WESTERN MICHIGAN GOLF COURSE SUPERINTENDENTS ASSOCIATION

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

Western Views

SEPT/OCT 1987

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

As many of our members are aware, Bill Davis has moved to the Palm Springs area and resigned as a director of our Board. Therefore, a vacancy was created, and I appointed Charlie Dinkins to fulfill Bill's term. Most of you know Charlie; however, for those who don't, he resides in Battle Creek and is superintendent of Charles Binder Park Golf Course.

A much appreciated "thank you" goes to Bill Madigan, this year's host at the Country Club of Jackson, for providing our association the opportunity of holding our annual Golf Day Benefit on August 31st. Everything about the day was outstanding, especially the golf course. Approximately $2,500.00 was raised for the day's effort, which will be donated to the Michigan Turfgrass Foundation. The M.T.F. will ensure that the money is utilized on a worthwhile Turfgrass research project at Michigan State University. Also, thank you to Jim Eceleton at Arbor Hills Country Club for serving as host at the alternate golf course for the benefit.

Remember, the GCSAA Seminar on Golf Course Construction is being held on November 3rd and 4th and our annual Fall party hosted by Don Fitz is at Cascade Hills Country Club on November 7th.

As we begin our "slower season" in a few months, it is a time to give consideration to involving oneself in our association. The success of any association is a reflection of the people who decide to get involved and offer their input and services. Volunteer to serve on a committee or consider running for the Board of Directors. Yes, there are times when you may have to spend a few hours on association affairs, however, in the years that I have served on this Board, I've found the time spent has been very interesting and education as well. It's time to get involved!

See you at the Fall Party!

Sincerely,

Kurt A. Thuemmel

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MEETING SCHEDULE

Nov. 7 Fall Party
Cascade Hills C.C.

WHO INVENTED THIS GAME ANYWAY?

Jim Bogart
Turfgrass, Inc.

Many a golfer in the middle of a frustrating round has been heard to utter the question "who invented this game anyway?" Searching for the answer to that question can be even more frustrating than the game itself.

Unlike other sports, golf can not point to an Abner Doubleday or James Naismith as its originator. In fact the game of golf can't even point to a specific country as its birthplace. Over the years historians have nominated many ancient games as possible forerunners of golf. The Dutch, the Scotch, and even the Romans among others have gotten into the act of trying to claim such parentage. In each case games using clubs and balls are cited as proof positive.

In the days of Caesar, Roman soldiers were known to have relaxed with a game called Paganica. This game featured sticks that were used to propel a feather filled ball toward a specific goal. The use of sticks plus the featherie ball are suggestive of an early form of golf. However, Paganica was played by teams instead of individual players, thus differing from golf as it is known today.

A similar game, Chole, was known in Belgium and Northern France as far back as the twelfth century. One theory suggests that Scottish soldiers returning from Europe introduced Chole to their homeland. The game itself featured clubs with iron heads which were used to hit wooden balls toward a target. It is altogether possible that the iron headed clubs of Chole were prodecessors of golf's mashies and niblicks.

Like Paganica, however, Chole was a team game in which the object was apparently to hit the ball toward a specific target or goal. Opposing team members tried to keep this from occuring by attempting to hit the ball away from the player in control. Based on this description one might conclude that chole was more likely an early form of field hockey than of golf.

Two other French games have also been offered as possible ancestors of golf. Jeu de paume and Jeu de mail both make use of balls. In fact the ball used in Jeu de paume was constructed of leather filled with feathers much like the early golf balls.

Similarities between golf and this early French game end there. In Jeu de paume, hands were used to propel the ball; thus making it one of the less likely candidates in the search for golf's roots. In fact Jeu de paume sounds like a more probable candidate for handball's family tree.

On the other hand, Jeu de mail, or Pall Mall as the British knew it, is the better choice for golf's ancestry. Jeu de mail featured peach-size balls that were hit toward a goal using wooden croquet-like mallets. The balls were also made of wood. Thus, Jeu de mail could have just as easily predated croquet as it might have golf.

Although all of these ancient games express some similarity to golf they will no doubt remain forever as distant cousins only. Leaving behind the arguments for Paganica, Chole, and the other games, attention can now be spotlighted on the two strongest possible ancestors. Golf historians remain divided between the Dutch and Scotch as to the rightful origins of golf. Strong arguments can be advanced for both countries without a firm conclusion being reached.

A popular passtime in the Netherlands was the game of Kolven. Like the previously mentioned games Kolven also featured a club, known as a Kolf, and a large ball. Due to the lack of available land in the Netherlands Kolven was played on roadways or frozen canals. It is believed that Kolven eventually developed into an indoor game. The playing area of this indoor version was suggestive of a hockey rink, measuring 60 feet by 25 feet and bounded by a two foot wall.

Historians, however, are quick to point out several similarities between Kolven and golf. First among these is the club it self. Kolf sounds very close to golf. A second

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similarity pointed out by the historians is an expression used by the Dutch. Stuit Mij when translated means "it stops me". In the modern game of golf a stymie is a ball which can not be played because it is up against a tree or other object. Fore is a cry of warning on the golf course that could have been derived from the Dutch warning cry Vooor.

These similarities between Kolven and golf are very strong even though the playing area for Kolven was totally dissimilar to golf courses as known today. However, the use of roadways and frozen canals was probably necessitated by the nature of the Netherlands itself. Whatever the reason for playing on these areas, the popularity of Kolven can not be denied. In fact, in the mid 15th century the town of Naarden found it necessary to pass an ordinance forbidding the playing of Kolven. Apparently, the game's popularity was detracting from more important matters of the town.

