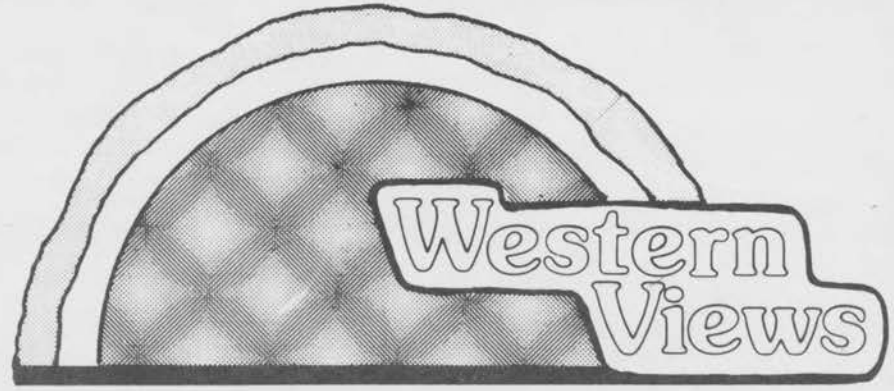




Official Publication of the
W.M.G.C.S.A.



NOV/DEC 1986

PRESIDENTS MESSAGE
Kurt A. Thuemmel C.G.C.S.

October has come and gone. The month started out with a continuation of the September rains and ended with the weather pattern changing for the better. October also brought us a memorable occasion in the retirement dinner for Roy Peck who is retiring after 41 years as the golf course superintendent at Kalamazoo Country Club. Many of Roy's friends and neighbors turned out to honor Roy at Gull Lake View Golf Course and enjoyed an evening of socializing. The evening was very well organized, thanks to Bill Madigan, who organized the dinner and Cecil Kerr, Master of Ceremonies. Although Roy is retiring from Kalamazoo Country Club, he will remain an active member of W.M.G.C.S.A. Congratulations Roy; I know it will be tough not worrying about the golf course or working weekends and holidays. It's time to put some miles on that new van.

November brought us the Fall Party on Saturday the 8th, hosted by Roy Peck at Kalamazoo Country Club. It was a very enjoyable evening with approximately 106 people in attendance. Roy certainly knows how to plan a party as the dinner was outstanding and everyone seemed to have a good time.

By the time you receive this issue, you should have received a notice on the upcoming Michigan Turfgrass Conference at the Clarion Hotel and Convention Center in Lansing. The dates for the conference are January 12, 13, and 14. The format will be similar to last year's with new and informative speakers. Basic schools will once again be offered on Monday and Wednesday afternoons. Sign up sheets will be available for superintendents who wish to accumulate points toward re-certification. Make sure you read the program brochure carefully, because changes in the conference program format will be indicated here. One important change that comes to mind is on Tuesday morning the general session will begin at 8:30 a.m. instead of 9:00 a.m. as in previous years. Please pass along to Michigan Turfgrass Foundation Board Members or the M.S.U. professors comments or concerns regarding the conference, as we need feedback from the members in order to continue to improve the conference from year to year.

I am sure most of you are aware of the upcoming National Convention in Phoenix this winter. The dates are January 26 through February 2.

As your Board of Directors begins to plan the affairs of W.M.G.C.S.A. for 1987, please pass on to any board member any suggestions you may have in order to make our association more beneficial for everyone.

See you at our next meeting in early January.

Happy Holidays!



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TURF MANAGEMENT COURSE

Michigan State University Cooperative Extension Service in cooperation with J. Mollema & Son, Inc, of Grand Rapids, will be holding a Turf Management Course. This course is available to all turf managers and their employees from lawn care companies, golf courses, municipal grounds, athletic and school grounds, cemeteries, and institutional grounds.

Who: Dr. Paul Rieke, Dr. Joe Vargas, Dr. Bruce Branham, Dr. Dave Smitley, and Goris Passchier.

When: Starting January 20 through March 10, 1987; 7:00 to 9:30 for 8 consecutive Tuesday nights.

Where: Kent Skills Center
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How: Register by calling Wendy at J. Mollema & Son, Inc., (616) 245-0533 by December 15, 1986. Cost of the course is \$60.00 per student, which Mollemas will invoice to you or your company. Please make checks payable to J. Mollema & Son, Inc., Attention: Turf Management Course.

Call today!! Don't delay!! Classroom size limited to the first 100 people.

FALL PARTY

The Fall Party was held Saturday, November 8, at the Kalamazoo Country Club. Hosts for the evening were Roy and Sharon Peck and Mike and Kathy Horvath. Approximately 100 people attended this year's event.

Everyone had a very enjoyable evening — maybe too enjoyable for a few. The evening's festivities included fine food and drink and some excellent door prizes. The top prize, an evening at the Amway Grand with dinner at the 1913 Room, was won by Pat and Jim Iman.

Our thanks go out to the Pecks and Horvaths for a splendid evening.

WHO DARES TO ASK FOR YET ANOTHER DAY OFF?

Feeling burnt out? Want more vacation? Hate to tell you — only two of us deserve it!

Author unknown

If you're like most people, you've got too much to do and not enough time to do it. And this week, like so many others in the year, has been a long and hard one. You've

taken care of the daily duties, handled the major and minor crises at work and at home; maybe you've taken some work home. You're exhausted, thoroughly drained. You need a mental health day to recuperate. So you ask the boss for a day off. He says no and gives you this explanation.

There are 365 days in the year, but you take weekends off, so you have to subtract 104 days. That leaves you with 261 working days.

But you only work eight hours a day. The other 16 you are either sleeping or tending to your own business. So you have to subtract 174 days. That leaves 87.

But wait. We're not through subtracting yet. You eat lunch every day, and although lunch hours vary, it is estimated that the average worker consumes 45 days per year at lunch.

Coffee breaks? Figure 21 days over the course of the year. Take those 21 days from the 42 left from the last subtraction and that leaves you 21 days to get your work done.

From those 21 days you have to subtract your two weeks of vacation — 10 work days. Continuing the subtraction, 10 from 21 leaves you only 11 actual full work days in the entire year.

But of course, you do not work on Christmas, New Year's, Independence Day or Thanksgiving. Most firms now allow 10 paid holidays per year. After subtracting the 10 paid holidays from the 11 days remaining, you've got

one full work day to your credit, and you want to take that day off?

Forget it!

The boss sees no reason why you should be unduly exhausted given the above schedule. So you explain to him that the USA's population is 200 million or so, of whom 72 million are over the standard 65-year retirement age. That leaves 28 million people to do all the work.

If you subtract the 75 million under the age of 21, you are left with 53 million actual workers. Of that 53 million, 27,471,002 are employed by the federal government. That leaves 25,528,998 workers for all the other jobs.

Subtracting the 8 million people who serve in the Armed Forces leaves us with 17,528,998 workers. From here we must turn to the city and state work force. Subtracting their 16,520,000 from 17,528,998 brings us down to 1,009,998.

Of course we also should consider those people who have a complete aversion to work. It's been estimated that there are some 800,500 vagrants, bums and the like. Now we are down to 208,498 people to carry the workload for the entire nation, but you still have to subtract the prison population, which accounts for 208,496 people.

