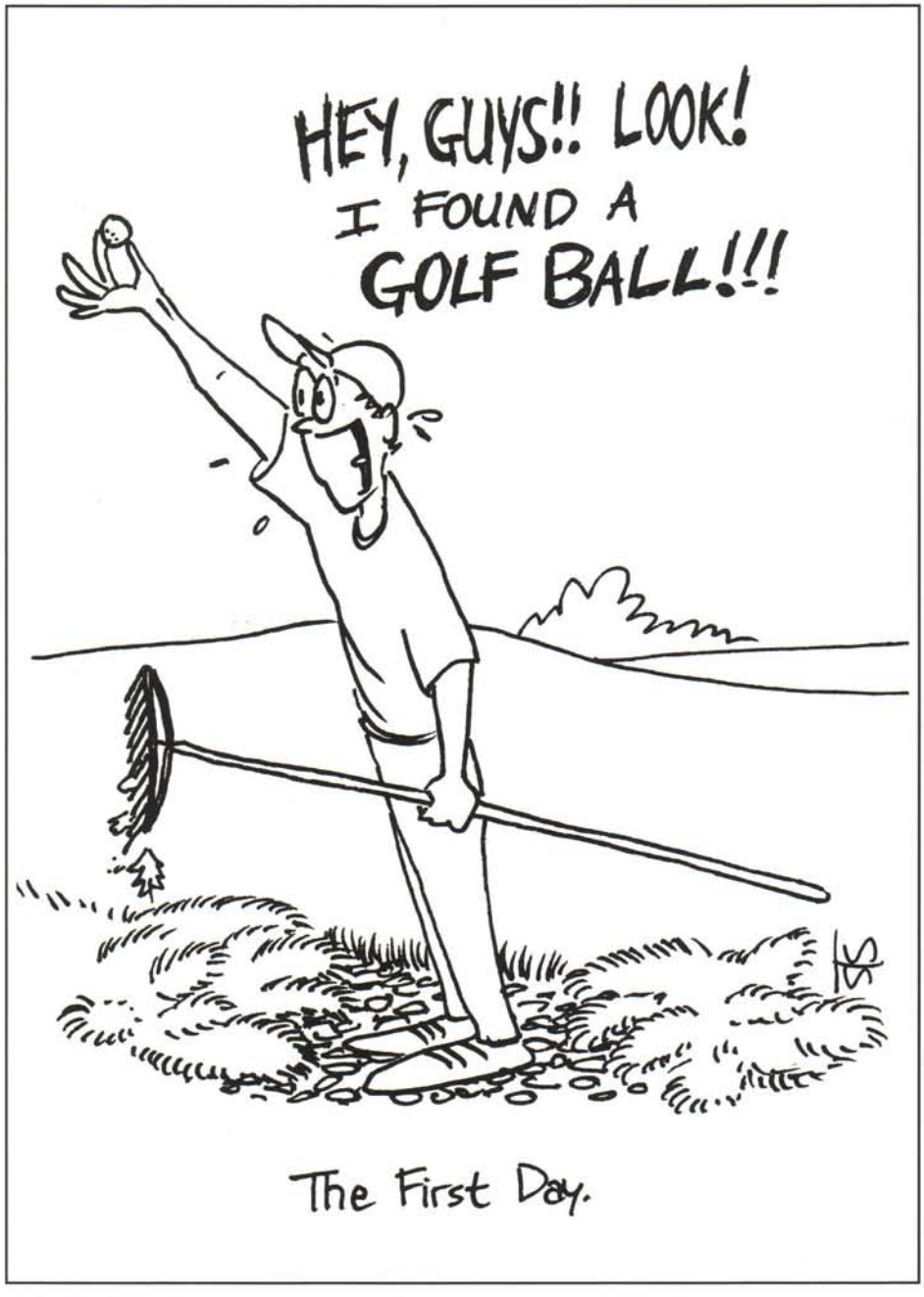
The use of resistant plant species when planning a landscape or replacing plant materials is essential to managing Japanese beetle adults. Certain plants are highly attractive and often sustain heavy feeding damage. Also, other plants such as grapes, multiflora rose, sassafras, smartweed, and Virginia creeper may attract adult beetles resulting in a higher incidence of egg-laying in adjacent turf.

