WESTERN VIEWS

WESTERN MICHIGAN GOLF COURSE SUPERINTENDENTS ASSOCIATION

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PRESIDENT'S MESSAGE
Roger Barton

November is ending on a sad note; Roy Peck passed away in his sleep at deer camp on November 17. Roy, as you know, was Green Superintendent at Kalamazoo Country Club for many years. He was a good friend and will be sorely missed.

I would like to thank Kurt Thuemmel for hosting the fall party at Walnut Hills Country Club. Kurt, his wife Kathy, and the Walnut Hills staff did an excellent job. I would also like to thank Fred Pastoor from Muskegon Country Club and his wife, Sandy, for their help and excellent job supporting Western Michigan GCSA Golf Day and the fall party. Thanks again!

Happy holidays to everyone, and I will see you at our January meeting and at the Michigan State conference on January 16 through 18.

Sincerely,

Roger Barton
Blythefield Country Club

59th ANNUAL
MICHIGAN TURFGRASS CONFERENCE

January 16-18, 1989

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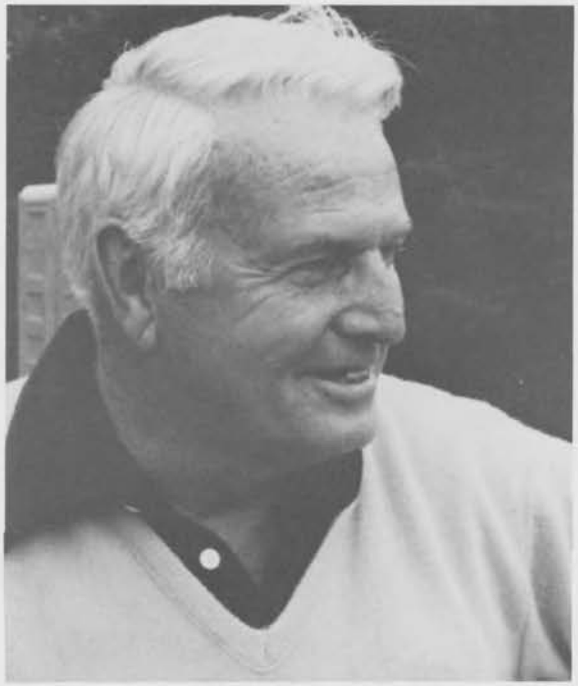

ROY PECK'S 41 YEARS AT KALAMAZOO COUNTRY CLUB

by
Cecil R. Kerr

Roy Peck, retired Kalamazoo Country Club Superintendent, died in his sleep on Wednesday, November 16th, while on a hunting trip at Ontonagon in the upper peninsula. It was the fourth time Roy had been in Ontonagon this season. He died where he was most happy. Golf and hunting were Roy's two greatest joys. Roy's wife, Sharon, said he called her Tuesday and told her that he had shot an eight-point buck that morning. "He was so excited ," she said.

Roy was born in Battle Creek in the home on the Country Club where his brother, Harold, had lived all his life. Their father, Andrew Peck, built Battle Creek Country Club.

Roy served in the Marine Corps as an aide for Admiral Chester Nimitz in the Pacific theater of operations.

Roy became golf course superintendent at Kalamazoo Country Club in April of 1945. In 1945 the course was solid chickweed and crabgrass. The fairways were yellow dandelions. When Roy came to Kalamazoo there was no equipment. There were no wrenches; not even a hammer.

Roy Peck's trademark was beautiful flowers. Several years ago Roy constructed a rustic fence surrounded by canna lillies, and dahlias with an American flag in the background with a beautiful flower bed at the base of the flag pole on the hillside. The pro-shop and club house were beautifully landscaped and annual bedding plants were effectively used to enhance the beauty and dignity of the grounds. Roy changed the plantings each year with original ideas. The entire golf course reflected the character of Roy Peck.

Roy started with a budget of $13,000, including his salary. Roy built Kalamazoo Country Club's 147 acres with 27 holes into one of the finest clubs in western Michigan.

In 1960 Roy constructed a new nine-hole short course, which meant added responsibility for Roy and his crew. Kalamazoo Country Club is one of the best conditioned and challenging layouts anywhere.

In the past 41 years there have been changes. The fourth hole has been changed from an easy par five to a tough par four; the par four fifth was lengthened and the green moved to make a par five; the ninth green has been completely reconstructed; the tenth hole has been lengthened by installation of a new tee; the eleventh hole has been rebuilt; the twelfth, a water hazard hole, has had tee placement changed; the 13th hole plays along Whites Lake and has been completely changed.

A tennis court, swimming pool and platform tennis court and shelter have been added to the facilities. The platform tennis court was built by Roy and his crew. Roy has planted hundreds of trees since 1945, replacing the trees that died from Dutch Elm Disease.

Roy maintained twenty-seven sand traps on the short course, plus 58 more on the full-length 18-hole course. This was his most time consuming job. The traps were raked every day and the greens were mowed six times a week, fairways four times a week, with a portion of the clipping removed. The roughs were mowed an average of once a week. Roy arrived on the job each day at 6 a.m. and often worked until dark.

Kalamazoo Country Club has both men's and women's leagues, Friday twilight, and heavy play every day of the week. The KCC also has a Member-Guest tournament, the Invitational Best Ball and a Junior Invitational, annually.

Roy had the ability to hire good, qualified people who respected him. He was able to bring out the best within his crew. Roy was also respected and loved by his membership. Roy was part of the KCC family. He was an early leader and President of the Western Michigan Golf Course Superintendents Association. Both Roy and his brother, Harold, have been past presidents. Roy cooperated very closely with Michigan State University and the Greens Section of the USGA.

Roy loved his job. After having open-heart surgery, he admitted to his long-time greens committee chairman, Glen Smith, that he was involved in a labor of love at KCC. Roy believed that his members should leave their worries behind when they turn off Whites Road and start the drive into the club. Roy once said, "I want to do my part to make their visits here as enjoyable as possible."

Roy was honored many times by his club at Roy Peck Golf Days, and he was awarded a life-time membership to the club at his retirement party.

We are all going to miss Roy Peck!

CHI CHI RODRIGUEZ TO RECEIVE AWARD

Juan "Chi Chi" Rodriguez, a superstar on the Senior Tour, has been selected to receive the Old Tom Morris Award from the Golf Course Superintendents Association of America (GCSAA). Rodriguez is the seventh recipient of the award, one of golf's most prestigious.

The award will be presented to Rodriguez on Feb. 13 at the banquet closing GCSAA's 60th International Golf Course Conference and Trade Show, which begins Feb. 6 in Anaheim. More than 2,000 people are expected to attend the banquet, including dignitaries from every major golf association.

GCSAA President John A. Segui, CGCS, said, "Mr. Rodriguez has truly demonstrated the characteristics so commonly associated with Old Tom Morris. He has dedicated his life to promoting the game, but more so, he has dedicated his life to helping his fellow man."

Rodriguez joins Arnold Palmer, Bob Hope, Gerald Ford, Patty Berg, Robert Trent Jones, Sr. and Gene Sarazen as recipients of the coveted honor.

