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ABOUT THE COVER

Jennifer Samerdyke captures the sense of a late winter/very early spring day with this scene from outside the shop at the 9-hole golf course Buckhill Falls Golf Club in west central Wisconsin.

The 1972 Jacobsen F-10, made in Racine, has patiently waited through the winter, waiting for a new season to arrive. This will be the 24th season at Buckhill Falls for the trusty and durable fairway mower and tractor.

"Precious as are all the seasons of the year, none so rejoices the heart as Spring. There is about Spring a gladness that thrills the soul and lifts it up into regions of spiritual sunshine."
- Helen Keller

THE GRASS ROOTS

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Are You Ready?

By Marc Davison, *Golf Course Superintendent, Green Bay Country Club*

Is the winter dragging along for you? I always think about all the projects I need to get done once the golf season comes to a close, when I can relax and do the things I need to do that always seem to get pushed off during the season. All those projects at home, all those magazine articles that accumulate on my desk over the months that I need to read etc. Well, my winters seem to get busier each year. Do yours? It probably doesn't help that I am gone most weekends with two boys playing hockey, travel hockey. It seems to be the perfect fit for our occupation, assuming you never want to sit home or sleep in. We have a good time nonetheless.

Board member David Van Auken has resigned from his position on our board. Dave is not currently employed as a superintendent. Our association's bylaws require board members to be employed as Class A or B superintendents. I would like to thank Dave for his time and efforts while on the board and wish him the best of luck in the future. Randy Dupont has agreed to fill this vacancy on the board. Randy will chair the golf and arrangements committee. I would like to thank Randy for his willingness to serve our association.

On Tuesday Feb. 15, 218 members of the Green Industry attended the first ever "Green Industry Day on the Hill" event in Madison. The Green Industry is comprised of numerous organizations involved in some way in the horticulture field such as: sod growers, golf course owners, superintendents, arborists, Christmas tree growers, nurserymen, sports turf managers, florists, landscape contractors, landscape architects, garden center personnel and the numerous companies that supply products to our industry. There are over 4,700 businesses that employ over 43,000 workers in these areas in Wisconsin. We are part of an annual $2.7 billion industry in our state.

The intent of the day was to meet our state senators and representatives and tell them about the magnitude of our industry and the impact we have on our state's economy. We presented them with the Green Industry Survey results. We also expressed concern on various topics that affect our profession such as: our concern for the environment, fertilizer and pesticide regulations, labor issues, health care benefits for the small business and various other topics.

We went in small groups to visit with the lawmakers from our home districts. It was nice to meet these legislatures or in some cases their staff. We left each lawmaker a folder full of information on the Green Industry for their future reference.

Brian Swingle, the Executive Director of the Landscape Federation, organized this entire event. Brian did a wonderful job as always and we all owe him a big thank you. Thank you also to the superintendents and others from the WGCSA that attended as well.

Monroe Miller once again received the first place award in GCSAA's Chapter Newsletter contest, category 2. This is the 21st time Monroe has received this award for his outstanding work in producing The Grass Roots. Monroe spends a great deal of time each month developing this exceptional publication. We are truly blessed and honored to have him as our editor. Congratulations, Monroe, and thanks for all your hard work!

Congratulations also need to go out to Dr. Geunhwa Jung in Plant Pathology. Geunhwa has been awarded a GCSAA grant to continue his snow mold research work this year. The WGCSA has supported his work over the years but getting extra funding from GCSAA is a tremendous boost for Dr. Jung's project.

People vs. Pro is a new nationwide golf tournament coming to one of our monthly meetings this year. The winner from each participating chapter will move to compete on a national level. BASF is sponsoring this event to help promote the golf course superintendent profession. Look for more on this in the future.

Jake Schneider was awarded the J. R. Love scholarship at the WTA Conference back in January. Jake is in the turf program in Madison. The WGCSA funds this scholarship every year. And then he travelled to to GCSAA conference in Orlando and accepted a GCSAA scholarship and was chosen as a Scotts Scholar as a top turf student in the country. Congratulations, Jake!

Dr. Wayne Kussow is planning to retire this year. He has been teaching soil science and turfgrass classes at the University of Wisconsin for the past 22 years. Dr. Kussow has been a wonderful friend to us all during his career and we will miss him when he retires. Thank him for all he has done for our association and wish him an enjoyable retirement.