At about the same time in history the word golf showed up in records for the first time. Like Kolven, it was the popularity of golf that led to a parliamentary ban in 1457. Under King James II the Scotch Parliament decreed "The Futeball and Golfe be utterly cryed downe and not to be used." A good scotsman was expected to spend his time practicing archery, not games such as golf that could never win a war. Golf in Scotland had apparently grown rapidly in popularity prior to this decree, as an earlier act of Parliament in 1424 had banned football without any mention of golf. Following the parliamentary ban of 1457, golf was again decried in 1471 and 1491.

Although banned by Parliament, golf did not disappear. Scottish nobility continued to practice the new found game, playing in pasture areas along the seashore. Numbered among the decree breakers was King James IV. Being King made it considerably harder for him to sneak out and play golf. It wasn't long before James IV was discovered playing the game, after which the ban on golf was generally ignored.

Golf still didn't become an acceptable passtime in Scotland until two James' later. It was King James VI, who also ruled England as James the First, who was himself bitten by the golf bug. Not only did he allow golf on Sundays, but he also appointed his own Royal Clubmaker and Ball Maker. From then on golf flourished and began to expand throughout the world. In fact James VI mother, Mary, Queen of Scots, was one of the first woman golfers. Her use of an army cadet to carry her clubs perhaps led to the modern caddy.

It has been suggested that the golf course at St. Andrews, Scotland, has existed since before 1414. If that is the case the course must not have been widely known or else golf would have been mentioned in the 1424 parliamentary decree. Once James VI put his royal stamp of approval on the game other courses began to decorate the Scottish countryside. Among these were the courses at Leith, Musselburge, North Berwick, Prestwick, Gullane, and Montrose.

The early Scottish courses varied considerably from only 5 holes at Leith and Musselburgh to as many as 22 holes at Andrew's and 25 at Montrose. St. Andrew's in 1764 became the first course to play over 18 holes. It was felt that the first four holes at St. Andrew's offered little challenge. Therefore, the decision was make to make two longer holes from these first four. Since the holes were played in both directions this change resulted in a reduction from 22 holes to eighteen. This soon became the accepted standard for Scottish courses.

1744 saw the beginning of golf culbs and societies. The earliest of these was formed that year when the Honourable Company of Edinburgh Golfers took to the links at Leith. Leith remained the home course for the Edinburgh Company until it was disbanded in 1831. Five years later the Honourable Company of Edinburgh Golfers was reestablished at Musselburgh where it remained until 1891 when it moved to its present location at Muirfield.

Ten years after the founding of the Honourable Company of Edinburgh Golfers the Society of St.Andrew's golfers was begun. A third golf club came into existence in 1766 with the formation of the Honourable Company of Golfers at Blackheath. Located in England this club was the first non-Scottish Golf CLub to be formed. The course itself at Blackheath dated back to 1608 when it opened with 7 holes.

From these first few clubs golf, or Kolven if you prefer, continued to gain in popularity. By the middle of the 19th century golf courses had sprung up around the world. India entered the golf business with its first club in 1829. France's Pau Golf Club became the oldest club on the European continent when it was founded in 1856. Australia and New Zeeland joined the ranks of golfing nations in the early 1870's as did Canada.

Royal Montreal became the first golf club in North America in 1873. It was followed a year later by the Royal

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Quebec Club as golf spread to Canada. But as yet golf remained relatively unknown in the country that a few decades later would become the world's leading practitioner of the game.

Even though golf was widely known, and even banned, before Christopher Columbus took his historic voyage in 1492; it was nearly 400 more years before golf became established in the United States. Like the game itself, golf's background in the United States is a clouded issue.

(To be continued in the next issue of Western Views)

SUPERINTENDENT TOURNAMENT

The first annual state-wide Superintendent's tournament was held at Forest Acres on Monday, September 14. The overall winner was Chris Fochtman from Greenridge Country Club. Congratulations, Chris, for an excellent tournament. The rest of the flight winners were:

CHAMPIONSHIP (gross)

Chris Fochtman	78	Western Michigan
Dale Bauer	78	Border Cities
Carey Mitchelson	79	Border Cities

1st FLIGHT (net)

Don Riddle	72	Mid Michigan
Tom Stark	72	Border Cities
Steve Kolongowski	74	Border Cities

2nd FLIGHT (net)

Darwin Prieskorn	72	Border Cities
Roger Barton	75	Western Michigan
Craig Roggeman	77	Border Cities

Chris Fochtman was also the overall low net winner with a 70.

Everyone had a very enjoyable day and are looking forward to next year's tournament. We would like to thank Jay Delcamp and his committee for their efforts in setting up the tournament.

EPA ANNOUNCES ACTIONS ON CADMIUM

Use of cadmium in the environment has been prohibited under a federal regulatory order announced Aug. 10 by the Environmental Protection Agency (EPA). The sole exception to this regulatory order allows use of cadmium fungicides on golf course greens and tees under certain circumstances.

Specifically, cadmium use will be allowed on greens and tees only with a "mini-broom" sprayer, and applicators must wear protective clothing during mixing, loading and application of the product. Homeowners, turfgrass managers and other users of cadmium fungicides will be forced to seek alternative materials for the control of fungi of turfgrass. Additionally, use of cadmium on fairways and other golf course areas except greens and tees is prohibited.

The decision to exempt golf course greens and tees relies in part on information provided through the Golf Course Superintendents Association of America's Government Relations Program. In May, members of the EPA review team were given a demonstration of the "mini-broom"sprayer at the Congressional Country Club in Bethesda, MD.

Originially, EPA proposed cancellation of all pesticidal cadmium use. However, as the EPA announcement noted: "At the time of the proposed cancellation, EPA assumed that cadmium was applied on golf course greens and tee areas with hand held sprayers only. Since that time, the agency has received new information indicating that most golf course applicators use power spray equipment, such as mini-broom sprayers."