The Old Tom Morris recipient is nominated and selected by the GCSAA Board of Directors.

Born in Puerto Rico. Rodriguez was determined to become the first professional golfer from his home country. He became a caddy at age seven and taught himself the game.

Rodriguez joined the PGA Tour in 1960. He's won eight tournaments and earned more than a million dollars.

Since joining the Senior tour in 1985, his career has flourished. Second only to Arnold Palmer in gallery draw, Rodriguez has captivated the fans, not only with his personality, but also with his consistent performances on the course.

Rodriguez set the Senior mark and tied the regular PGA Tour record with eight straight birdies at the Silver Pages Classic in Oklahoma City in 1987.

In less than three years on the Senior Tour, he has surpassed his tournament earnings from his PGA Tour participation.

Presently, Rodriguez has 12 victories on the Senior Tour. But his golfing achievements are of less personal significance than his work with underprivileged children at the Chi Chi Rodriguez Youth Foundation in Clearwater, FL.

"My greatest victory is when one of my kids gets a college degree," Rodriguez says. "Golf is only a means by which to help others."

One of golf's first greats, Old Tom Morris was a greenkeeper, golf professional, club and ball maker, golf course architect and accomplished player who won four British Open championships between 1861 and 1867. At the Royal and Ancient, St. Andrews, Scotland, Old Tom gained worldwide fame, boosting the popularity of golf throughout the British Isles and in many other parts of the world.

FIRST AID HELP FOR FROSTBITE

Frostbite is the most common injury caused by exposure to the cold.

Just before frostbite occurs, the affected skin may be slightly flushed. The skin changes to white or grayish yellow as the frostbite develops.

Pain and tingling are sometimes felt early, but subside later. Often there is no pain.

The victim is commonly unaware of the condition until someone mentions the pale, glossy condition of the skin.

This can be a very serious condition and medical assistance should be sought as soon as possible in severe cases.

- Bring the victim indoors as soon as possible.
- Give the victim a warm drink, no alcohol.
- Rewarm the frozen part quickly by immersing it in running or circulating water that is warm, but not hot. Test the temperature over the inner surface of the forearm or use a thermometer; temperature should be between 102° and 105° F.
- If warm water is not available, wrap the affected part gently in a sheet and warm blankets.
- Do not massage the affected part.
- Severe swelling will develop very rapidly after thawing.
- Discontinue warming as soon as the part becomes flushed.
- Once the part is rewarmed, have the victim exercise it.

GOLF COURSE WATER UTILIZATION

FINDING: Experts are increasingly worried about the continued supply of water. Already, periodic droughts and regional shortages cause planners to worry about supply issues. The widespread drought in the summer of 1988 may be an indication of what is to come.

Compared with other industries, golf courses are efficient users of water. The professionals who care for the nation's golf courses recognize the potential dangers of water shortages and have already started conservation efforts. Techniques have been adopted to decrease demand for freshwater, and the future promises to bring even more advances to save this resource.

NET WATER USE: Golf courses are important sources for recharge of rainfall and snowmelt to groundwater supplies. For example, open, grassy areas are approximately 90% pervious to rainwater whereas residential areas are only 20% pervious.

Even assuming a 50% rate of evaporation, a typical golf course in Westchester County, New York, provides seven times as much groundwater recharge as it consumes for irrigation purposes. By providing an open "green belt," a healthy, properly irrigated golf course is actually a net water supplier to the community.

Thus, when it becomes necessary for a community to curtail its water use, restricting the commerical use of water on a golf course may be a mistake. Industry and agriculture are the largest consumers of water overall in the United States, accounting for more than 90 percent of the daily total. Even minor conservation measures in these areas can solve the water supply problem.

EFFLUENT WASTEWATER: An estimated 10 percent of the golf courses in the United States have already started using effluent wastewater for irrigation needs. Because recreational users are generally low-priority recipients of potable water, reclaimed water is a real panacea for golf courses. Use is especially high in hot and arid regions like Arizona, Florida and California. It is anticipated that nearly all desert courses will be irrigated with effluent by the year 2007.

Effluent water is high in nutrients like nitrogen and phosphorus, which means that professionals can use less chemical fertilizers. Moreover, reclaimed water cannot currently be returned to municipal water supplies, and federal regulations make it difficult to release it into streams, lakes or oceans. Thus, turfgrass use helps dispose of this water. Obviously, turfgrass use of wastewater is safer than use of effluent to irrigate food crops.

TECHNOLOGICAL PROGRESS: Many technological advances promise to reduce golf course demand for water. Indeed, some have already been adopted by superintendents. For instance, a new low pressure irrigation system, combined with computer controls, is being used on some golf courses, including one in the Southern California desert. That course achieved a 25 percent reduction in water use. Additionally, the new technology substantially reduced the need for fertilizers and other chemicals.

Still other courses are beginning to apply improved climatological information to irrigation problems. Using data about evaporation and transpiration — known as "evaportranspiration" or ET - turf specialists can achieve 20 to 40 percent reduction in water demand, depending on the season. The National Weather Service provides ET data.

Turfgrass research and development can also lead to reduced water needs. In particular, drought resistant strains can be developed that will require less water. A jointly operated research program by GCSAA and the U.S. Golf Association provides funds for scientists to develop new turfgrass strains. The ultimate goal of the program "is a 50 percent reduction in water use." Scientists also seek ways to decrease compaction of the soil, a condition that increases the need for irrigation.

EROSION CONTROL: Soil erosion causes sedimentation of the nation's lakes, rivers and streams, effectively limiting the supply of clean water. Since turfgrass prevents soil erosion, golf courses indirectly assure a continued supply of fresh water.

According to the scientific evidence, land planted in grass erodes at a rate far less than soil planted in agricultural crops. Indeed corn erodes 668 times more topsoil, and wheat 84 times as much. Construction is even more devastating to soil, often causing the equivalent of

a decade's erosion in a single year. Thus, alternative projects, such as shopping malls or housing developments, cause much more erosion than does a golf course.

WATER MANAGEMENT: Golf course ponds act "as a reservoir for storm water drainage" thereby preventing erosion and urban runoff which pollute water supplies. Because pond water provides a supply of irrigation water that the superintendent can use at his discretion, it reduces competition against other users of a community's water supply.

CONCLUSIONS: Golf course superintendents recognize the potential importance of water supply issues in the future. Many have already started to adopt means to conserve water today. Various techniques have been developed that can reduce demand for water by 25 percent or more. Other projects are in the research state and could achieve even greater water savings.

Water is economically vital to the golf industry. There is no sound reason to limit golf course access to water supplies when other businesses are not similarly restricted.

"GREENKEEPER" VS. "GREENSKEEPER"

by
Bud Dufner

Historically, the "green" referred to the common, a smooth, grassy area or plot open to the use of all. By extension, when the green came to be used for golf, the caretakers of the course were known as "greenkeepers." It is important to note that the term "green" was inclusive, comprising the entire golf course (excluding designated hazards). This connotation has survived in the *Rules of Golf,* which refer to the course of play as "through the green."