Get those winter projects finished up; spring will be here before we know it.

When Ice Kills

By Dr. John Stier, *Department of Horticulture, University of Wisconsin-Madison*

Winterkill of turf is a serious issue in our part of the country. The major causes of winterkill (snow molds, desiccation, low temperature) were reviewed in a previous issue of The Grass Roots (Stier, 2003). This year, though, the primary concern seems to center on ice. During my eight winters in Wisconsin, this is the first year that ice has been an issue. The purpose of this article is to describe why ice can be deadly to turf, particularly putting greens, and to provide information on what to do before it's too late.

Some turf, such as Kentucky bluegrass lawns, can withstand ice cover for extended lengths of time as found in backyard skating rinks. But we worry about putting greens and fairways. Why is that? Textbooks tell us that creeping bentgrass is more cold tolerant than Kentucky bluegrass. But the issue is deeper: first, tolerance to ice is not necessarily the same as cold tolerance; secondly, many golf turfs have an abundance of annual bluegrass (Poa annua) which isn't as cold tolerant as creeping bentgrass or Kentucky bluegrass.

Types of ice matter

Clear ice has high density which greatly restricts air movement between the soil and aboveground air. Ice with a whitish or milky appearance is less dense and does not restrict air movement as much. Whether ice forms above or below snow can also matter. In general, a sheet of ice forming over an uncompacted snow layer is less likely to cause turf injury than ice forming under a snow layer (Beard, 1973). The uncompacted snow layer allows air movement, thus an ice sheet above the snow has less of an effect than ice underneath a snow layer. But the type of snow matters too: compacted snow also restricts air movement compared to uncompacted snow. This can be one of the reasons winterkill can occur under snowmobile tracks. Unfortunately, I've never seen any information on the effects different depths of ice may have on

the turf. I expect it will vary with the situation, with increasing thickness of ice being more detrimental than thin ice, especially as winter progresses into spring and low temperature hardiness decreases.

Why is air movement important during the winter?

Despite freezing conditions, all living organisms continue to respire during winter. This includes both turf and soil microbes. Oxygen-loving organisms, or aerophiles (including humans), use oxygen as an electron acceptor during respiration in order to use energy necessary for survival. Carbon dioxide (CO_2) gas is produced by respiration and, if trapped under ice, may lead to turf death. Occasionally fungi can produce deadly levels of cyanide under ice (Lebeau, 1966; Lebeau and Cormack, 1956). Both gases can be toxic at relatively low concentrations. In addition, the lack of oxygen essentially stops respiration: a situation known as anoxia. Though anoxia may be less frequent than a buildup of toxic gases, Rochette et al. (2000) reported that anoxia occurs within 60 days of ice cover and kills turf within 100 days.