ELECTION RESULTS

The following individuals were elected at this year's annual meeting for the 1988 terms of office:

President	Roger Barton *Blythefield Country Club*
Vice President	Fred Pastoor *Muskegon Country Club*
Secretary/Treasurer	Keith Paterson *Kent Country Club*
Board of Directors	Chris Fochtman *Greenridge Country Club*
	Doug Boyle *Duck Lake Country Club*

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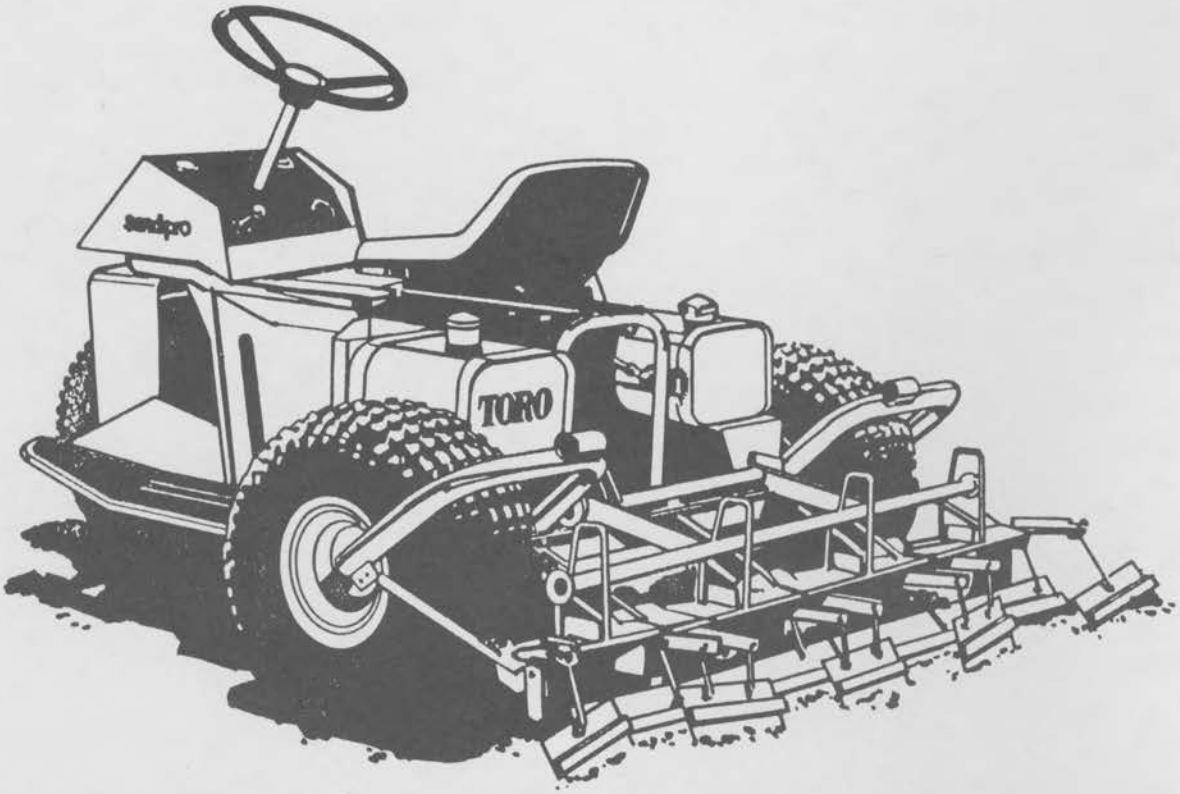

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PREVENTING TRANSPLANT FAILURES

Spring is almost upon us and I am sure many of you, like me, will be planting trees and shrubs to functionally or aesthetically improve our environment. However, what about the survival rate of your plants? Are your newly planted trees and shrubs leafing out with adequate vigor? Are your plants dying a month or two after planting? If you are having transplant failures you should examine every aspect of the project from its conception to follow-up care even on year after planting. There are many causes of plant failure. Let's take a look at a basic procedure for establishing a new tree in your landscape.

PLANT SELECTION

View plant selection in two ways. It may save you much aggravation in the weeks, months and year to come. One of the most important aspects of planting new trees is selecting the right one for your site. Analyze the environment. Study the soil, exposure, use of the area, general surroundings, specie of existing plants and all micro-environmental conditions that exist which may affect growth and development of new plants. Do not expect a tree to grow on a site for which it is not adapted. The tree may leaf out but it may never reach its potenial. The result is usually a dead plant, along with a question of why. Matching of plants to the site is critical.

Secondly, plant selection at the nursery is equally important. At this point, know what specie you want. Look at the plants carefully. Look for crooked or missing leaders, scars on the trunk, proper root ball size in relation to caliper or plant height, as well as an intact root ball. A damaged root ball means separation of root system from the soil and this will be a plant with a high potential for problems if it manages to live.

If selecting a container plant, be sure to check the root system. If a plant has grown too long in a container, its roots will spiral. This type of root system will only cause problems in the future. Obtaining a normal root system is nearly impossible after planting, and usually the root system will girdle itself causing the plant to die several years later.

Never accept poor quality trees. A bargain plant many not be worth the price if it dies.

PLANTING AND HANDLING PLANTS

The next phase is proper planting technique and handling of the plants during planting operations. Remember, proper handling of plant material may mean life or death to the plant. The most common mistake is carrying the plant by its branches or trunk. This places undue pressure on the root system and can cause soil-root separation. Carry the plant by supporting the root ball and when setting the plant down, do not drop it, but set it down. If the tree is not planted immediately be sure to attend to its water needs on a daily basis. The root ball may dry out very quickly when exposed to the elements.

PLANTING

The Hole: In preparation of the hole, consider the size of the root ball. A general rule is that the hole be 6-12" or more wider than the root ball. Also, the soil below the hole should be loosened usually to a depth of 6-12". The finished depth of the hole should reflect the height of the root ball. Only in special situations should the root ball be planted higher than the existing soil.