By folk etymology, however, the comprehensive term "the green" came to be replaced by the more circumscribed application, "greens" — referring only to a course's putting surfaces. Thus, the erroneous term "greenskeeper" has gained a foothold in popular usage.

This development can be traced in the game's literature. *The Golfer's Manual,* 1857, states that "green" refers sometimes to the links, but more generally to the putting-ground. *The Golfer's Handbook* of 1881 took the reactionary position, however, that the term referred first to the whole links and second to the putting-ground. A contemporary (1980) reference work, *Davies' Dictionary of Golfing Terms.* states unequivocally that the term "greenskeeper" is erroneous, while citing numerous literary examples of both proper and improper usage.

It is our feeling that the battle lines on this issue can be demarcated nationally: "greenskeeper" seems to be an Americanism which is seldom, if ever, employed by the British — who, after all, nurtured the sport in its infancy and conceived the terminology.

It is both ineffectual and myopic to attempt to deter the natural evolution of the language. On the other hand, some linguistic developments many be unnatural and ought to be resisted. We here at GOLFIANA are unapologetic traditionalists. The earlier and more fundamentally correct "greenkeeper" will forevermore be the standard usage within these pages.

CREDIT: Golfiana, The International Golf Journal for Golf Historians and Collectors

DEW IS NOT DEW

by
Tom Mascaro

The beautiful crystal-clear droplets that you see on a turfgrass leaf in the early morning is not *Dew*. They are droplets of exudated liquid being pumped out of the grass plant. Exudate is pumped out of the grass blades through its hydathodes. The hydathodes are located along the edges of the leaves.

Exudate is easy to see with the aid of a simple magnifying glass. You will see the precise location of each exudated droplet along the edges of both sides of the leaf, and a large droplet at the tip of the leaf, if it has been cut off. This liquid is crystal clear. It looks like a fine piece of jewelry.

Each droplet hides potency in its beauty. This liquid is not harmless water of condensation that we call dew. Dew is moisture from the air that condences on a cold surface. Dew and exudate are completely different in composition. Dew is water of condensation and exudate is plant sap which is pumped out of the plant through the hydathodes. Dew can sometimes be found as a whiteish coating on the leaf surface. Exudate is found primarily along the edges of the leaf.

Dew is inert, because it is pure water of condensation. Exudate, on the other hand, contains all of the elements that are present in the plant sap, such as nitrogen, phosphorous, potash, calcium, magnesium and trace elements. With these salts, we can also find sugars, such as glutamine.

Dew Is Not Dew. When the grass is covered with millions of droplets in the early morning hours, what we have been calling "dew" is actually exudated liquid.

The presence of salts in the elements contained in the plant sap can be demonstrated in a number of ways. With a clean glass or paper cup you can scoop up the exudate and poor it into a clean container. A clean sponge will also do.

The concentration of solids contained in the exudate will depend upon the fertility of the soil and how much is available to the plant.

Pour some exudate into a clean petri dish or saucer. Allow the water to evaporate. You may have to fill the dish a number of times, each time allowing hte water to evaporate. When all of the water is gone, crystals of the salt present in the exudate will form, and can be observed closely with a low power magnifying glass.

Try pouring a small amount of exudate in the palm of your hand and allow it to dry. Feel how sticky it is.

Surprisingly, very little research has been done on the subject of exudate liquids. Dr. Randy McCoy, while at Oklahoma State University, wrote his thesis on how an extract from thatch could kill seedlings.

He gathered clean thatch from a well fertilized green and placed it in a clean glass container. He then filled the container with hot water. After allowing this to seep for a while, he poured off the water, which resembled a strong tea. Using this extract from thatch, he found that he could kill any plant seedlings by simple watering them with it.

Other experiments have shown that you can kill not only seedlings, but any young plant. This extract will also burn leaves and stems of mature plants as well.

Pour some pure exudate in a petri dish or small clean saucer. In order to gather pure, uncontaiminated exudate, use a glass tube or clean soda straw. Touch the end of the tube to the exudated droplet and it will be drawn into the tube by capillary action. After gathering a number of droplets in this manner, blow the liquid into your clean container. Cover the container and store in a warm place. Observe the fungi that germinate and grow in the pure exudate. Since fungi have no chlorophyl, they can only grow in a medium that has an abundant supply of ready made food. Exudated liquid is a perfect food for any fungal spores. These simple basic experiments demonstrate how exudate and turfgrass management practices have a profound affect upon the health and growth of the turf.

When we take a glass of exudate and pour it on one spot we find that we can burn the turf. Great care must be exercised in the selection of fertilizer, especially its nitrogen content, and its rate of availability. Nitrogen that is quickly available will move into the plant cells and can be found in the exudate. This is the reason that quickly available nitrogen fertilizers must be applied with care. As we know, when it is applied it must be quickly watered in or it will burn the grass leaves and stems. When a lot of nitrogen is contained in the plant cells, it will move through the leaves and out of the plant as exudate. This falls on the lower leaves and stems, causing the same kind of chemical burn.

A slow release nitrogen fertilizer, either organic or inorganic, releases slowly and the exudate will have only small amounts of this nutrient at any one time. The danger of chemical burn at the time of application and in the exudate is greatly diminished.

Now, let's look at thatch and the experiments that Dr. Randy McCoy made. We must assume that the thatch, acting like a sponge, soaked up the high nitrogen exudates. Minimal surface watering allowed the salt concentration to build up to a point where the thatch literally changed into a potentially dangerous material. A torrential rain storm and high temperatures could release enough salts to cause a severe chemical burn. Another assumption would be that disease fungi would immediately begin to flourish in dying and dead grasses and therefore should be considered the secondary cause of the grass' demise. Obviously we need a great deal of research in this area of turfgrass culture.

What about Dr. Robert Endo's research, where he demonstrated that fungal spores that germinated in water grew very slowly, while spores that germinated in droplets of exudate grew very rapidly. This research certainly demonstrated many things. Especially important to the golf course superintendent, it demonstrated why early morning syringing is important, because it dilutes the accumulated exudate by washing it off of the leaves and back into the soil.

We look at Dr. Mike Britton's reasearch and his graphic illustrations of how fungal spores germinate slowly in water, while spores germinated in water with sugar added grew more rapidly. When he added glutamine to a solution, spores germinated quickly and the mycellium from these spores grew many times faster. He found that glutamine is one of the ingredients in exudated liquid.

The presence of glutamine is known to every golfer, because his hands get sticky when he plays when the so called "Dew" is on the turf. The presence of glutamine also accounts for the fact that clippings accumulate on the mowers. Syringing the turf when exudate is present in the early morning will quickly wash this material back into the soil. Clean water dries more rapidly than exudate, therefore less clippings adhere to the mowers. It is interesting to not that over forty years ago. Dr. Fred Grau, after making a survey of member clubs, found that greenkeepers (as they were called then) that practiced early morning watering had far less disease than those that didn't. Today we know that it was not the time of watering, but that the washing off of the exudate minimized the incidence of disease. Golf course superintendents have always been a very important part of turfgrass research. In practicing their science and art, they found many ways to combat problems that seemed to have no answers.