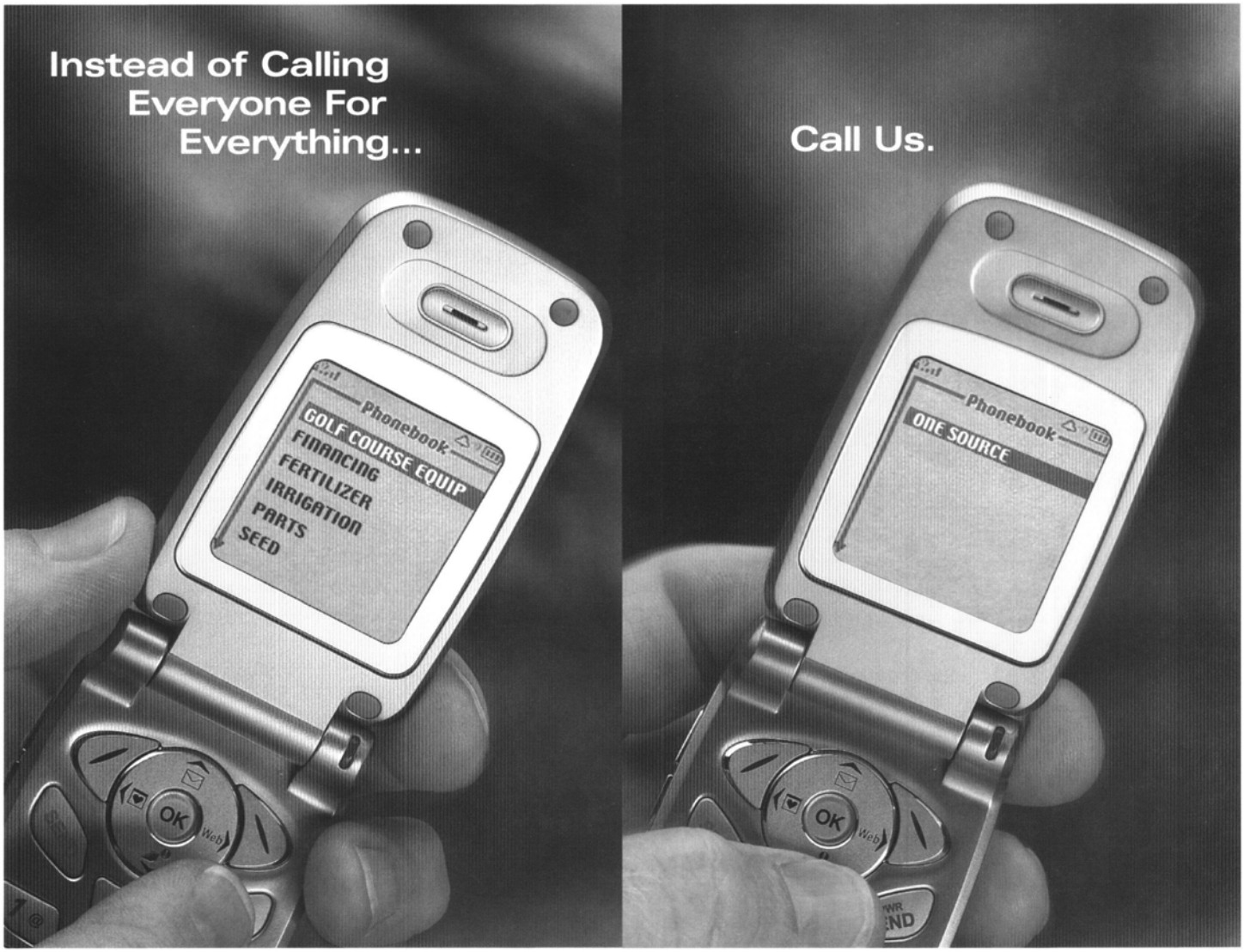
Ice problems may worsen as the winter continues

Cold tolerance of turfgrasses is at its maximum in December and January. Cold tolerance begins to decline during February, and is essentially lost in March. Unfortunately, March often brings thaws which melt snow and ice, but the liquid moisture can easily be re-frozen during a single cold night. Part of the hardening process that occurs in late autumn includes a mild loss of water from the plant tissues. Thawed plants are likely to reabsorb moisture which, if quickly frozen, can generate ice crystals within or between the plant cells, essentially causing low temperature kill. In these cases ice formation on the turf surface may not be at fault.

What about turfgrass types?

Grass type has a huge impact on the potential for ice to kill turf. Research published in the 1960s indicated annual bluegrass tolerated ice cover for less than 75 days, while creeping bentgrass survived 120 days under ice (Beard, 1964; Beard, 1965). More recently, Tompkins et al. (2004) brought a more narrow focus to these parameters through a combination of laboratory and field studies. In both cases, greens-height turf of annual bluegrass (biotype MN 42) and creeping bentgrass (cv. Penncross) was either covered with snow, or ice, or saturated with water which was allowed to freeze followed by placing an ice "cap" on the turf. In the field study, ice was removed from half of each treatment 45 days after it was formed. Turf samples were removed at 15 to 30 day intervals over several months. Results showed that cold hardiness decreased faster under ice cover than under snow cover, particularly for annual bluegrass. In their field study, annual bluegrass died between 60 and 75 days after ice cover, whether or not ice was removed 45 days after it formed. Creeping bentgrass was still alive at the end of the 90 day field trial and the 150 day laboratory trial. The authors concluded that if ice is to last for 60 days or longer on annual bluegrass, then ice removal needs to occur sooner than 45 days after it forms in order to protect the turf.