PACKAGING

Before placing the plant in the hole, take a minute to examine the packaging of the root system. Typical B & B plants are wrapped with burlap or burlap-like products. Natural burlap decays quickly in the soil and should be left intact when planting. Many nurseries use artificial burlap (plastic or nylon materials) which must be removed or cut away. This is best done after placing the plant in the hole. Also, any rope that holds the root ball together should be cut to avoid girdling the roots or trunks at a later date.

Containers, of course, are removed. However, some plants are dug in the field and placed in plantable containers. These containers are typically made from compressed peat or paper products. It is a good practice to cut or break down the sides of these containers as they do not decay quickly enough to allow root penetration into the soil or water movement between the root ball and soil.

Placement in the hole is critical. Planting too deeply is detrimental to the plant. Plants should be planted at the height at which they were grown. This means maintaining the same soil level around the root collar. The root collar is the transitional area between the root system and the trunk. Typically there is a distinct flair at the base of the trunk. Be sure to firm, not compact, the loose soil in the bottom of the hole first.

BACKFILLING

In the past, it was standard practice to replace all excervated soil with loam or a mixture of loam, sand, peatmoss or other soil amendments. Soil amendments have been found not to be essential except for plants that require special soil mixes - for example Rhododendrons and other Ericeous plants. In some tests amended soil actually hinders root development. Use existing soil to backfill the hole. New roots will penetrate the soil and the plant will adapt to the site in a shorter period of time.

While adding soil back into the hole, firm the soil and eliminate all air pockets. Watering the plant at this time will also help to settle the soil and eliminate air pockets. Complete filling the hole, slightly covering the root ball with a scant 1" of soil. The leftover soil can be used to make

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a berm around the perimeter of the hole. Berms are important in containing water during the first growing season.

FINISHING TOUCHES

After backfilling is completed, apply a 2-3" layer of mulch over the root ball. Mulch not only dresses up the plant, but prevents excessive water loss from the soil as well as preventing radical temperature changes in the soil.

Staking and guying are recommended. Securing the tree is critical to successful establishment. If the root ball pivots in the hole, the new roots may break and the tree may be unable to absorb an adequate amount of water and establish itself in the new environment. Leave the tree secure for at least one year. Within that period a new and stronger root system should develop.

Wrap the trunk with tree-wraps. Tree-wraps will prevent sunscald on the trunk. Scalding is the result of heat build-up on the bark of the trunk coupled with inadequate moisture levels in the phloem and cambium cells.Eventually the cells become dehydrated and die. This type of cell death usually occurs during the winter months. Many times the damage to the trunk is not visible for many months. However, a decline in vigor during the spring growth is most noticeable. Leave the tree-wrap on for at least one year or until the tree is well established.

FOLLOW-UP CARE

After planting, the job is not done. A maintenance program should be well planned. The most obvious is a strict watering schedule. Newly planted trees need water on a weekly or bi-weekly basis to ensure good growth and development. There is no magical formula. Some say an inch of water per week is adequate. However, the bottom line is **keep the root ball and surrounding soil moist** throughout the growing season. Besides watering, check the tree-wrap to be sure it stays intact. Add additional mulch when needed later in the season. Occasionally check the tautness of the stakes and adjust if necessary. Check for insects and disease problems. These can cause slower establishment if your trees are left unchecked. If these follow-up procedures are part of your maintenance program, chances of tree survival increase.

Newly transplanted trees and shrubs not only need the right environment in which to grow, but proper maintenance after planting. By taking time and care during and after planting, your tree's survival rate will be very visible.

CREDIT: Gateway Green Mississippi Valley GCSA

I open the window and make salute:
"God bless thy branches and feed thy root!
Thou hast lived before, lived after me,
Thou ancient, friendly, faithful tree."

Henry Van Dyke

GOLF DAY

As chairman of the 1987 W.M.G.C.S.A. GOLF DAY, I would like to thank William Madigan and staff, as well as the clubhouse and pro shop presonnel, for a great day at the Country Club of Jackson.

In all, 212 players contributed to Turfgrass Research by playing in this year's event. Leaders after the morning round must have thought the luncheon buffet and dessert extravaganza was in their honor after posting a 21 under par, 123. But, perfect course conditions coupled with the beautiful weather allowed for the evening feast to be served on time to honor the day's best. Fred Pastoor's team, consisting of Dave Price, Steve Nedeau and Dick Berry from Muskegon Country Club earned $75.00 for fashioning out a clean 23 under 121. Second place, at 22 under 122, was posted by another Muskegon Country Club team consisting of Phillips, Jacobenson, Joseph and Johnson. They netted $50.00 each for their effort. I had heard that they were opening a golf hustling school, but I didn't know it was along the lake in Muskegon. Third place went to the morning round leaders from Royal Scott; Clint Overn, Bob and Todd Kwiecien, and Brian Toomey. Their 21 under 123 was worth $35.00 a man. Ed Dejong and Dave Kasprzycki each earned a $50.00 gift certificate for their smooth swings on the third hole. Dave won the closest to the pin in the morning round and Ed in the afternoon round.

Again, Thanks for a great day to all who participated and Thank You, Jackson, for hosting us.

Jeff Gorney

LIGHTNING PROTECTION FOR TREES

Kevin Dushane, CGCS
Bloomfield Hills Country Club

Most everyone knows the value of trees on a golf course. They provide beauty in the landscrape, color in the Fall, shade, windbreaks, depth perception and play a strategic role in the character and playability of the golf course layout.

Beautiful trees require several generations to grow. Trees on a golf course that are 50 years and older cannot be replaced very easily if they meet a premature death, and trees can die in many ways. Diseases such as the Dutch Elm disease eliminated many beautiful American Elms in the early 60's and there was virtually nothing anyone could do to stop or avoid the destruction created by nature. Insects can pose major problems for the well being of a tree. Strong winds are capable of blowing a tree over and destroying it. Even man can cause the demise of trees through careless mowing practices. A tractor operator pulling a gang mower or a irresponsible employee using a weedeater can debark a tree at the base and kill it.