To mention a few, Carl Bretzlaf, Golf Course Superintendent of Meridian Hills, Indianapolis, and past president of the GCSAA many years ago, had a reputation of having little or no disease problems on his golf greens. His secret was that he had a home made rig that consisted of two iron wheels and five layers of burlap bags that was pushed over the greens—to dry them off! O.J. Noer, agronomist for the city of Milwaukee, always preached that "mold never grows on dry bread" and on that basis Carl dried his greens. His men would then syringe the grass with water and then mow. What he was doing was physically removing the exudate, washing what remained on the grass back into the soil and then mowing.

At Merion Golf Club, Ardmore, Pennsylvania, superintendent Joseph Valentine, in addition to syringing the greens, would, during periods of stress, apply a little hydrated lime when the grass was dry and then wash it in. He always felt the pH in the thatch layer was important in relation to disease incidence. He also believed in frequent light topdressing to control thatch and disease. Years later, Dr. Ralph Engle's research at Rutgers, New Jersey, revealed that there was a correlation between pH and each disease organism that effects turfgrasses. Here, again, we see the need for basic research to explore the pH of thatch and exudate.

We need research to update the research of Dr. J.K. Wilson, Cornell University, New York, that he performed in 1923. Dr. Wilson was walking across campus early one morning and noticed that there was more "Dew" on some areas of the lawns than others. He suspected that it was due to soil moisture. However, when he analyzed the moisture content of the soils, he found, surprisingly, it was the same in the light "dew areas" and the "heavy areas".

These results piqued his curiosity, so he decided to investigate. His research disclosed that the droplets that he found on the grass blades were not "dew" at all. It was liquid pumped out of the leaves.

This liquid, first found and reported in Egypt in 1893, was referred to as guttated water. Guttated water and exudated water are one and the same, and can be found reported either way in the literature.

Dr. Wilson also made another interesting discovery. He found that all grasses do not exudate at the same rate. He classified each of the turfgrasses in the following order: the Bentgrases, Bermudagrasses, and Poa Annua were prolific pumpers of exudated fluid. The Bluegrasses were medium pumpers (except Poa annua). We can also include St. Augustinegrasses as medium pumpers. The Fescuegrasses, Zoysiagrasses and the ryegrasses were the low pumpers.

We have all seen these differences in the amount of exudate, when we look at an area of mixed grasses in the early morning. Can we not draw the conclusion from Dr. Wilson's work that there must be a correlation between grass species, exudate and diseases on turfgrass areas? More exudate means more problems. It is obvious that more diseases occur on Bentgrasses, Bermudagrasses and Poa Annua. The Bluegrasses, excluding Poa Annua, have less diseases than the foregoing species. Zoysiagrasses, Fescuegrasses and Ryegrasses have little or no problems with diseases.

After sixty-five years, it seems that we have a great deal of research to catch up on. Golf course superintendents cannot do this research alone.

When we lose grass for some unknown reason, we need to find the answers. When 18 greens are lost overnight, we need to take a hard look at our management practices and an even harder look at researach. We need research that gives us answers to problems and not just cures.

Let's briefly review what we have discussed. First, let's look closely at exudated water. It is a natural function of the plant to force this liquid out when it imbibes too much water. This, in a few words, is a very simplistic answer to a complicated function that needs answers.

As the exudate forms and falls to the lower leaves and stems, new droplets are formed. No one knows how much exudate forms under conditions of high or low humidity, or at what temperature. No one knows when the chemical concentration is critical. On windy nights, when exudate evaporates, do the residual salts remain to cause problems later? How much sugar and glutamines are formed? Does the nitrogen in the exudate become nitrate, and upon exposure to the air become nitrite? This is only a short list of questions that need answers.

In the meantime what do we do about dew and exudate? The answer for the present is to modify management practices to recongize that exudate plays an important role, especially during periods of stress.

Until money is found from sources other than industry for needed research, we might want to look at turfgrass management in a different way. A popular cliche' is "when you look at a doughnut, don't look at the hole, look at the whole doughnut."

Starting with the management of the soil, we concentrate on the need to relieve compaction so that air and nutrients can move into the root zone. What about exudated liquid. An open pourous soil allows the exudate to be diluted and washed down into the soil to be recycled. Aerification, therefore, is essential to minimize or eliminate high concentration of salts at the soil surface.

Next, let's look at the grass species. If the grass that we are using exudates at a high rate, then we must manage it differently than a grass that exudates at a low rate.

What about our irrigation practices? Dilution at the right time is one of the keys to control exudate. Irrigation can be done anytime, but careful syringing in the morning to dilute and wash off the exudate and get it down into the soil is vital. If the exudate is washed down into the thatch or soil surface without dilution, problems may occur.

Now, lets turn to fertilization. We have heard the expression,"nitrogen is nitrogen, no matter what the source." This may be true, but if one is growing grass on a golf green, or any intensive use area, more emphasis should be placed on how quickly the nitrogen moves into the plant and out with the exudate, than the source of nitrogen.

Fast release nitrogens must be applied frequently and in light amounts. This will minimize the concentration of this element in the plant tissue and exudate. Slow release nitrogen sources are safer, and result in low concentrations in the tissue and exudate. Care must be exercised with some slow release materials, in that a portion of the nitrogen is quickly water soluble when first applied.

What do we know about the salt index of nutrients for turfgrasses? We know that more research is needed in this area. Muriate of potash, for instance, has a salt index of 116, while sulphate of potash has a salt index of 46. Which do we use and when? We know that the higher the salts in a soil, the higher the need for water. On intensive use areas, are we watering too much because of our selection of nutrients that have a high salt index? We also know that exudated water will contain salts in relation to their availability to the plant cells.

What about pH levels in the exudated liquid? Is it affected by acidifying fertilizers? If they are, can these differences in pH be found in the soil and the plant cells? If they are, then can we predict which pathogen will affect the grass plant?

Lastly, we look at management practices. We have learned that early morning syringing is a sound practice. Almost everything we do in turfgrass management comes into play when we think in terms of biological culture. These, of course, include aerification, verticutting, height and frequency of cut, controlled nutrient applications, soil profile temperatures, pH at all levels of the soil horizon, topdressing, irrigation practices, etc.

We know that we can rely on some proven research, some theory, and lots of green thumb hands on experience to keep grass alive during periods of stress.

We also desperately need more meaningful research to separate dew from exudate. As we get the ansers, turfgrass management will become more biological and cultural than curative.

CREDIT: The Florida Green

GREEN IS THE COLOR OF GOLF

History of Turfgrass Management

by William H. Benegeyfield, National Director
USGA Green Section

Early on, "green" has been the color of golf. If those early days when Dutch Traders called at St. Andrews (one of the world's largest trading markets and fairs in the 12th century), green Linksland between harbor and town was ideally suited for Het Kolven — a popular ball and stick game from the Netherlands. The sandy coastal soils; the smooth wind-blown, rolling terrain and the soft, springy turf sustained by howling gales and gentle rains produced the Green Links. Natural, too, were the pits of sand where sheep huddled for shelter, later to become hazards in the evolving game of "golf." Through the centuries the game cast its spell over these people and their land and eventually over the earth.