Though the limited information which is available agrees that annual bluegrass is less tolerant of ice than creeping bentgrass, the biotype of annual bluegrass may also be important. Dionne et al. (2001) collected annual bluegrass from western Pennsylvania, coastal Maryland, and central Quebec. Plants were subjected to sub-freezing temperatures in freezers, and the lethal temperature to kill 50% of the plants (LT50) was determined. Annual bluegrass from Quebec was more cold-tolerant than plants from Maryland or Pennsylvania (LT_{50} values of 14.7 °F versus 18.3 and 19.6 °F, respectively-remember, ground temperatures below ice or snow may be warmer than air temperatures, which is why turf won't necessarily be killed by an air temperature of -5 °F).



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Avoiding ice damage

Good drainage is essential to avoiding ice problems. Both internal and surface drainage are important. Remember the skating rink situation discussed at the beginning of the article? Turf in backyard skating rinks can survive extended periods under ice if the soil and turf is first frozen before surface ice forms. In this case, internal drainage must be good to ensure the soil is not saturated prior to freezing conditions. Good internal drainage prevents excessive ice formation in the soil which could either desiccate roots or lead to direct freezing injury. Research at the University of Wisconsin showed freezing begins first in small roots then rapidly progresses up into the crown (Stier et al., 2003), killing the growing point for new roots. This phenomenon explained why *P. annua* leaves may be green as winter turns to spring, but the plants eventually die for lack of a root system. Secondly, surface drainage must be good: as the ice melts, it must be able to move off-site before re-freezing on the turf. Since ice melts from the surface downwards, the ground is usually frozen while surface snow and ice are melting. Thus, surface slope must be sufficient to provide surface drainage as ice melts.

A second way to avoid ice damage is to remove ice that forms. One method is to melt the ice then remove the water before it refreezes. Ice could be melted using heat, though it takes a lot of energy and is usually cost-prohibitive. In fact, I've never seen it done. (Incidentally, don't pour hot water on the ice because it will quickly refreeze and you'll only make the problem worse.) A second way to remove ice is to melt it passively. This is done by applying a dark material such as Milorganite or black sand. The dark colors absorb solar heat on sunny days to melt through ice. Not all of the ice needs to be melted as long as air exchange can occur. Unfortunately there are no research data on the amount of material to apply because that will depend on ice thickness, air temperature, and sunlight. Water-soluble fertilizer such as urea can also be applied, but caution must be used as excessive rates can cause salt damage to the turf. Road de-icers are generally not suitable, though our research is continuing this winter with experimental products. A third option is to chip the ice away using core aerators, shovels, picks, or other equipment. Not all of the ice needs to be removed-Beard (1973) suggested holes made at 1 to 3 foot intervals could be sufficient.

Knowing the causes of any problem make it possible to develop a solution. If ice has completely encased the turf and surrounding soil, removing the ice from the surface may not be sufficient. If this happens, it's time to convince the Green Committee that the time has come to rebuild or regrade the area, re-grassing it with creeping bentgrass. Fortunately, ice is usually the least likely cause for turf death during the winter. Remember, annual bluegrass should be able to withstand up to 60 days of ice cover, while creeping bentgrass should withstand nearly 4 months or longer. If ice cover occurs early in the winter it may be worthwhile to at least punch holes in it; if it occurs with 2 months or less of winter to go, it usually can be left alone.

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Invasive Insect Species: Unwanted Invaders!

By Dr. R. Chris Williamson, *Department of Entomology, University of Wisconsin-Madison*

Invasive insect species are exotic insects or alien invaders that are not native to North America, nor are they wanted! So, how did they get here and what threat do they pose to us? These two questions are often very difficult to answer directly. There are frequently many factors associated with how an exotic insect species makes its way into the United States. And, once its get here, it is difficult to predict the potential negative impact (if any) that an alien invader may have on our various agricultural ecosystems.