This means that two people are carrying everybody else. You know who those two people are, don't you? It's you and me. No wonder we're so exhausted!

Credit: Northwest Turfgrass Topics

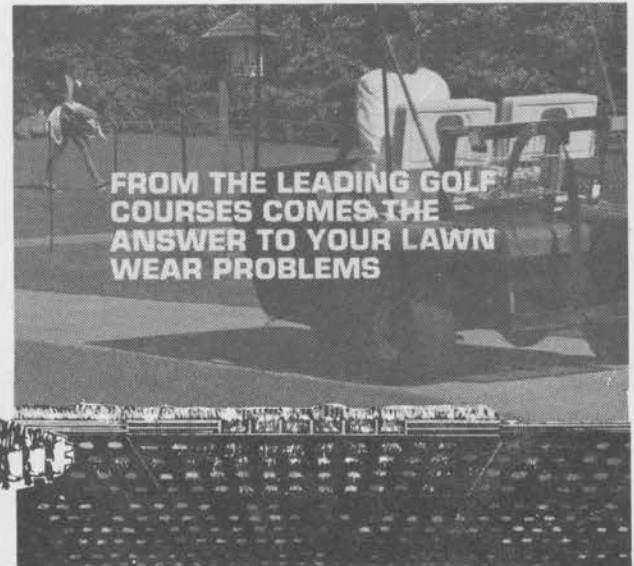
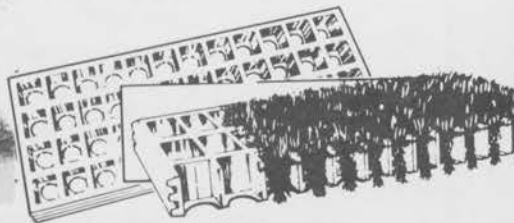
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HOW A PLANT TAKES UP NUTRIENTS

How a plant nutrient moves from the soil into a plant cell has been well studied. Water and nutrient absorption are independent of each other. Contrary to popular belief, nutrients are not absorbed with water like blotter absorbs ink. Elements enter the root primarily as ions, a modified form of the element with an electric charge. The cell wall is a barrier for movement of material in or out of a cell. Just how the nutrient moves across this barrier has been difficult to determine. Today it is reasonably well understood. For example: a positively charged ion, such as potassium, can move in a series of steps probably attached to various enzymes that serve as carriers; a hydrogen ion, also positively charged, moves out simultaneously. The exchange of one positive ion for another maintains the necessary electrical neutrality. Knowledge of ionic transport and the carrier concept has invalidated the humus theory.

The process of active ion transport, whereby the mineral nutrients are initially secured from fertilizer and nutrients introduced into the biosphere are as critical for life as those that bring about photosynthesis. The only difference is that the leaf is a port of entry for one nutrient (carbon); the root is the interface between plant life and the other mineral sources in the soil.

The failure of some books on plant life to stress mineral absorption has permitted widespread ignorance of this important mechanism. We have witnessed lately an amazing outbreak of quaint lore about organic fertilization, this reveals an almost total ignorance among many people of the most basic facts concerning the nutrient elements of plants and their absorption. The neglect of this subject in the current teaching has no doubt contributed to the ready acceptance of some students of thoroughly discredited ideas concerning the nutrition of plants.

The lack of information on nutrient uptake has given rise to such myths as organic farming or the production of organically grown foods. For all practical purposes, nutrients enter the plant in one way, only this is in the inorganic form. It makes no difference whether the nutrients come initially from organic or inorganic sources.

Credit: Divots

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-AERIFICATION- A COMPARISON OF SHATTERCORE VS. HOLLOW-TINED

by Dr. Roy L. Goss

Aerification has been a standard practice on all heavily trafficked turfgrass areas for many years. It is the major means of relieving surface compaction in the uppermost 2-3 inches of soil and mat. Aerification is essential not only to relieve compaction, but to promote faster water infiltration rates, maintain firm dry surfaces and to allow better gas (oxygen) diffusion into the soil. Aerification will also enhance root growth due to better oxygen relationships and a soil that has less resistance for root penetration.

Aerification is more essential on turfgrass areas that were established on soils of sandy loam texture or heavier than it is on those areas established on pure sand. We usually assume that infiltration rates of water and oxygen diffusion rates are satisfactory in sands, although this can change with the accumulation of surface organic materials that are decomposing as well as accumulating as thatch. In this case, aerification also becomes essential. Native soils, due to their fine texture, have greater compactability than sands due to greater total pore space. When fine materials become packed tightly together, air spaces are essentially eliminated, leaving only capillary porosity, which increases the water holding capacity of the soils as well as increasing their density. The overall effect is poor root growth conditions and surface wetness.

In recent years an old concept of soil tined aerification has been modernized where solid tines are fitted into the Ryan Greensaire aerifier. These tines are bullet-nosed, generally of 1/2 inch and possibly 5/8 inch diameter, and are literally punched into the soil with the force of the downward thrust of the aerifier. Due to the rapid insertion and withdrawal of these solid tines, it is reported that hard compacted soils have become much softer, water infiltration rates have picked up, rooting has increased and overall turf quality has significantly improved.

Hollow tined aerification is the usual means of aerifying turfgrass areas. Problem putting greens with heavy soils, fairways, and sportsfields should be hollow tined aerified up to 4 times annually to help reduce compaction and maintain a better environment for root growth. Obviously, hollow tined aerification will increase water infiltration rates as well. In general, hollow tined aerification should be followed by sand topdressing to place as much sand down the holes as possible to maintain continuity of water flow to the surface. When aerifier holes close over at the soil surface with heavier textured soils, aerification is only a temporary effect.

We have some reservations with respect to hollow tined aerification. Therefore, we have initiated a research project to compare shatter core vs. hollow tined aerification to determine if there are any long range problems associated with shatter core aerification. It is obvious that the downward thrust of a solid instrument through the soil must create some compaction at the bottom of the thrust. When a solid object is moved through the soil, there should be displacement in all directions. Although the upward thrust of the aerifier tine may loosen the soil throughout its length, it may not loosen the soil at the bottom of the thrust, creating a pan or compacted layer. No doubt, there is some compaction at the bottom of the thrust even on

hollow tined aerifiers as well. Our objective, therefore, is to compare the two methods as well as combinations of the two methods. We will be measuring the parameters of infiltration and permeability rates of water, bulk density of the soil, and turf quality aspects.

There was excessive variability in the water infiltration studies, but this may change in another year, although there are some interesting trends. Bulk density of soils of this nature (silt loam) is a reasonably accurate measure of compaction. It is interesting to note that no aerification resulted in a lower bulk density than any aerification treatment. A bulk density value over 1.5 g/cc might indicate excessive compaction in a silt loam soil.

These data were developed from an area maintained as putting green turf, but without heavy traffic. It is probable that these values will change more within 2-3 years and even more so if traffic is applied.

Credit: The Bull Sheet

Ideals are like stars. You will not succeed in touching them with your hands; but like the seafaring man, you choose them as your guides, and, following them, you will reach your destiny.

— Carl Schurz

He who hesitates is interrupted.