Other forces in nature, such as lightning, can be very destructive to trees. But there is a way to prevent lightning from destroying or even damaging an important tree on a golf course and I would like to tell you what steps we are taking at Bloomfield Hills Country Club to protect key trees from lightning and why we are doing it.

Lightning strikes the earth hundreds of thousands times a year. A single discharge of lightning is incredibly powerful. Many millions of volts of electricity can be released from a single bolt. As we all know, trees appear to be a main target of a lightning strike. According to the Robbins Lightning Protection Company, one reason trees are so susceptible to lightning is because they are usually the largest and tallest object in an area. They are subject to a build-up of a heavy charge of static electricity. This is an attraction to a heavily charged sky cloud of opposite potential, so when they reach a saturation point a lightning discharge takes place. Also, the moisture content of a tree can be a factor for lightning strikes. The tree is alive and moisture is carried to every branch in the tree. The moisture will aid in the build-up of static electricity but usually is not a good enough conductor for safe passage of reverse current to ground. Because wood is such a poor conductor it cannot help in the release of the energy so

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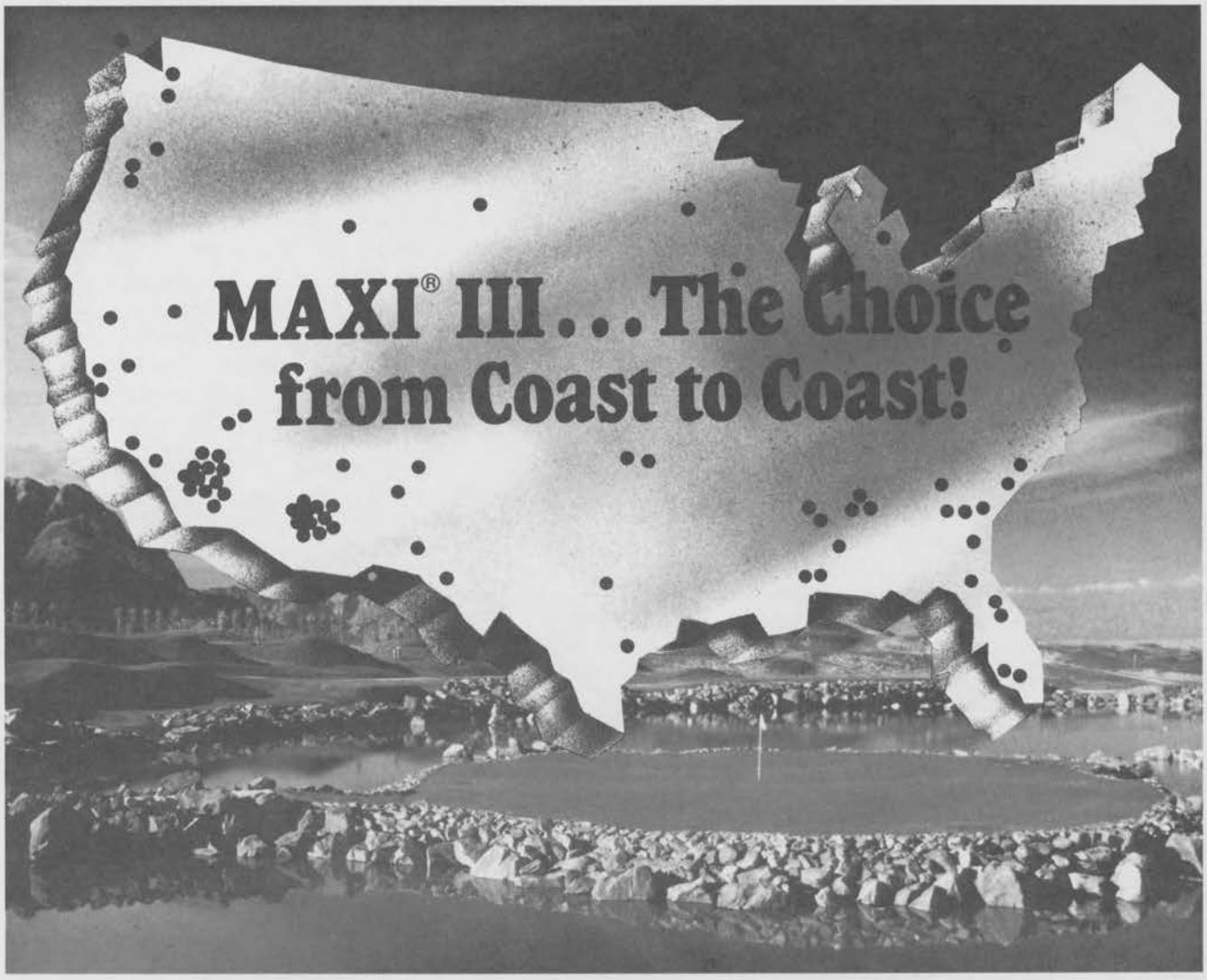

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the rush of electricity explodes on the tree surface or within the trunk. This action will often destroy the tree. Lightning protection in a tree can prevent this.

The first thing you might think of as lighning protection in a tree is a lightning rod, a long metal pole extending above the tree and attached to a ground wire. I always envisioned them as being like the rods I would see fixed to barn roofs on a rural farm. I was surprised to find that the rod used is about six inches long and are called points rather than lightning rods.

Depending on the size and crown a tree could have one point or seven. The company that installs the lightning protection systems should be knowledgable enough to determine the correct amount of points for the tree. Once the number of points is determined they are placed in the tree at various areas of the crown for the best possible coverage. A heavy gauged copper cable connects all of the points. (Copper is used because of it's excellent conductivity with electricity.) The cable is secured to copper nails which are driven into the limbs and trunk. (These nails are referred to as stand offs.) Each stand off has connectors attached at the head that hold the cable approximately 2" from the bark to avoid contact with the tree, thus preventing any potential discharge of electricity from striking the surface as it runs down the cable to the gound. The cables are then guided down towards the base of the tree. At various junctions in the tree the cables are connected, with the end result being one or two cables ending at ground level.