Exotic insects can, and often pose serious problems to agricultural ecosystems that are not accustomed to them. In these new environments, there are typically few or no predators, parasites, or diseases to keep the alien invader populations in check. Sometimes exotic species multiply so quickly that individuals cover all available habitat, literally crowding out other desired species, as in the case of the Multicolored Asian Lady Beetle (*Harmonia axyridis* (Pallas)). Sometimes an exotic species out-competes all related species, as in the case of the Red Imported Fire Ant (*Solenopsis invicta*), which in the Southern United States has caused not only a decline in native ants species, but also population decreases of ground-dwelling birds, mammals, and reptiles.

There are numerous examples of exotic insect species that have been introduced into the United States. They include: Gypsy Moth (*Lymantria dispar*), Japanese Beetle (*Popillia japonica* Newman), Asian Longhorned Beetle (*Anoplophora glabripennis*), Multicolored Asian Lady Beetle, Red Imported Fire Ant (*Solenopsis invicta*), as well as

several others. Two insect species whose recent introduction to the United States has generated a lot of concern are the Emerald Ash Borer (*Agrilus planipennis* Fairmaire) and the Asian Tiger Mosquito (*Aedes albopictus*). It is suggested that both these species entered the United States via commercial shipments from Asia within the past 10-20 years.

The Emerald Ash Borer (EAB), *Agrilus planipennis* Fairmaire, is an exotic beetle that was discovered in southeastern Michigan near Detroit in the summer of 2002. The larvae (immature stage) feed on the inner bark of ash trees, disrupting the tree's ability to transport water and nutrients. It is suggested that EAB likely arrived in the United States on solid wood packing material carried over 8-10 years previously in cargo ships or airplanes originating in its native Asia. In Michigan it has only been found in ash trees. Ash trees in woodlots as well as landscaped areas are affected. For the most part, affected trees or branches appear to be at least 2 inches in diameter and larger. All species of North American ash species (*Fraxinus* spp.) appear to be susceptible.

EAB is also established in Windsor, Ontario; it was found in Ohio in 2003 and northern Indiana in 2004. Since its discovery, EAB has: 1) killed at least 12 million trees in Michigan, Ohio and Indiana, most devastation occurring in southeastern Michigan; 2) caused regulatory agencies to enforce quarantines in Indiana, Michigan, and Ohio and fines to prevent potentially infested ash trees, logs, or firewood from moving out of areas where EAB occurs; and 3) cost municipalities, property owners, nursery operators, and forest product industries tens of millions of dollars.

The Asian Tiger Mosquito, *Aedes albopictus*, is native to southern and eastern Asia. This mosquito was first found in North America near Houston, Texas, in 1985, and is thought to have entered the country with a shipment of used tires. Since that time it has spread widely throughout the United States, especially through the southeast of the country. By 1992 it was considered to be established as far north as Delaware and Minnesota, and a 1999 survey showed that it was established in 25 states.

In its native range, the Asian Tiger Mosquito is an efficient vector of dengue fever, and laboratory work has shown that it is also an efficient vector of Eastern Equine Encephalitis (EEE) virus. Although transmission usually occurs in tropical or subtropical areas, public health specialists are concerned that if dengue is introduced to the United States from the Caribbean area, the presence of this mosquito will make it difficult to eradicate the dengue virus.

The EEE virus normally cycles between passerine birds (songbirds, which include American Robin and Northern Mockingbird) and the mosquito *Culiseta melanura*, in forested wetlands. The Asian Tiger Mosquito feeds exclusively on birds and, thus, does not transmit the EEE virus to mammals such as horses or people. However, other species of mosquito, such as *Aedes albopictus*, that feed on both birds and mammals, readily transmit this virus to mammals.

EEE is prevalent in most areas where the Asian Tiger Mosquito is becoming established. In the Untied States, EEE causes occasional epidemic mortality in horses. Many of these outbreaks are small and localized; however some have been rather large, involving as many as 14,000 horses and mules. Generally, 80%-90% of horses that develop EEE die. EEE has been reported on occasion in horses in eastern Canada. Captive birds raised for hunting or human consumption, such as domestic ducks and turkeys, ring-necked Pheasants, and Emus have also occasionally become infected.

Although EEE is not a common human disease, it is estimated 1/3 of people who develop EEE die, and many survivors are permanently incapacitated. In the past 35 years, there have been just over 150 cases recorded in the United States. Fortunately, EEE is not contagious from human to human or horse to horse.