These were simple times. The implements and balls of the day were as simple as the playing conditions crude. But the game persisted from the 12th Century on and by 1700, townsfolk of St. Andrews simply called the narrow strip of land leading to the harbor and the sea "The Green." The course was known in this way for generations. There they would tee up with a handful of sand, hopefully drive the leatherwrapped feathered ball to the "fair-green" all the while keeping it out of the surrounding heather and mass of entanglements. Once on the fair-green, the next target was on the "play-green," a roughly prepared area with an equally roughly prepared hole in it. Sometimes the hole was so deep it took a long arm to retrieve the expensive ball. In early "golfe," the winner was determined by the number of holes he won in the contest, not by the number of strokes taken during the round. Whether it be 5 or 15 was of minor concern, just as long as he "won the hole."

It was in 1754 — a rather recent date in the annals of golf, that the Royal and Ancient Golf Club was formed. Since the beginning of time, the Old Course has always belonged — and still does — to the citizens of St. Andrews. The Royal and Ancient Golf Club sought playing privileges there and in return worked out an agreement with the town fathers to pay for the maintenance of the course. This raises an interesting historical point, at least from the grass growers perspective. The Royal and Ancient was actually concerned with the care and maintenance of the turf on the Old Course fully 100 years before assuming responsibility for The Rules of Golf! In other words, course conditioning received very early attention. It was not until 1892 that the SR&A became the one and only governing body for the Rules (Unification of the American and British Codes of Rules did not take place until 1951.)

By the end of the 1700's, the first greenkeepers came into being. Not unlike today, they were charged with making things better for the golfer. From Horave Hutchinson's book, "British Golf Links," (1897), there appears this record from the Aberdeen Golf Links on July 6, 1920:

"The secretary was instructed to pay Alexander Monroe at the rate of L4 (approximately $15) per annum for taking charge of the Links and providing accommodation for the member's club boxes, and for that sum Monroe is to pay particular attention to keeping the holes in good order. If that was not bad enough, the above allowance was diminished in 1882 to L3, an alteration which may be regarded as an illustration of the well known prudence of the aberdonians in financial matters."

Long before there was golf on the western side of the Atlantic, the Society of Golfers at St. Andrews (1832) decided to rebuild some of their "old greens." They enlarged them to the enormous and famous double greens of St. Andrews as we know them today!

And so the care of "The Green" had its beginning. The early golf professionals frequently became the greenkeepers as well. Neither job was know for its security even in those days. If a man could win at competitive golf it was all to his credit. But he would also be wise to know how to make club heads or golf balls or care for the course just in case.

Old Tom Morris, still considered the Grand Old Man of Golf and four times winner of the British Open, became greenkeeper of St. Andrews in 1865 and continued until 1904. He had two rules for his maintenance program: "Maire sound, Honeyman" was his cry for his assistant Honeyman to apply evermore topdressing of sharp sand to the greens and fairways in order to "maintain the character of the grass." His second rule was, "Nae Sunday Play. The course needs a rest if the golfers don't." As a tribute to Old Tom Morris for his care of the Old course, the first patented hole cutter developed by Charles Anderson was presented to him in 1869.

Golf was now sinking its roots in this country and around the world. It caused people to take an increasing interest in grass. The first turf garden in America was established at Manchester, Connecticut, in 1885 and the first turfgrass research was recorded in 1895 at Kingston, Rhode Island. Grazing sheep were still used in the early 1900's for mowing and nurturing the green cover of golf courses. But the lawnmower, having its start as early as 1830, was slowly adopted for horsedrawn use and special leather shoes were placed on the horses so the golfing surface would not be disturbed.

Now two explosions lie just ahead for golf in America. The first occurred in 1913 when an unknown American caddy by the name of Francis Ouimet beat the world's greatest golfers of the day. Englishmen Vardon and Ray for the U.S. Open Championship at The Country Club, Brookline, Massachusetts. The popularity of the game soared. About the same time, agricultural science had budded and was about to bloom. The USGA, organized

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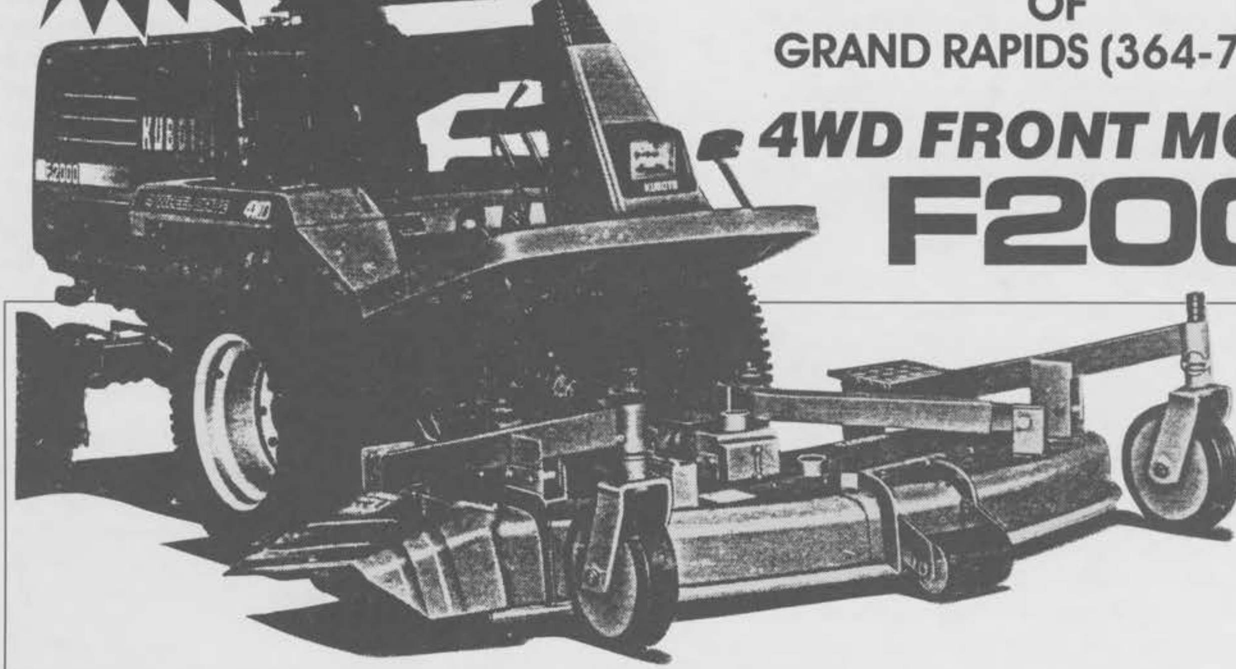