Once the points and cable are installed the next and last step is to connect the system to a ground post. This is accomplished by using a ten foot copper rod ½" in diameter, driven into the ground at the dripline of the tree. The copper cable connected to the base of the tree is buried in the ground at a one foot depth and connected to the rod. If the tree is large enough, two ground rods will be used. The tree is now protected against a lightning strike. If lightning does strike the tree the electricity will hit the point, follow the copper cable to the copper post in the ground and dissipate.

I have been told by a tree expert that the lightning protection in the tree will actually prevent the build up of the static electricity around the tree that attracts the bolt of lightning. At first, I was a little skeptical of this theory but I have yet to see a tree get hit by lightning that has lightning protection in it.

I would like to make a suggestion at this time. If the tree to be protected has not been trimmed in recent years you might find it beneficial to have a thorough pruning done prior to the installation of the system. Proper symmetrical shape and a tree free of dead and diseased limbs will aid in the longevity of that tree. Most likely, the company installing the system can properly trim it and install any necessary bracing of weak limbs before the lightning protection process begins.

Trees continue to grow after installing the copper cables and points. The system may have to be inspected and upgraded five to ten years later to properly protect the tree.

What does a lightning protection system cost? Depending on the size and condition of the tree, anywhere from $400 to $1,500, possibly higher if the tree is large enough. The question you will have to ask yourself and your employers are: How valuable is the tree to the playabilty of a particular hole or the golf course in general? Will it change the difficulty and character of the hole if a tree is struck by lightning and dies? Depending on the size and location it could cost anywhere from $200 to $1,000 or more to remove it. Can the tree be effectively replaced if it is destroyed? Not likely if it is over 50 feet tall. It would take many years for a transplanted tree to replace such a large tree. These are some very legitimate questions to answer in deciding if lightning protection is necessary and cost effective for a particular tree.

In the past two years we have had seven trees protected against lightning. Every year we plan to review our tree program and select other trees for lightning protection that we feel are important to the golf course.

There are many other facets of total tree care. Tree fertilization, trimming, root purning, supplemental irrigation, cabling, pest control and a tree nursery for replacement and addition are as important to a tree care program as lightning protection is. Just remember, lightning protection is available for the trees on your golf course.

HOW SOILS AFFECT WATER USAGE

J.R. Watson, V.P., Agronomist
The Toro Company, Minneapolis

Water is essential for plant growth and plant activity. It is involved either directly or indirectly in all phases of the care and management of turfgrass. Water is necessary for germination, for cellular development, for tissue growth, for food manufacture (photosynthesis), for temperature control and resistance to pressure. It acts both as a solvent and a carrier of plant food materials. Nutrients dissolved in the soil by water are taken in through the roots and then carried to all parts of the grass plant in water. The food manufactured in the leaves also is distributed through the plant body in water.

Soil affects watering practices because it is the reservoir from which the plant obtains the water needed to sustain its growth and development. Thus, effective and efficient water usage on golf courses demands a knowledge of the basic physical and chemical soil properties and how these relate to water absorption, storage and drainage as well as the frequency, rate and manner in which water must be applied to turfgrass. Further, all such basic information must be correlated with the requirements for color, play or use, adjusted to fit the existing or planned irrigation facilities, and modified to suit the level or standard of maintenance at which the golf course is being kept or maintained.

Golf course soils, as for any turfgrass site, must provide support for the turfgrass, provide a firm uniform footing for the player, serve as a storehouse for nutrients, supply oxygen by providing for exchange of soil and atmospheric gases and act as a reservoir for the water used by the turfgrass plants.

The texture (size of soil particle), structure (arrangement of soil particles) and porosity (percentages of soil volume not occupied by solid particles) of a soil are the basic physical factors which control the movement of water into the soil (infiltration), through the soil (percolation) and out of the soil (drainage).

Texture, structure and porosity, along with organic matter content, determine the water-holding or reservoir capacity, control the air-water relationships and drainage characteristics of the soil. All directly affect watering practices and, hence, impact directly on water usage.

The intake of water is through the roots, actually through root hairs as they are the organs through which water is taken into the plant system. Hence, the depth of rooting, the extent to which a given root system occupies the soil, the age of the roots and the supply or number of root hairs all affect the depth to which the soil should be wet. The volume of soil that is occupied by active roots represents the soil reservoir for the plant. When high evapotranspiration (ET) rates occur the need for water is great and the reservoir may have to be replenished frequently, especially if the root system is shallow and the soil sandy.

For example, if the need for moisture is 0.25 inches daily as the case may be during the heat of summer, the soil must supply to the plant 0.25 inches of water between irrigations. Soils that are otherwise very good for putting greens may hold only 0.5 to 0.75 inches per cubic foot. This would be an adequate amount of water for one to two days if all of it were available to the plant. For this to be the case, the roots must extend through (permeate) the entire volume of soil to a depth of 12 inches. If the roots are only three to four inches, obviously the soil may have to be replenished more frequently - irrigated daily or even twice daily. With a limited root system or one that does not fully occupy the volume of soil, the soil must possess the characteristics neccessary to move the neededed amount of water at a rate rapidly enough to permit its uptake by the root. Generally, plant water needs can be satisfied if enough supplemental water is applied to replenish that portion of the available water in the root zone which has been used since the last irrigation. Some authorities indicate that water should be added when approximately 50% of the available soil water has been

(Continued on Page 14)

(Continued from Page 13)

exhausted. Thus, if the roots fully occupy the soil to a depth of six inches and the soil holds one inch per cubic foot, the ET rate is 0.25 inches per day. The green must be watered daily, since 50% of the potentially available water will have been used in that period of time.