— Franklin P. Jones

POTASSIUM - A MIRACLE ELEMENT

by Robert C. Sherman

Associate Professor

Department of Horticulture

University of Nebraska

Sherman

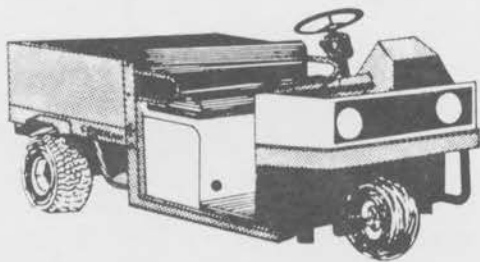
Evidence gathered in surveys of turfgrass nutrition programs shows that golf course superintendents are taking more interest in the role of potassium in their turfgrass nutrition programs. The surveys were conducted at GCSAA Nutrition Seminars. Further evidence came from superintendents attending regional turfgrass conferences. The growing interest in potassium nutrition has also coincided with the increased use of light, frequent sand top-dressing and with the use of higher sand concentrations in rootzone media.

Potassium is one of 16 essential elements required by plants for growth and development. Though it is an essential element, potassium is not a constituent of turfgrass tissues. It is found in plants only in the elemental form (K⁺). Potassium enhances carbohydrate synthesis and translocation, protein and amino acid synthesis and enzyme activity. It controls transpiration, respiration and uptake of certain nutrients, like nitrogen and magnesium. It has been reported to enhance rooting and stress tolerance of turfs.

Turfgrasses require fairly large quantities of potassium, second only to nitrogen and there is growing evidence that potassium may be useful to turfgrasses in equal amounts to nitrogen, particularly in relation to environmental stress tolerance. The term "luxury consumption" has often been

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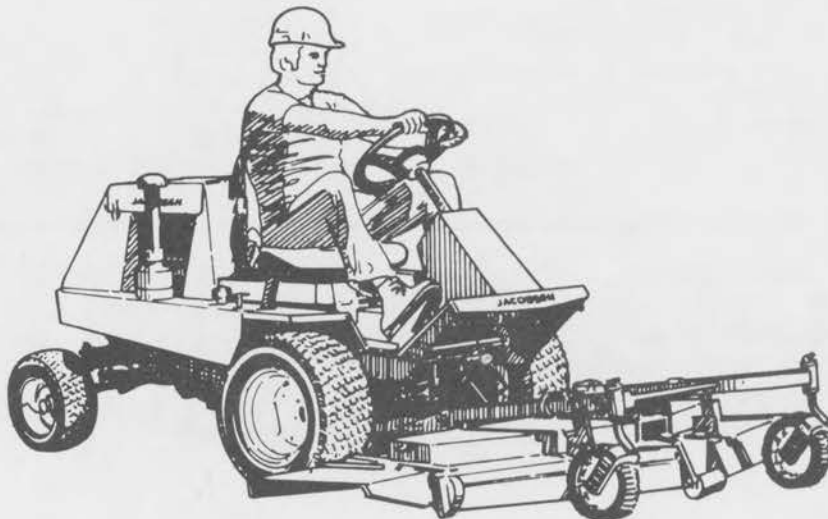
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associated with potassium since it may be taken up by plants in greater quantities than that required for growth and development. Luxury consumption of potassium has been associated with crop production and subsequently has been related to turfgrass management. This association may not be fair or realistic, since clipping yield and dry matter production are not of primary concern to superintendents. But increased turfgrass stress tolerance is. Tolerance for heat, cold, drought and wear grows with increased potassium fertilization of turfs. Therefore, luxury consumption of potassium likely does not occur in relationship to turfgrass stress tolerance.

A drought avoidance study conducted at Nebraska on a Kentucky bluegrass turf growing on a soil that was high in potassium (i.e., greater than 500 pounds available per acre) demonstrated that wilting tendency decreased with increasing potassium, ranging from zero to eight pounds per 1,000 square feet during the growing season. Recovery from drought injury was also enhanced by potassium fertilization. The evapotranspiration rate declined and turfgrass depth and extent of rooting increased with potassium fertilization in this Nebraska study. Wear tolerance increased and desiccation injury decreased with potassium treatment in a Michigan study conducted on a Penncross creeping bentgrass green. These responses were observed even though soil potassium levels were considered to be high. Similar reports of stress exist for warm season turfgrass species like St. Augustine grass and bermudagrass.


Potassium deficiency symptoms are usually subtle and not seen as easily as in nitrogen-deficient turf. Deficiency symptoms often show up as reduced tolerance to environmental stress and to disease. Potassium deficiencies occur most often on sandy soils that receive frequent irrigation. Daily irrigation on a seaside creeping bentgrass green growing on a sandy rootzone resulted in a soil potassium level only 79% of a similar grass growing on the same rootzone, but given the same amount of water in three installments per week. In this study, potassium content of turfgrass tissues showed a similar trend as the soil levels; lower levels were found in the frequently irrigated turf.

On sandy soils with low nutrient retention capabilities, it is better to apply potassium in light and frequent, rather than heavy and less-frequent, applications. This is particularly the case when frequent irrigation is also required to maintain desired turfgrass quality. The low nutrient retention capability of sand coupled with frequent irrigation, results in much of the potassium being leached from the rootzone and a subsequent reduction in potassium uptake by the plant. Light, frequent topdressing with sand results in similar potassium management problems as those encountered with high sand content rootzones. Superintendents need to be aware of these relationships and to adjust their nutrition programs accordingly.

Potassium is not a miracle element; it is an essential nutrient and superintendents should keep its role in perspective. A fair degree of evidence supports potassium's role in turfgrass stress tolerance, but controversy exists among turfgrass researchers regarding its potential benefits. For example, concern has been raised about high potassium levels increasing *Poa pratensis* competition in turfs, but little research evidence supports this concern.

More work is needed to further delineate the role of potassium in golf course fertilization programs and superintendents should be willing to approach its use for enhancing stress tolerance in a reasonable manner. A concerted research effort with potassium is being conducted at the University of Nebraska. This research is part of an extensive cultural practice research project supported by the USGA.

Credit: USGA Green Section Record




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REDUCING GOLF COURSE MAINTENANCE COSTS BY LINING SAND BUNKERS WITH PERMANENT NON-WOVEN POLYESTER GEOTEXTILE FABRICS

by Joseph F. Barney
Eastern U.S. Sales Representative
Warren's TerraBond

Sand bunker maintenance is a routine task most superintendents prefer to spend as little time on as possible and still keep the membership happy. In the last few years hundreds of golf courses, during the scheduled refurbishment of their bunkers, have lined the entire bunker with a geotextile fabric before putting in new sand. They have done this to drastically reduce the time and materials formerly used to maintain those bunkers in acceptable playing condition. And the superintendents are happy not to have to spend so much time on bunker maintenance.

Problems in the Bunkers

The following routine tasks contribute to bunker maintenance costs: (1) pumping out standing water after rainfall; (2) servicing clogged drainage lines; (3) removing rocks from the sand; (4) removing clods of soil from the sand; (5) raking sand up onto the bunker slopes after rainfall or irrigation; (6) mechanical or hand raking to keep the sand "fluffed" and cleaner looking; (7) adding new sand to help mask dirty sand; (8) edging to cut back encroaching turfgrass; (9) removing weeds.