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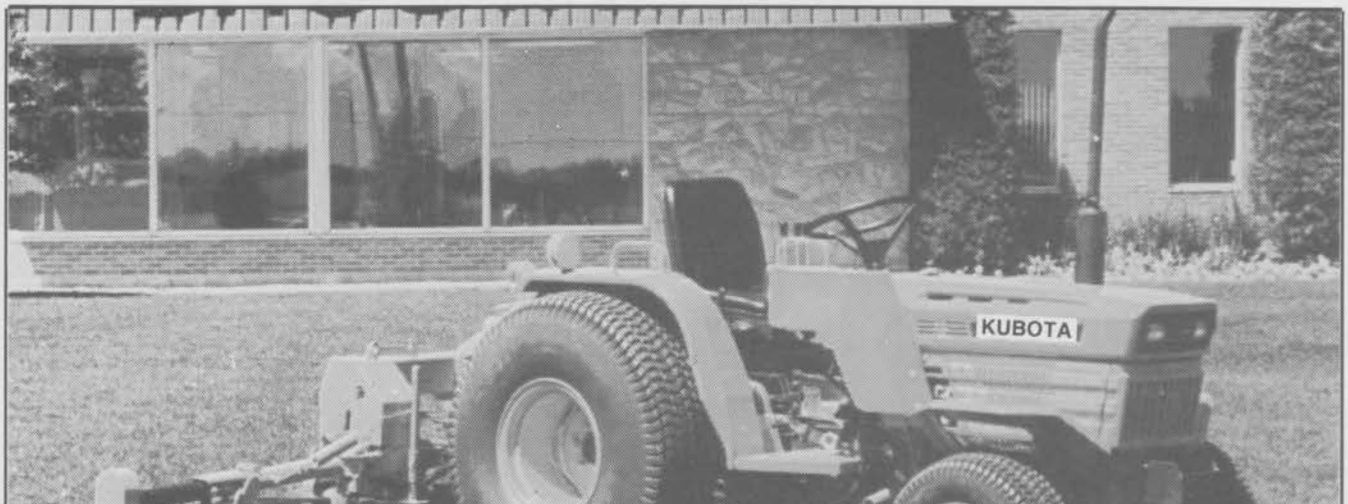

in 1894, supported publication of a new book in 1917, "Turf for Golf Courses" written by Drs. Piper and Oakley of the Department of Agriculture. These men were not only scientists, but golfers as well. Others throughout the country who loved the game could see the need for better, more dependable playing surfaces. Agricultural science would now serve golf.

The Green Section of the USGA was formed in November, 1920, and gained immediate support from green chairmen and greenkeepers (now they prefer to be called golf course superintendents) throughout the country. It's difficult for us today to even imagine or understand the complaints of the golfer just 40 years ago! For example, earthworms were a major problem, especially on greens. Either their cast or their bodies were always in the line of a putt. One early Green Section agronomist recalls the golfers would complain bitterly that their ball would invariably be deflected away from the hole while putting over these impediments. In all his years, however, he never once heard a golfer complain that his ball was deflected into the hole by the earthworm. Surely, the scientist thought, statistically this must have happened at least now and then!

Disease was the big grass killer of those days and Dr. John Montieth, then Director of the Green Section, in the late 1920's developed the first effective fungicides for their control. His findings are still in use today.

The march of science made possible new machinery, new grasses, chemical fertilizers, weed controls, insecticides, improved soil mixes, irrigation and drainage principles, etc. All followed in blazing succession from the early 1930's to the present day.

Dr. Fanny Fern Davis received the 1975 USGA Green Section Award for her tremendous contribution to golf through work with turfgrasses. During World War II, Dr. Davis left her job with the National Capital Parks Service and served as Acting Director of the USGA Green Section. During this time she was instrumental in recognizing and adapting newly developed carotenoids. They develop in late summer in the sap of the cells of the leaf, and this development is the result of complex interactions. Their formation depends on the breakdown sugars in the presence of bright light as the level of phosphate in the leaf is reduced.

During the summer growing season, phosphate is at a high level. But in the fall, phosphate, along with the other chemicals and nutrients, moves out of the leaf into the stem of the plant. When this happens, the sugar-breakdown process changes, leading to the production of anthocyanin pigments. The brighter the light during this period, the greater the production of anthocyanins and the more brilliant the resulting color display. The brightest colorations ususally develop when the days of autumn are bright and cool, and the nights chilly but not freezing.

Anthocyanins give the familiar color to such common fruits as cranberries, red apples, purple grapes, blueberries, cherries, stawberries, and plums. In our autumn forests they show up vividly in the maples, oaks, sourwood, sweetgum, dogwood, tupelo, black gum and persimmon. These same pigments often combine with the carotenoids' colors to give us the deeper orange, fiery reds, and bronzes typical of many hardwood species.

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PEAT MOSS and PEATS

by
Kenneth Peck
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To arrive at a precise definition of peat is enough to bog anyone down (we had to do that at least once) and perhaps the easiest way to do that would be describe the origins of various peats.

Peat materials used in horticulture are the result of the incomplete decomposition of a wide variety of plant remains by micro-organisms, usually under flooded conditions in which oxygen is limited or lacking. Most growers have no problem distinguishing between soil and soilless growing mixes. True soils are derived from mineral strata of the earth's rock mantel and usually contain a nutrient supply, whereas soilless mixes consist of at least 50% organic peat with the addition of a number of inorganic, essentially inert ingredients such as vermiculite, perlite and sand (styrofoam is inert but is a synthetic organic). More will be said later about nutrition in soilless mixes.

Peatland areas around the world have probably developed within the past 10,000 to 14,000 years, or since the most recent retreat of glaciers. Melt water from these glaciers was considerable and provided, along with glacially modified terrain, the numerous natural conditions for the development of peat bogs. In addition precipitation came more frequently as rain than as snow or ice. Radiocarbon dating has been used to chart changes in peat bogs and, in turn, climate variations that prompted these changes. In general, peat accumulations were more rapid in cool and moist periods than in warm and dry periods.

Peat bogs are complex systems. The plant species that contribute to peat formation vary according to the level of nutrients supplied by the enrironment. Where nutrients are abundant or only moderately abundant, trees such as larch, spruce, alders willows and birches will be found. Non wood plants, such as cattail, horsetail, spatterdock and water lily, are common aquatic species found in peats. Sedges and grasses contribute greatly to peat formation in many bogs. Finally, the mosses may or may not make up much of the peat formed in a nutrient-rich site, but they are not likely to be species of Sphagnum. Peats developing in these nutrient-rich conditions are called fen peats. On the other hand, nutrient poor situations favor another group of species very much different than those listed above. Tree species contributing to peat formation would be a couple of heathers, Labrador tea, blueberry and bog rosemary, non-woody plants, a number of sedges and grasses, and a fair list of Sphagnum mosses. It is these nutrient-poor conditions that give rise to bogs from which we receive the Sphagnum peats used horticulturally. *See Figure 1.*