These are merely two examples of unwanted, invasive or exotic insect species that potentially have the ability to negatively affect animal and human health, economics, and our valuable environmental resources. Thus, it is important to become educated and stay informed about potentially threatening exotic insect species in order to reduce the likelihood of negative impact(s) associated with such unwanted pests.

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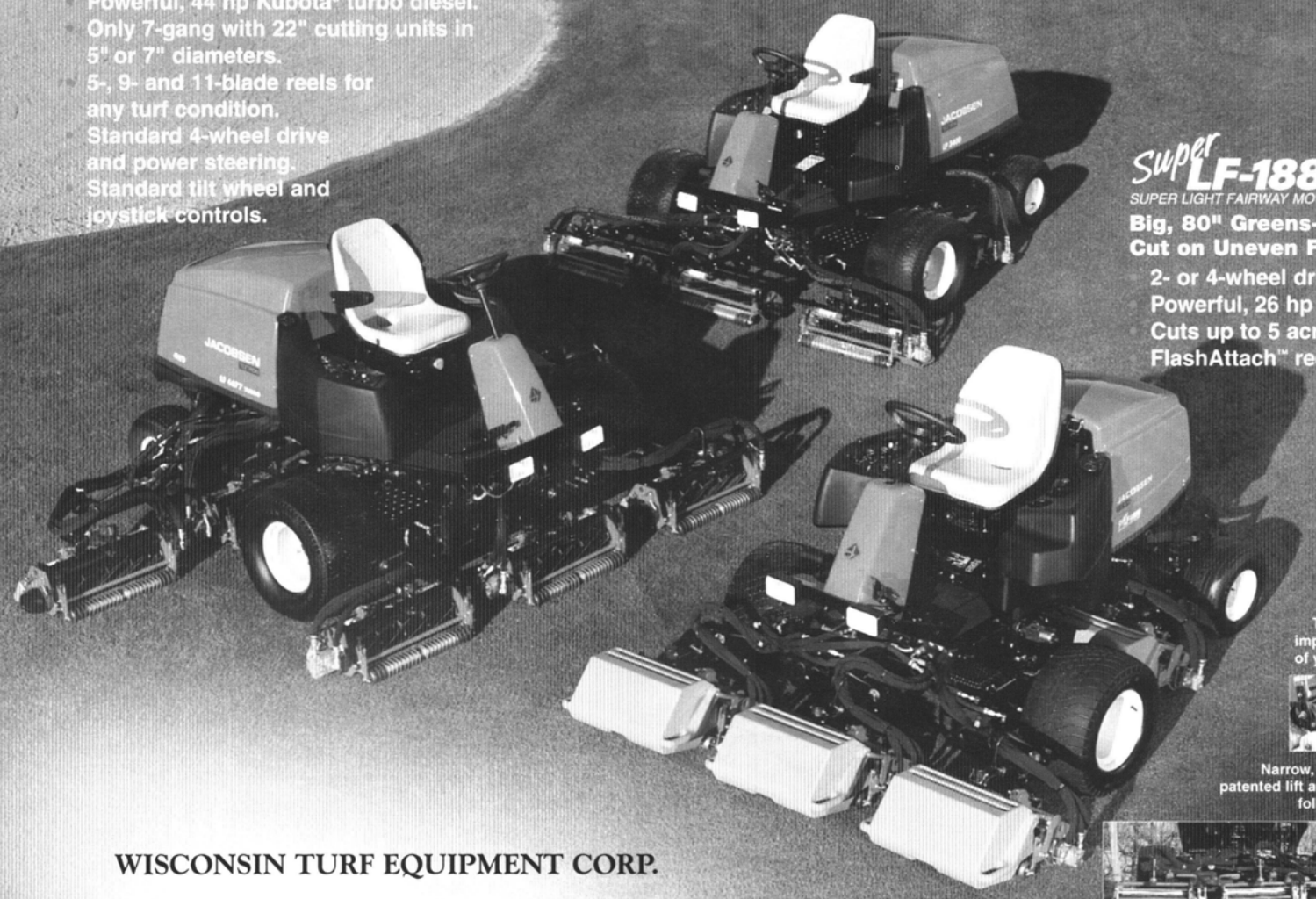

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