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What a Proper Liner Can Do

One superintendent in the Northwest, we have heard, reported that after lining his sand traps with Warren's TerraBond Polyester Geotextile Fabric, he has reduced his bunker maintenance costs to two functions: (1) edging and (2) occasional addition of sand to replace that blown out, chipped out and/or volatilized by the sunlight. Using a liner, if a properly designed one is used, will keep the drain flowing, stop rocks from moving upward into the sand from the soil, stop the sand from mixing with the soil, greatly reduce sand wash-down from slopes during rainfall, and reduce or prevent weed growth in the bunker.

The overall end result, the "bottom line", is less time devoted to bunker maintenance, better appearing and more playable bunkers, a far longer time span between sand replacement and bunker reconstruction, happier members and a happier superintendent.

Fabric Liner Selection

The sand bunker liner must be resistant to sunlight (Ultra Violet light) breakdown, hydro-carbon breakdown caused by spilled hydraulic fluid or gasoline and fertilizers being used on surrounding turf, be extremely supple — yet very strong — so as not to tear during installation, and have excellent filtration capabilities which lets water-borne particles of silt pass through its body without clogging.

A non-woven needle-punched continuous filament, polyester fabric like Warren's TerraBond meets these qualifications.

The fluffy matt of supple, strong, polyester fibers allows the roots of the perimeter sod to grow through the TerraBond and anchor into the soil below. Below the bunker sand, water passes easily between and along the polyester fibers, yet rock, pebbles, and native soil (which often discolours the sand and impedes water flow in the sand) find their upward journey difficult if not impossible.

Site Preparation and Application of the Fabric Liner

The first step is to construct the drainage system! After removing the old trap sand and bringing the bunker to the desired shape and grade, excavate the drainage trenches with the exit point at a depth below the lowest point of bunker bottom. Then line the trenches with Warren's TerraBond, place a layer of gravel, the 4" flexible perforated rain, and additional gravel to the grade line of the bottom of the bunker. Fold the fabric over the top of the gravel and itself, thus encapsulating the drainage structure with TerraBond. TerraBond's sieve size, or E.O.S. of 70 to 100 mesh, permits fine particles of clay (those which make muddy water muddy) pass right through. Yet the drain system will not clog with mud or sand, thus ensuring no more puddles of "casual water" in bunker bottoms! Set the sod cutter blade to a depth of 1" minimum and cut back the sod 12" around the desired perimeter of the final bunker shape.

Excavate the soil directly below the upper edge of trap slopes to a right angle (90 degrees), to a depth of 6" to 8". (This technique helps prevent erosion of the sand around the steep slope perimeter areas of the bunker during periods of heavy rainfall or irrigation due to surface run-off).

The bunker is now ready for application of the TerraBond liner. Roll the TerraBond across the bunker and trim with a TerraBond geotextile knife (available from dealer). Overlap 3" to 4" until the entire bunker is covered (including the 12" perimeter where the sod will be replac-

ed). The TerraBond will closely follow all the little contours and corners. Lay back the overlap areas and apply a generous bead of Goodrich construction and sub-floor adhesive. This technique helps prevent mechanical rake entanglement, and insures "one piece" liner integrity. (It is suggested to step on the glue bead along its entire length to squeeze the adhesive into the polyester fiber of both pieces of fabric before backfilling with sand.)

Replace the sod atop the TerraBond around the perimeter of the trap and keep watered to promote "knitting" through the fabric and into the native soil. This is the key to permanent anchoring of a fabric liner, and the permanent elimination of soil erosion of the perimeter of the bunker!

Future edging of the bunker is done quickly and efficiently with saturated wick applications of Roundup herbicide and/or rotary string trimmers!

Sand Selection

Bunkers should be re-filled with sand that meets USGA specifications. Playability and permeability are the most important considerations. The particle shape should be angular, free of silt and fine clay particles, and range in size between 1.00 and 0.25 millimeters (75% in the .50 to .25 range minimum). Deviation from these sizes should be larger, not smaller, to prevent wind erosion where this is a problem.

Conclusion

Lining sand bunkers with a geotextile fabric is now a well-accepted technique across the U.S. It is a proven method for drastically reducing bunker maintenance costs. Be certain, however, that the correct geotextile is

used, not necessarily the cheapest one or just because it is called a "filter fabric" or a "landscape fabric" or geotextile. Make certain it is long-lasting, strong, supple needlepunched (mechanically bonded) polyester. Some superintendents have done otherwise and made even bigger ponds out of their bunkers after spending alot of money on reconstruction.

Credit: The Bull Sheet



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WHAT WETTING AGENTS CAN AND CANNOT DO FOR YOUR TURF

by William J. Johnston

The field of turfgrass management has seen many products come and go, they were a *flash in the pan* so to speak. Wetting agents may or may not fit into this category of products. However, they have received a considerable amount of attention from the turfgrass community and have caused some controversy. This paper is being presented to update you on the current status of wetting agents and is also an attempt to separate fact from myth regarding wetting agents.

What are wetting agents? Wetting agents are chemicals that change the physical properties of water. They reduce the surface tension of water. Basically, they can be thought of as making water wetter. To illustrate this, if you placed a drop of water on a waxy leaf surface, the water droplet would sit on the surface as a somewhat spherical drop. If, on the other hand, you added a wetting agent to the water prior to placing a droplet on the leaf, the droplet would spread out on the leaf surface. The drop with the wetting agent added would have a lower contact angle between the leaf surface and the water droplet.

Wetting agents are classified according to their chemistry as anionic, cationic, and nonionic. Anionic wetting agents are negatively charged, general phytotoxic to turf, and highly leaved in soil. For these reasons the anionic wetting agents are not generally used in turf. Cationic wetting agents are positively charged and are, therefore, tightly held to the predominantly negatively charged soil particles. This makes these compounds somewhat less effective. The nonionic wetting agents have no charge, are less bound to soil, and are less phytotoxic to turf. The nonionic agents are the most common wetting agents used in turfgrass management.

What can wetting agents do? Table 2 gives a list on some of the claims that have been made regarding wetting agents. Let's look at these claims to see just what role wetting agents might play in your turfgrass program.

Localized Dry Spots. The cause of localized drop spots, also termed LDS, has been most frequently attributed to a fungal growth that produces a waxy material that coats soil particles. These coated particles then become very hydrophobic (water hating). These problems most often are associated with sandy soils or sands in golf course greens. Although LDS is most common on golf courses, it is becoming more apparent that LDS is also associated with other turfgrass areas. Table 3 gives the results of some research conducted at Michigan State University, which indicates that wetting agents are quite effective as a treatment for LDS.

Plant Growth. Most of the research with wetting agents would indicate that they have little effect on plant growth or are somewhat detrimental. On a positive note Schmidt indicated from his research at Virginia Polytechnic Institute that sod rooted faster under dry conditions when wetting agents were used. Also, Petrovic's work at Cornell showed that Aqua Gro substantially reduced annual bluegrass *Poa annua* seedhead production without reducing clipping yields on a golf course fairway.