Enough water should be applied to ensure that the entire root zone will be wetted. Too, on natural soils, as opposed to those modified for intensive use (golf greens and bowling greens), sufficient water should be applied to bring about contact with sub-soil moisture. Continuous contact between the upper and lower levels of moisture will avoid development of a dry layer through which roots cannot penetrate.

Under arid or semi-arid conditions, or any location where salts may have or will accumulate, water must be added in quantities greater than is actually required to satisfy the water needs of the grass or to replenish the soil reservoir. This is necessary to ensure periodic "flushing" of the soil to remove the salt accumulations.

Application of too much water at one time (misuse) is serious when the soil is poorly drained and the excess cannot be removed within a reasonable period of time. Such a situation is more critical in saline or salty areas or when saline water is being used. When such conditions exist, water usage must be modified.

Soils have little direct affect on plant usage of water. Plant use of water is a solar driven phenomenon. The water evaported and transpired as a result of this solar energy is approximately equal to that reuqired to meet the plant's need. This relationship must be clearly understood to make efficient use of this vital and dwindling resource.

Prepared for: Golf Architects Meeting, GCSAA Annual Conference, January, 1987, Phoenix, AZ.

Credit: Hole Notes

"It's a new weed control technique— I smother them."

TO KILL MOLES FIRST FIND AN ACTIVE TUNNEL PATH

John K. Arbogast
Roanoke City Extension Agent

Q: We are plagued by moles in our yard. Is there any one effective control of moles other than killing the grubs? We sprayed this spring with a recommended chemical for grubs, but the number of moles seems to have increased. Someone has suggested Juicy Fruit chewing gum placed in the opening of the holes to kill the moles; I'm not sure whether this might be a joke or not. B.R.L., Martinsville.

A: Moles have been very active in home lawns this past winter and spring.

The suggestion to give the moles some chewing gum is not a joke. An article from the Michigan Association of Nurserymen, Inc. suggests this. According to the articles, moles will eat chewing gum, but they can't digest it and so, after a day or so, it gums up their insides and the moles die. Juicy Fruit gum was the kind suggested.

This is the procedure that article suggested: wear plastic gloves to avoid human scent; unwrap the stick of gum and roll it up; make a slit in an active mole run; place the gum in the run and replace the sod.

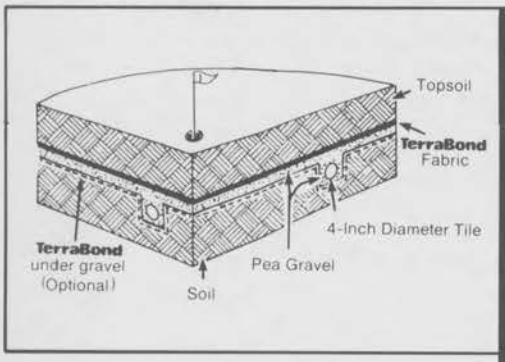
I guess that all you have to do, then, is wait for the stuff to work.

Reprinted from the Roanoke Newspaper

SPECIFY THE BEST FOR YOUR GOLF COURSE

Warren's® TerraBond™

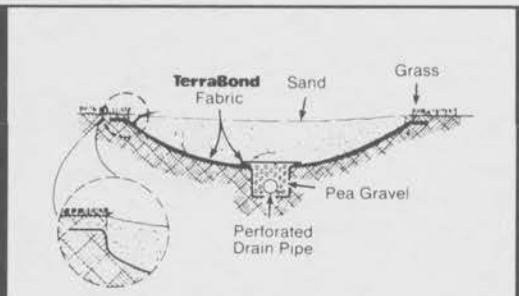
PUTTING GREEN CONSTRUCTION



Use TerraBond as a replacement for the usual 2″ coarse sand layer between the greens mix and the gravel drainfield. The fabric will eliminate downward migration of the mix into the gravel and the subsequent reduction of water flow from the green.

TerraBond's high water permeability and highly engineered uniform density and EOS (AOS) make it an ideal fabric for this use. It will not rot in the soil-water environment. Its horizontal (planar) flow characteristic moves excess water horizontally out to the sides.

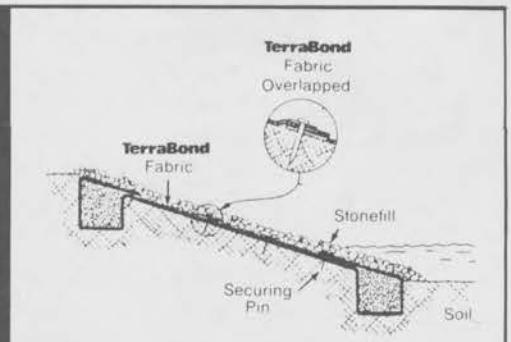
SANDTRAP LINING



Line the entire golf sand trap with TerraBond, including 6″ under the surrounding sod. The sod's roots will knit the fabric to the soil beneath. Clay and rocks will be totally restricted from moving up into the sand.

Sand wash-down in rainstorms will be dramatically reduced, because TerraBond interrupts the interface of sand/soil. Rakeup will be greatly reduced. Time will be saved. Also, ''wrap the gravel'' in the trap drain to keep it flowing indefinitely. TerraBond's polyester will resist chemical and ultraviolet degradation.

SLOPE EROSION CONTROL



TerraBond is utilized beneath cut slope stone protection (rip-rap) as shown above. The fabric provides long-term confinement of cut slope or fill material.

Being constructed of soft and pliable needle-punched polyester, TerraBond will remain stable and functional for many years, in spite of potential exposure to the sun's ultraviolet rays and/or concentrated hydrocarbons such as gasoline, diesel fuel, oil or hydraulic fluid.

TerraBond also can be used in weed control, gravel path construction, retaining wall filtration, subsurface drainage, patio construction and planter filtration/separation.