Trapping

There are commercial Japanese beetle traps available, however, research studies have shown that the use of such traps will not protect a landscape from damage. In fact, traps attract more beetles than what are caught, thus susceptible plant material in the vicinity of the traps are likely to sustain greater damage than if no traps were used.

Chemical Control

A number of insecticides are labeled for use for control of Japanese beetle adults. However, the number and selection of products available to a homeowner is vastly different (limited) from what is available to commercial or licensed applicators. Homeowner have a select few products in



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which to choose. They include carbaryl (Sevin), acepahte (Orthene), diazinon, and permethrin. The aforementioned products are foliage sprays only, and where beetles are abundant, they require weekly applications to protect susceptible host plants. As for licensed applicators, many more products are available. Such products include pyrethroids (Astro, Delta Guard, Scimitar, Talstar, and Tempo) imidacloprid (Merit), acephate (Orthene), and carbaryl (Sevin).

Grubs

Cultural Control

Because eggs and young grubs can not survive relatively dry soils, withholding irrigation during peak adult beetle flight may help to reduce respective grub populations. However, adequate moisture in late August and September can help the turf tolerate and/or recover from grub damage.

Biological Control

There are plethora of biological products that allegedly control Japanese beetle grubs, however performance of many of these products has been quite inconsistent. Such products include Milky disease spore, insect-infecting nematodes, and fungal pathogens such as *Beauveria bassiana* and *Metarrhizium*.

Chemical Control

Most soil insecticides provide adequate control of Japanese beetle grubs, as well as other white grub species. However, specific criteria or conditions must be fulfilled in order for achieve optimal control. These include factors such as accurate timing of the treatment, treatment must be watered into the turf, and minimal thatch must be present. Until now, the most common approach to grub control was to apply short-residual insecticides after eggs had hatched, and before grubs had caused visible damage. This approach is termed "curative" control. And, the ideal treatment time is early to mid-August. Such curative treatments can be applied later even after the damage appears, but larger grubs (2nd and 3rd instars) are more difficult to control. Similar to the control products available to homeowners for adult beetle control, licensed applicators have a few more products available. From a curative control perspective, homeowners and commercial applicators only have a few options for effective grub control. These products include: diazinon (homeowner and commercial), carbaryl (Sevin, homeowner and commercial), trichlorfon (Dylox/Proxol, commercial only), and chlorpyrifos (Dursban, homeowner and commercial). Although Dursban is labeled for grub control, it is a poor choice. Because spring grubs are distributed variably throughout the soil profile, curative spring grub control applications are not recommended.

Due to the development of novel or improved grub control products, preventative treatments of long-residual insecticides are now available and seem to be the preferred control or management strategy of many turfgrass managers and homeowners. As a result, turfgrass managers are choosing to apply products such as halofenozide (Mach 2 and Grub-Be-Gone, commercial and homeowner, respectively) and imidacloprid (Merit and Grub-X, commercial and homeowner, respectively) during May, June, or July to control young grubs that hatch in late July and early August. This approach seems to provide added value from the standpoint of an "insurance policy" against potential grub damage.

Plans are in Full Swing

By Tom Schwab, O.J. Noer Turfgrass Research and Education Facility, University of Wisconsin-Madison

Tons of activities have been taking place at the Noer Facility this spring and summer. Most of this action is focused towards presenting the professional turfgrass industry with as much relevant information as possible during the Wisconsin Turfgrass Association (WTA) Summer Field Day. Over 15 different professors, students, and other helpers are working at the facility every day -- doing research, building new projects, and beautifying the grounds in an effort to bring you a top-notch field day. We hope every one of you can attend this informative and fun event this year, which will be held on Tuesday, August 10th.

This year's field day will include more formal presentations and more speakers than ever before. New on the program are entomologist Dr. Chris Williamson, plant pathologist Dr. Doug Maxwell, and turfgrass breeder Dr. Michael Casler. Jeff Gregos, Dr. John Stier, Dr. Wayne Kussow, Gary Gaard, myself, and several graduate students will also be on the program. Two separate research tours will take place starting at 8:45. One will concentrate on golf concerns, while the second will focus on studies for athletic fields, sod, landscaping, and lawn care. Additional educational attractions will include a wildlife tour, ornamental grass demonstration, athletic field painting clinic, and one-on-one informal conversation with the researchers.