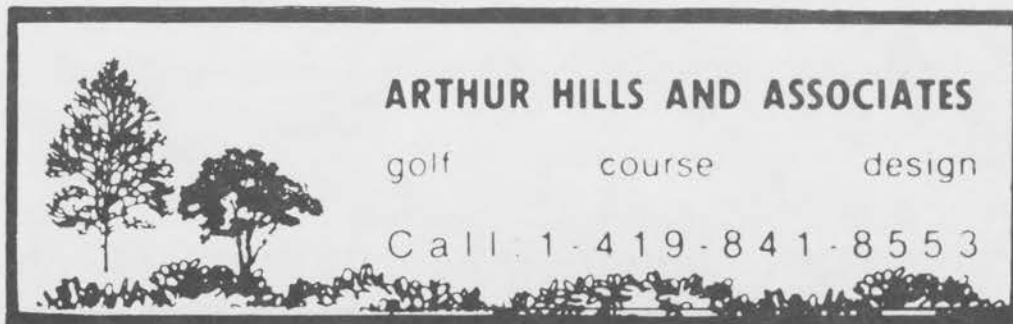
Infiltration and Percolation. As has been previously stated, wetting agents can substantially improve drainage in areas with LDS. Drainage is also better on layered soils when wetting agents are used. However, on easily wet soils there is little, if any, effect of wetting agents in his text book *Turfgrass: Science and Culture*, cites several references which indicate that wetting agents do not increase infiltration.

Compaction. There is no direct evidence in most cases that wetting agents affect compaction. In a University of Maine study (cited by Moore, 1981), it was found that wetting agents reduced soil bulk density and is also reduced compaction. Morgan et al., at the University of California at Davis, reported a decrease in compaction in peat-amended soil, but they reported no effect of wetting agents on other soil materials. It should be noted that if a site or soil is now compacted, the addition of wetting agents will not cure the problem.

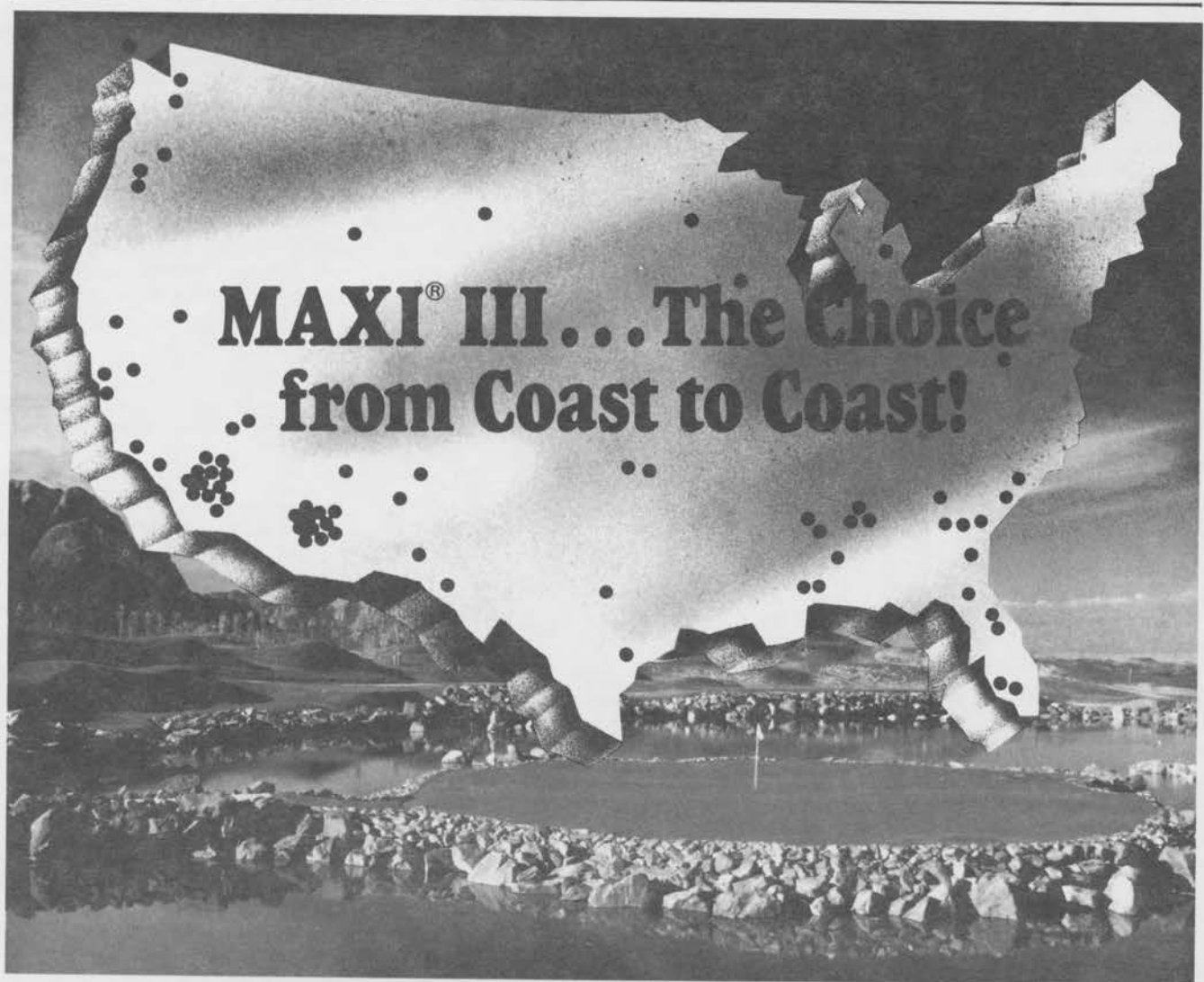
Thatch. Wetting agents have been claimed to reduce thatch buildup. There is little, if any, experimental evidence to support this claim. Most studies show that wetting agents, especially prolonged use of wetting agents, generally have no effect on thatch. Some work has shown a thatch buildup. Murry and Juska, in an 8 year study, showed no effect of wetting agents on thatch. Engle and Alderfer's 10 year study showed a slight increase in thatch.

Dew Removal. Wetting agents are fairly effective in mitigating the formation of dew. Wetting agents have been reported to reduce dew formation for 3 to 10 days on a bentgrass putting green. The length of effectiveness is probably related to irrigation and rainfall, both of which would tend to remove the wetting agent from the soil profile and thus decrease the period of effectiveness.

Fertilizer and Pesticide Effectiveness. Since water is the carrier for most chemicals applied to turfgrass, improved water movement and distribution within the soil profile could improve chemical efficacy. It has been proposed that wetting agents might improve the uniformity of movement of systematic pesticides into the root zone. More research is needed in this area to verify these claims.



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Water Use Efficiency. Work at the University of Nebraska by Shearman has indicated that in turf where water was not a limiting growth factor, evapotranspiration was reduced as much as 25%. However, this does not necessarily translate over into a 25% reduction in water used by the turfgrass manager. Additional studies by Carroll and Petrovic at Cornell University indicate that a reduction in evapotranspiration due to the application of wetting agents is a result of there being less water available for evapotranspiration due to increased loss of water through drainage. So, it appears that wetting agents will not improve water use efficiency, since water use efficiency is a measure of the amount of water needed to produce a given amount of dry clippings.

CONCLUSIONS

There are many wetting agents available in the market place and selection of the best one is not always an easy task; therefore, you should gather as much information as possible, especially hard facts, prior to embarking on a program utilizing wetting agents. Remember, wetting agents can be phytotoxic if not properly applied. Also, there is some evidence to indicate that prolonged use may increase thatch. However, wetting agents are one of the cultural practices available to turfgrass managers to improve water movement into and through localized dry spots (LDS) and hydrophobic soils. Wetting agents should be regarded as just another tool available to the turf manager and not the cureall they are often touted to be.