Fig. 1

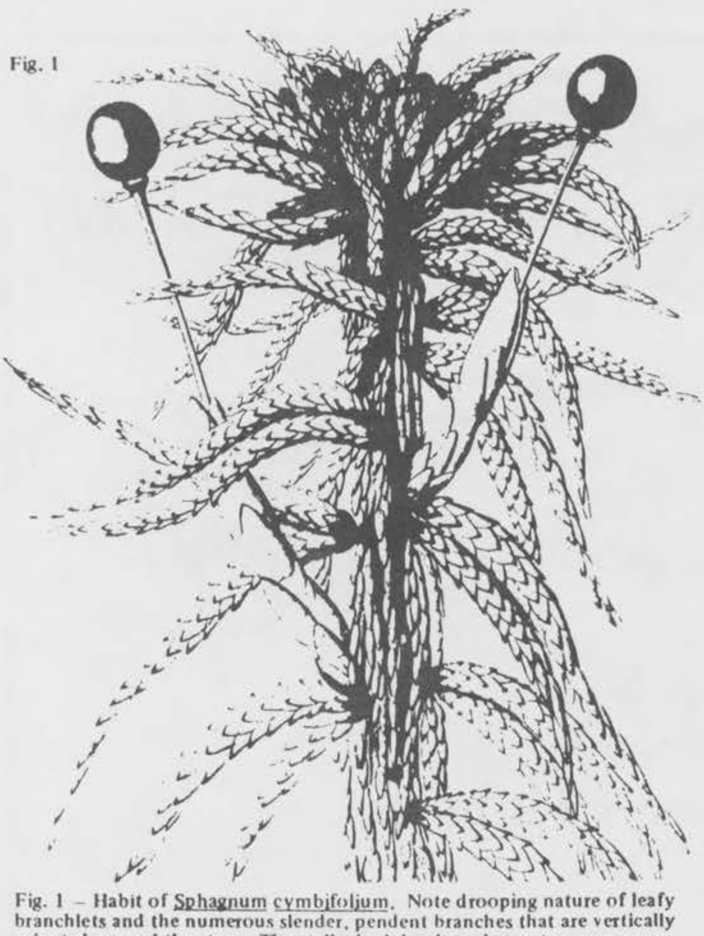

Fig. 1 – Habit of Sphagnum cymbifolium. Note drooping nature of leafy branchlets and the numerous slender, pendent branches that are vertically oriented around the stem. The stalked, globe-shaped structures are spore-containing capsules.

Quite a number of different types of peat are mentioned in the literature. Their definition, description and classification reveal their content, and often their origin, or even the degree of decomposition. Their designations are confusing and it seems that each author has his own way of dealing with them. Without being concerned about systems of classification at this point, the following peats are most frequently referred to.

SPHAGNUM PEAT—there are two types: light and dark. Light peats are known in several different forms which are yellowish to light brown or even gray. They weigh 40 (1½ oz.) to 80 grams (3 oz.) per liter(qt.) with a pore volume of 95-97%, which indicates the ability to hold a great deal of water that would be available to plants.

Fig. 2

Fig. 2 – Whole plants of Sphagnum acutifolium (a) and S. cuspidatum (b) two of the species identified in the formation of light sphagnum peats. (c) detail of a leafy branch of S. cuspidatum.

Air capacity is 15 to 40% of the total pore volume. The cation exchange capacities (the ability to hold nutrients) of light peats runs from 2.0 (4 lbs.) to 3.5 Kg. (7 lbs.) per cubic meter (cubic yard). Two species of Sphagnum, which are common constituents of light peats, are shown in *Figure* 2. Note their long, unbranched stems. Dark Sphagnum peats weigh nearly twice as much and possess 92-94% pore volume. Air volume is less, running 12 to 25% of the pore volume. Their exchange capacity tends to be higher, somewhere between 4.8 (2) to 7.8 Kg. (3.5 lbs.) per cubic meter (cubic yards). Dark peats are less elastic and will not return to their original volume after compression. They also lack the durability of light

Sphagnum peats and are not as suited to long term culture, alghough they are still better than the light colored forms of other peat types. Sphagnum peats are regarded as superior for soil amendment or to use in growing media. The pH of Sphagnum peats ranges from 3.0 to 4.2 or 4.5.

The pore volume of sphagnum mosses is a feature that makes them so suitable for horticultural purposes. These pores form an internal capillary system, which is capable of absorbing, holding and releasing water to plants. *See Figure 3.* Capillary water on the external surfaces is connected to the water of the internal system, making the sphagnum peats excellent reservoirs of water. Only 7% of the water held is bound in the cell walls and unavailable to plants. It is said that sphagnum mosses, upon drying, develop surface waxes that make them difficult to re-wet.

HYPNUM PEAT—also known as Bryales peat. "Bryales" is a botanical classification that includes the true mosses. (Sphagnum mosses are not regarded as "true" mosses.) Hypnum may have a couple of meanings. First, it is the generic name of a good sized group of moss species. Second, it refers to an even larger body of moss genera and species which show some close relationship to the species of Hypnum. Hypnum peat decomposes rather quickly, but is considered to be good for soil conditioning, seed germination and acid-intolerant plants. It has a pH of 5.0 to 7.0, and re-wets more easily than Sphagnum peats.

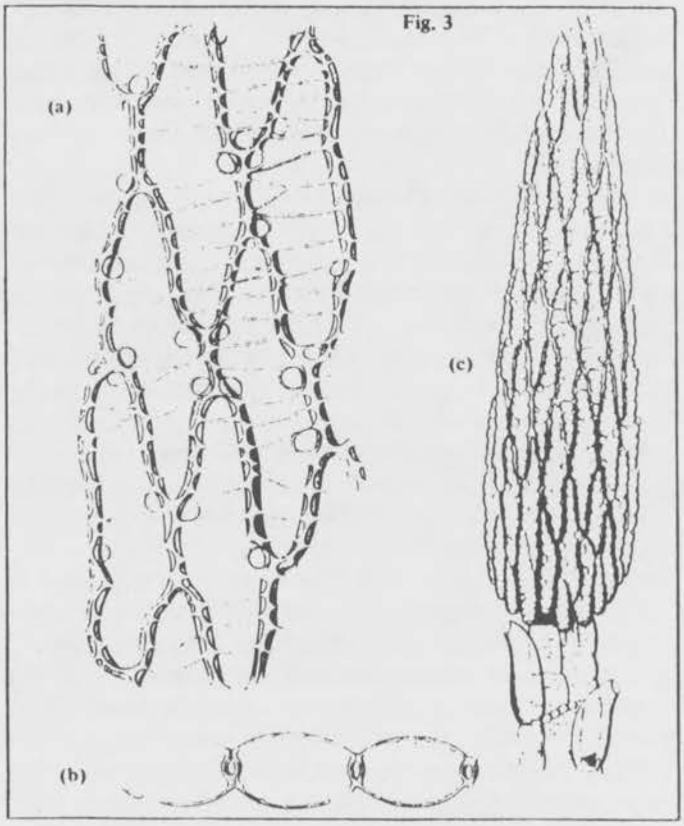

Fig. 3 – Cellular details of leaves of Sphagnum acutifolium. (a) Magnified portion of leaf. Note the pores in the cells. (b) These pores appear as breaks in the cell wall of the leaf cross-section. The large spaces are devoid of living cell contents. The smaller enclosed areas contain chlorophyll. (c) An illustration of an entire leaf.