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THE EXPERTS AGREE

Winter 1984-1985 Wind Desiccation Damage Test on bentgrass greens
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- Desiccation injury around test site was severe. Uncovered control area had 60% damage. TerraShield covered area had no injuries. Control area produced only 36% of the green cover obtained under TerraShield blanket.
- Green-up occurred 24 days earlier with TerraShield . . . and remained significantly greener than the uncovered control area for 21 days after cover was removed.
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(A NON-PROFIT MICHIGAN CORPORATION)

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Attested_____ Address_____

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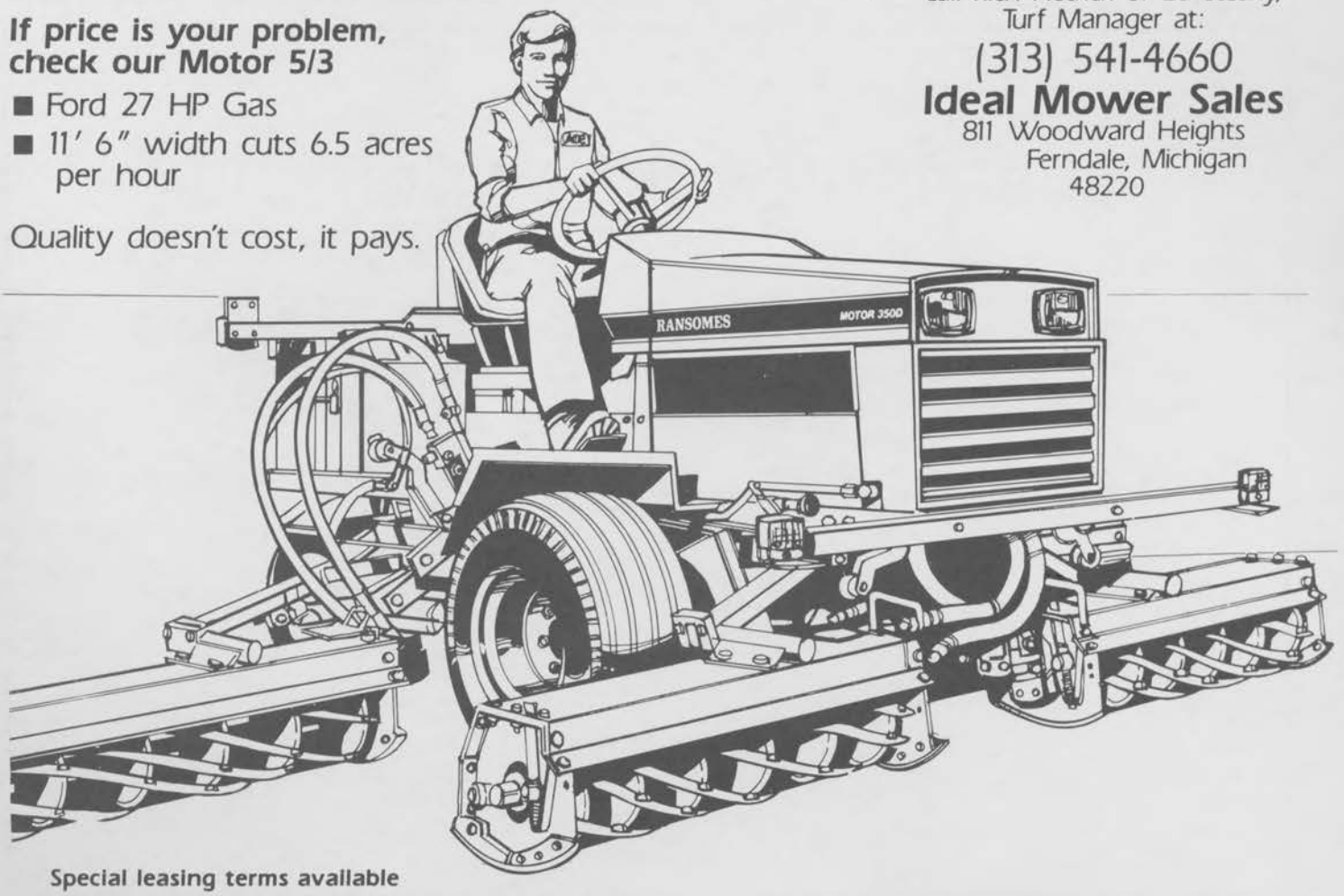

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The Greens King® IV with the revolutionary new Turf Groomer™ greens conditioner has no equal for producing faster, truer greens, *without* lowering height of cut.

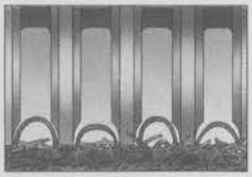
This unique, patented greens care system, a Jacobsen exclusive, concentrates on troublesome thatch and horizontal runners that can slow down putting, or even throw off putting accuracy.

The front roller "puckers up" horizontal runners and plant leaves, readying them for clipping.

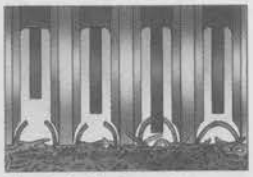
Then, the powered knife blades rotate *through* the slots in the front roller, cutting horizontal runners and removing thatch that can choke a green to death.

The reel follows closely behind, neatly cutting the grass while it's still standing straight and true.

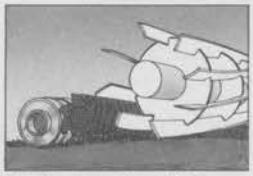
The result: Faster, truer putting and healthier, hardier greens, ready for play. And, you get all this without reducing the height of cut.



Exclusive roller design features bevelled edges to "pucker-up" horizontal runners.



The knife blades rotate through slots in the front rollers, slicing horizontal runners before they lie down.



The horizontal reel follows closely behind to clip grass while it's standing straight, for faster, truer greens without lowering height of cut.

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