No doubt you will also enjoy the informative trade show. Over 50 different exhibitors will display their latest products, equipment, and services for our industry. As always, there will be lively equipment demonstrations where you can observe mowers side-by-side and hear about features from factory representatives. Or take a personal test-drive yourself to check out the performance of different equipment. The exhibitors also sponsor a silent auction during the trade show where many deals can be found. The auction proceeds help to support important turf research at the University of Wisconsin-Madison.

New members that join WTA this year can find another deal at Field Day - free admission. The field day is still a bargain for other attendees. Admission includes all the features mentioned above in addition to coffee and donuts and a wonderful lunch. It also provides a nice time to visit with peers. A first mailing with registration information was sent out in June. Or use the enclosed registration form that you'll find in the Grass Roots. You may call WTA administrative secretary, Audra Anderson, at 608-845-6536 if you have any questions.

NOTES FROM THE NOER FACILITY

Where Did Thirty Years Go?

By Monroe S. Miller, *Golf Course Superintendent, Blackhawk Country Club*

A few months ago I received a letter from a couple of guys I hadn't heard from or spoken to for almost 30 years. They were Army buddies, men I was stationed with in a military police unit at Long Binh, RVN, about 25 miles north of Saigon. I got to know them and scores of others really well during that 1969 - 1970 period of my life.

I hadn't thought about them much, either. When I returned to Wisconsin in October of 1970, I was right back to grad school under Professor Love, working as a TA in his soil science course, studying hard on my own course work, and organizing a research project. Most important, I was trying to be a good husband and father. Army buddies, sad to say, were pushed to the back reaches of my mind.

Over the many years since that time, I have exchanged Christmas cards with one guy from Connecticut, and for a few years after my discharge from the Army I occasionally would speak to a buddy in Minneapolis and another in Michigan. But that was it.

The years have whizzed by. I have been really busy, it seems, and have not dwelled long on that difficult part of my past.

But then there was the call from my Dad two summers ago. The soldier who was with Dad's 18 year old brother - Malcolm, my uncle - when he was killed by the Germans in France in WWII wanted to stop and see any of Malcolm's family still living in southwest Wisconsin. We gathered in our hometown and the meeting was emotional beyond words.

The movie *Saving Private Ryan* was an overwhelming experience for any GI who had been in a war. It inspired me to record my Uncle Bud's WWII duty - his foot march across Europe as a rifleman in Patton's Army.

Like most American families, ours has a past firmly entrenched in military service to the country - Korea, the war against the Nazis, the war to end all wars, the Civil War and on back to the American Revolution. Duty, honor and country carried meaning.

The day after graduation in 1968 brought me a draft notice. When all was said and done, I entered into the military in the cold weather of January 1969 when the UW - Madison campus was torn apart by student riots. What a sendoff to a group of young people, off to be trained to be "baby killers", the protesters said.

For whatever reasons, I didn't ask questions about the Vietnam conflict and its legitimacy. We all owe something to our country; we all have an obligation. And my turn had come. It was really quite simple. As I took off for a trip that would lead me to Fort Campbell, Kentucky for basic training and Fort Gordon, Georgia for military police school, I only prayed for good luck and maybe a break here or there. It was the best I could do.

I will never forget standing at attention in the company compound at Fort Gordon, lined up alphabetically, to receive our duty orders that had come down from the Pentagon. Actually, after the first fifty guys or so, I was nearly euphoric; every assignment was a plum. There were orders for guarding missile sites in the Dakotas, guards for the Army finance center somewhere in Indiana, duty with MP units in Germany, Italy and Turkey. I was already making mental plans for some serious travel! The guy next to me, on my right, was sent to Fort Lee, Virginia, and I was thinking that was where I was going, too. The company first sergeant called my name. I stepped forward. Then, he asked me an odd question.

"Are you a tiger, boy?"

I wasn't exactly sure of what to say, but in the Army you learn not to question, so I replied loudly and confidently, "Yes, First Sergeant!"

"You better be, boy," he returned, " 'cause you're goin' to 'Nam."

I nearly fainted as I stepped back into line. I could hear guys on either side of me - those already given good assignments and those not yet assigned - gasp. From Miller on to the last man in the company line, the destination was our nightmare come true.

Afterwards, I faced the horrifying task of telling my wife and my parents, so that they would know as much as I did and when I knew it. I