Additional research is needed to fully define the role of wetting agents in turfgrass management.

Table 1. Common wetting agents used in turfgrass management.

Aqua Gro	Aquatrols Corp. of America	4 to 16
Hydro Wet	Kalo Laboratories	8 to 16
Lesco Wet	Lesco Corporation	8 to 16
Peneturf*	Four Star Agriculture Service	0.2
Surf Side	Montco Products Corporation	16 to 32

*Marketed as a soil conditioner.
Data from A.M. Petrovic 1985


Credit: The Bull Sheet



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SOME NORTHERN COURSES USING SKIING FOR OFF-SEASON PROFIT

It would seem, at first glance, that golf and skiing don't mix.

But for some northern golf course operators, cross country skiing is more than pulling its weight as a winter-time use for dormant golf courses.

Tim Caldwell of American Ski Industries is in the process of starting a campaign to set up 500 cross country skiing sites on golf courses and parks throughout the snowbelt. "For municipal courses, especially, it's a great way to use facilities and bring in revenue," he said. "It also can keep people employed during the winter, and be a great public relations project for the whole community."

Caldwell can point to a number of examples of successful, money-making operations. One is run by Jim Klosterman of Dayton, Ohio. Not only did his facility gross \$38,000 at the 36-hole Dayton Community Golf Course last winter, but he also helps others interested in operating a cross country skiing facility by providing equipment and assistance in getting started.

"You can generate enough revenue to make it pay," Klosterman said, "and municipal golf courses have done as good a job as any."

The first question in the minds of operators usually has something to do with possible damage to the golf course. Klosterman has an answer ready for them. "I can give them documented letters from people," he remarked. "All you need is 2-3 inches of snow and frozen ground base. Cross country skiing doesn't do as much damage as golfers do in the early spring. And any area that can't stand traffic can simply be roped off."

The land requirements are not very stringent. "A small nine-hole golf course is okay for a beginning course," Caldwell said. "The bigger the golf course, the better, but you don't need big hills. The more variety, the better."

The next problem is getting the proper equipment. Most of the revenue is made from the rental fees on skis and boots. Klosterman recommends 40-50 pairs of boots to start out with. He estimates the cost of getting started to be about \$5,000 - \$6,000. "If you have 30 days of skiable snow you can make that back without too much trouble," he remarked.

Location is a big factor to consider. "Places that have not done well have been out in the boonies. The key to success is urban or close suburban locations."

Having a rental facility and a skiing course is a big advantage. "You can be right next door to a sporting goods store that rents equipment and you'll blow them away," he asserted. That's because stores have to rent by the half-day, while a facility can rent on a two-hour basis — and the equipment never leaves the area.

Klosterman added that there should not be any insurance problems when dealing with cross country skiing. "I have never had a golf course come back and say they had to pay an extra premium for cross country skiing," he said.

The only other thing needed is expertise. "If you're in a snow area, there usually are enough people around who can help you," he said. "To be honest, all you need are people like me."

"Getting the right equipment is the key. There is equipment that works and equipment that doesn't work."



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Klosterman said he works with both municipalities and individuals that use private or municipal facilities. In his case he pays the City of Dayton 10% of his profits each winter. He's now in his ninth year of operation.

ASI has an operations manual they send to interested parties. Their address is 8377B Greensboro Drive, McLean, VA 22102. Klosterman can be reached at Box 1872, Dayton, OH 45429.



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| — Good Health | Privacy — |
| — Comfortable Housing | Time to do as I please — |
| — Safe Neighborhood | Go when and where I want — |
| — Part-Time Employment | Ability to Relax — |
| — Warmer Climate | To Be Myself — |

TO MOVE OR NOT TO MOVE

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- Neighborhood
- Friendships
- Familiarity of Surroundings
- Position in community
- Economics of current residence
- Will current living conditions meet future needs?

How to prepare to make a decision:

- Talk with people in the area you are considering.
- Visit the same area more than once and in different seasons.
- Subscribe to a local newspaper.
- Keep your home and try out a new area - keep options open.
- Rent for awhile.
- Think five to ten years ahead.
- Evaluate costs carefully.
- Decide jointly with your spouse.
- Will you have the opportunity to:
 - pursue you interests?
 - be with people?
- Evaluate your support system.
- Will you have freedom of movement?
- Will the people around you share your values?

IT HAPPENS EVERY YEAR

I may be wrong, but it seems to me that every year a superintendent is relieved of his duties because he just happened not to get along with some of his members. In fact, it may only be less than 1% of the entire membership. At one time or another the superintendent said something or did something to provoke this member to get him.

Now, granted, there are superintendents that carry a chip on their shoulder wherever they go. They practice at making people miserable. They think that everyone is against them and they are going to keep the upper hand on everyone they meet.

However, the majority of the superintendents are good people. They do what is expected of them and a little more. Some even give too much of their time to the profession. Most superintendents try to realize what the golfer wants out of the course. He is a person that listens well to the membership and tries to improve on his performance year after year. For the most part superintendents are perfectionists and that is tough to be in a profession that deals with what *Mother Nature* dishes out.

What can a superintendent do to avoid from getting the ax when the course is in excellent condition throughout the year? That is a very tough question to answer and one that superintendents should think about more.

A few answers that come to mind are:

1. Be careful what you say and how you say it to your members and their guests.
2. Watch what you drink and how many drinks you have when you are with your members. Even though you may be at a membership or a superintendent function, the member that is with you may feel that you are on duty and should not be drinking.
3. Avoid the clubhouse area. Some superintendents think they have to stay in the clubhouse to answer all the members' questions. If the members have questions they should be brought to the greens committee chairman. Then that person can relay them to the superintendent.
4. Try to obtain a contract for a 1-3 year period. This will help to protect yourself as well as the club.