SEDGE PEATS—there are light and dark forms here, too. They are sometimes called "Reed-sedge" peats. Sedge peats are derived from grass-like plants, including grasses, sedges and rushes in addition to cattails and other marsh plants. They generally have high air capacity and low water holding capacity and are not too good as a growing medium. Exchange capacity is low. They are, however, good for soil conditioning, both in the garden and in pottng soil mixes. The pH of sedge peats runs from 4.5 to 7.0.

WOODY PEAT—this is dark colored remains of trees and shrubs growing in forest bogs. It consists of pieces of wood, twigs and bark from birches, larches, black spruce, arborvitae, leather leaf and other heath type shrubs. It varies greatly in texture and make up, but is usually porous. It breaks down rather quickly to become a peat humus. Woody peats are acidic, with pH values between 3.6 and 5.5.

BLACK PEAT—these peats are variously referred to as peat humus or Michigan peat. The weight of such peats is quite heavy - 130 (4.64 lbs.) to 190 (6.79 lbs.) grams per liter (quart). Their water capacity is much higher than their air capacity, and their consistency when wet is sticky and "plastic". Humus peats are at the "end of the line", so to speak, as far as decomposition is concerned and it is not possible to recognize the structural features of the plants that contributed to its make up. There are two types of black humus peat. The first is called amorphous peat humus. It is highly acidic and cotains humic acids that render is structureless. The water it holds is largely unavailable to plants, and when it dries, it becomes lumpy, but turns to dust when broken up. The second type is granular peat humus containing humates that cause the colloidal particles to form aggregates. This type is very good for improving mineral soils due to its high air capacity and permability to water. Needless to say, mixtures of some of the above peat types will be encountered and their properties are determined by the most abundant constituent plant. Humus peats range widely in pH values from 4.0 to 8.0.

The one system of peat classification that seems to make some sense for both horticultural and scientific purposes was the one given by von Post. This system is based on the degree of decomposition of the plant material. On a scale of 1 to 10, the degree of decomposition is matched to the weight of the peat type per unit volume, the pore volume (which decreases and decomposition advances) and the color of the peat (the darker the peat, the more decomposed it is). Degree 1 peat is not decmposed, and the plants found in it are easily recognized.

As decomposition advances, the residues are more important in determining the properties of the peat. Degree 10 peat is totally decomposed. Long-fibered Sphagnum would qualify as a degree 1 peat, whereas Michigan, black or humus peat would be a degree 10 peat.

A good example of both a humus and fen peat formation is the Florida Everglades, which cover 2,000,000 acres of that state. Florida people refer to this peat as a "muck". The Everglades is a sea of Saw Grass broken by island hummocks and covering peats formed from sedges, rushes, grasses and aquatic plants. Present day peat is formed principally from underwater portions of plants—rhizomes and roots. In hot, dry summers when water levels in the Glades are low, the dried muck is sometimes accidentally or spontaneously ignited and will burn for days or weeks. In the past 40 years, a considerable area of the Glades has drained for agricultural use and cattle grazing.

Figures about world resources and uses of peat are enlightening. Moore and Bellamy published some data in 1974 that showed the world's exploitable peat resources (figures in hectares. 1 ha = 2.57 acres):

Canada	129,500,000
U.S.S.R.	71,500,000
Finland	10,000,000
U.S.A.	7,500.000
Norway	3,000,000
United Kingdom	1,582,000
Sweden	1,500,000
Poland	1,500,000
W. Germany	1,129,000
Iceland	1,000,000

Not all these resources are exploited to the fullest. For example, the U.S.S.R. utilized 95.7% of exploitable peat resources per year, whereas Canada harvested only .13% (1974 data). The figures are not exactly up to date, but demonstrate the varying degree to which certain countries use their peat.

Peat is not always used for horticultural purposes. To illustrate: Since the early 18th century, Russia has used peat as an energy source for heating homes. In 1914, there was an electrical power station fueled by the burning of peat. In 1928, the Russians developed a system of milling peat that allowed them to harvest much greater quantities of peat. Present day annual harvests probably exceed 80 million tons of peat. As many as 70 power stations are fueled by peat in Russia. Ireland has eight peat-fired power stations which produce a total of 387.5 mega watts of electricity. Peat has also been burned to some extent in Scotland, West Germany and Finland.

One of the curious events relating to man's use of peat for burning occurred in Denmark. Peat cutting for the purpose of heating homes is still a practice in some of the rural districts in northern Europe. One day in 1950, two farmers in Tollund Fen were cutting peat to be burned in their tile stove and kitchen range. When doing this, they uncovered the face of a man that was in such an excellent state of preservation, that they called the local police to investigate, supposing that a murder had recently been committed. As it turned out, this man had been sacrificed to the fertility goddess, Mother Earth. He had been buried there in the Iron Age, nearly 2,000 years ago. He was not the only one ever to be found. Nearly 700 bodies in varying states of preservation have been uncovered from the peat bogs of Northern Europe. The low bacterial activity and acidity of the bog were credited with preserving these bodies so well. The preserved head of the Tollund Man, complete with the leather hat he owned when he was alive, can be seen at the Sikeborg Museum in central Denmark. There are no reports of this kind of thing happening in North America.

In both Russia and Norway, peat is used for insulation purposes. In Russia, poultry houses are insulated with boards of compressed peat. In Norway, compressed peat bales are used on railroad beds that are subject to frost heaving. The peat bales evidently prevent this from happening.

Sphagnum peat has been the basic ingredient of peat-lite mixes which are now commercially formulated under many brand names. Their convenience and relatively pathogen-free make up have made them the preferred growing medium. Along with these good features is the problem of nutrition. Commercial peat-lite mixes, even with their starter nutrients added, have a low level of fertility that must be supplemented continuously. Toxicity problems were encountered with peat-lite mixes when soil-based fertilizers were used. The problems were related to the nitrogen cycle and the degradatiuon of nitrogen from ammonia to nitrate, the form of N most taken up by plants. Ammonia or ammonium ions are generally said to be the cause of the toxicity seen in plants grown in peat substrates. The problem of ammonia toxicity is pronounced in winter when days are short, light conditions poor and temperatures are cool, and plants are not growing rapidly. A good part of difficulty could well be the relative lack of nitrifying bacteria, coupled with a low pH that does not favor their activity.

Anyone who has had the intenstinal fortitude to read this far should be encouraged to read some of the references cited below. The story of peat is complex and fascinating. Every opened bale of peat moss is a word or phrase taken from a chapter of the history of some bog.

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A special note of thanks to Roy Judd of Premier Brands, Inc. for providing some excellent reference material relating to peat moss classifications.

FALL PARTY

This year's Fall Party was hosted by Kurt and Kathy Thuemmel at Walnut Hills Country Club. There were 93 people in attendance this year. The food and entertainment were excellent and everyone enjoyed a wonderful evening.

We would like to express our appreciation to the following companies for their donations to cover the expense of the hors d'oeuvre table.

Parmenter & Andre	D&C Sales
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Thanks, also, to Fred and Sandy Pastoor for their efforts in handling the door prizes.

Thanks, again, to everyone that worked on the party to make it so enjoyable.

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