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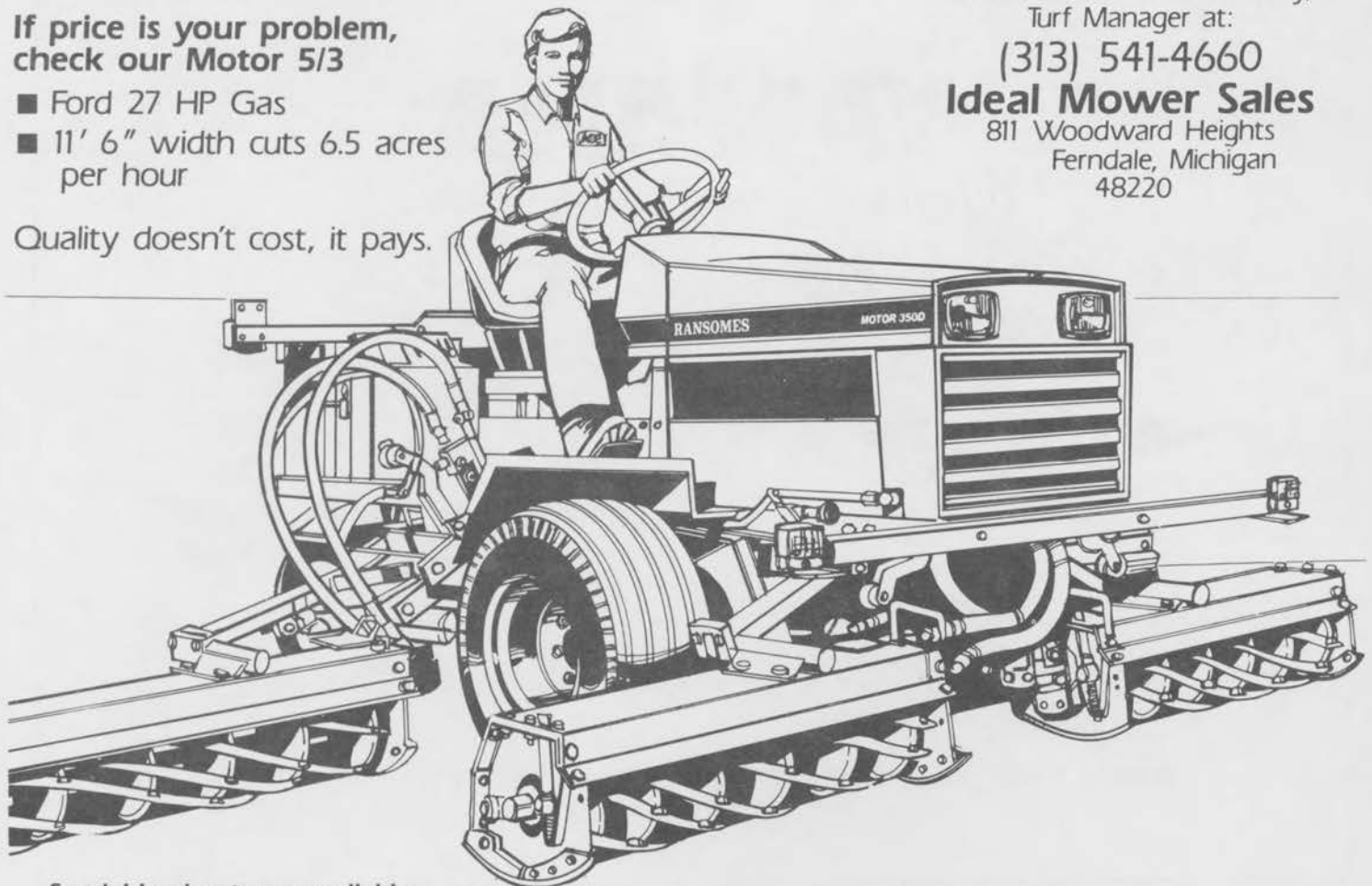
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QUESTIONS FROM THE FLOOR

Q. Does playing golf on frozen greens damage them?

A. The problems caused by winter play differ throughout the country. They are most severe where soil and air temperatures drop below freezing, but warm days also are common. The warm days are the danger period for putting greens - golfers can't be blamed for wanting to get out on the course on those spring-like days. No

one wants to tell them at that point that they can't play the course; they should have been informed long before that of the hazards of using regular greens in the winter.

Grasses and soils are living systems; both change with the seasons. But they don't enjoy the luxury of heat and protective covering. **Therefore, they need a period of adjustment from cold to warm temperatures before they are fit for use.**

The greatest danger to the green occurs when the top inch of soil is thawed completely, but the soil beneath it is frozen solid. This condition can occur any time from December through March, depending on the location of the course. **Any weight on the turf during this time has a compressing effect that destroys pore space and the arrangement of the soil particles.** This restricts water infiltration, air penetration and root growth. **As a result, the upper surface becomes more compact and less resilient.**

The more traffic imposed under the conditions described, the more quickly and completely the soil system breaks down. All this leads to more problems during the regular season. Therefore, greens must be aerated, syringed and top dressed more often. These are practices that golfers abhor during the regular season, but it takes longer for greens to reach their peak in the regular season if winter play is indiscriminately allowed.

Traffic on frozen greens causes grass blades to crack and cells to rupture, making grasses more susceptible to disease, desiccation and winterkill; it also causes unsightly footprints that are visible for most of the winter season. Resort courses are especially

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bothered by frost because of the tight scheduling of tee times and the lost revenue when the playing schedule is interrupted. Sometimes frost removal can be hastened by a light syringing, but play should be delayed until frozen greens thaw.

Frozen greens can be seriously weakened in any area bruised by traffic, scuff marks or ball marks because at that time the turf simply isn't growing. Be assured, however, that *Poa annua* is growing and is the first to gain inroads into the weakened areas. This subtle transition goes unnoticed by all but those trained in turfgrass culture. This is when *Poa annua* is mistaken for healthy, permanent grass by golfers who assume that the turf is recovering nicely; therefore, in their view, no real damage is being done. The impact of the *Poa annua* infestation makes itself known in spring when heavy seedhead production makes greens putt very slowly. Only then do golfers recognize *Poa annua* by its prolific production of seedheads.

Damage to frozen greens may be alleviated by opening the course later than usual in the morning. Not all greens react similarly to temperatures; the frost melts more slowly from greens in shade than from those in sunlight. Once golfers are on the course, it's too late.

Soil temperature plays an important part in determining when a course is ready for traffic in the spring. Soil temperature doesn't rise as quickly as air temperature; there is usually a 10 to 15 degree lag due to high moisture from thawing soils and low night temperatures. Therefore, soils are cold and clammy at that time. Good root growth does not begin until soil temperature rises to 40-45 degrees, depending on whether it is a cool season or warm season grass. Also, if soils are frozen when players tee off, some thawing may occur before they finish 18 holes of golf, causing serious soil damage.

It is best to use alternate greens during the winter season. If alternate greens are used, they should be conditioned well in advance so their putting quality is acceptable.

Finally, all golfers should be informed about the effort being made to provide maximum use of the course for their year-round golfing pleasure. When conditions exist that are conducive to permanent damage, their understanding and patience will be helpful and appreciated.

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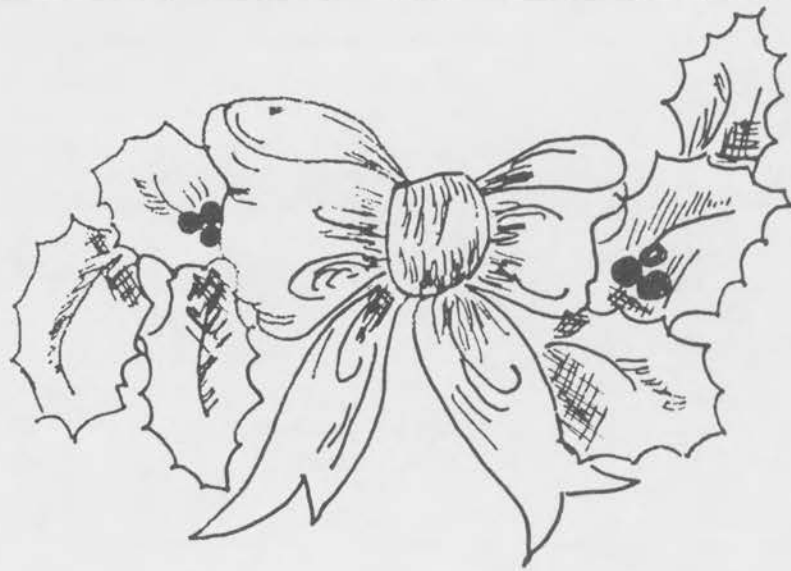
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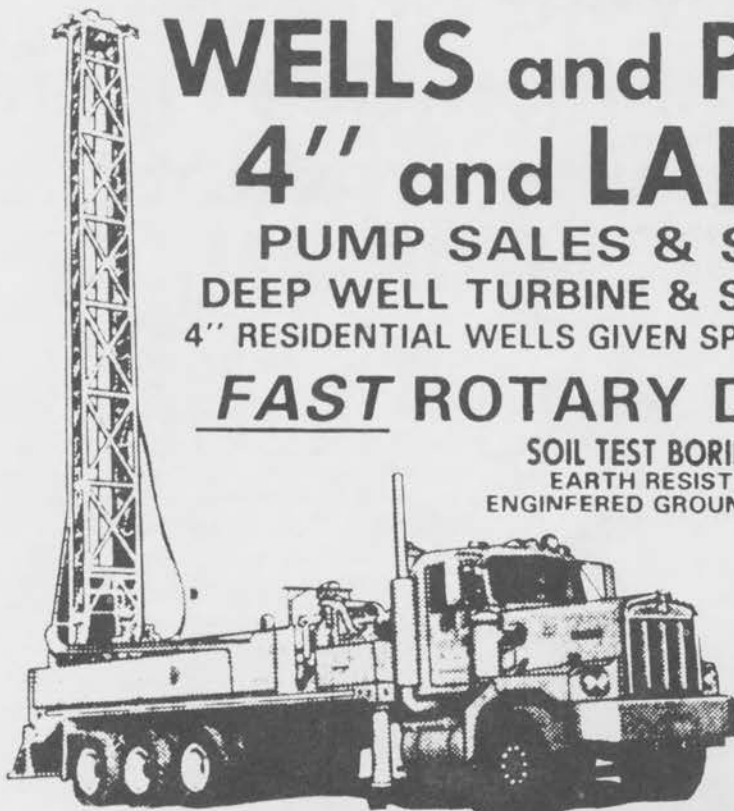
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2 **Yes, GCSAA is helping to further the advancement of the turfgrass industry.** Through the GCSAA Scholarship & Research Fund, Inc., GCSAA provided more than \$13,500 last year in research grants to leading turfgrass programs. GCSAA also provides educational opportunities to turfgrass students through annual turfgrass scholarships.

3 **Yes, GCSAA provides a meeting ground for superintendents.** Each year, GCSAA sponsors an annual conference and show for its members. Last year more than 6,500 educators, industry representatives and members from all over the world attended. GCSAA's executive committee decided at its last board meeting that the conference experience is so valuable that first-year members should be encouraged to attend by being given free admission.

4 **Yes, GCSAA offers recognition for superintendents.** Through its public relations efforts, its magazine, and its award programs, GCSAA helps promote the image and the professionalism of the superintendent. GCSAA also provides information to superintendents about how they can use public relations to promote their own image to their course, their community and their association.

5 **Yes, GCSAA provides each member with a life insurance program.** Supplemental insurance, disability and pension programs also are available.

6 **No, GCSAA can't help you with your golf handicap.** You'll have to work on that yourself.

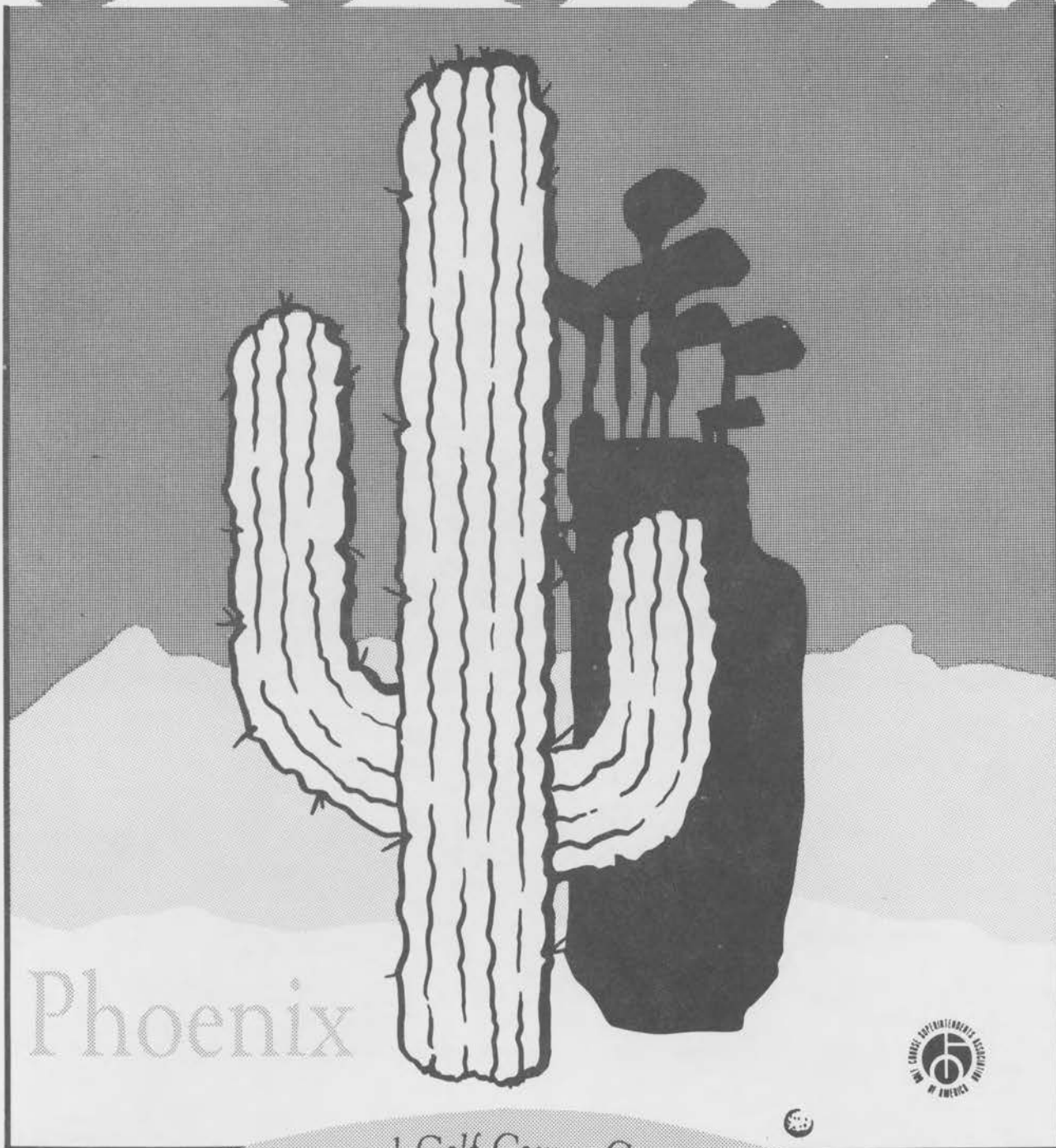


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