



NORTHERN MICHIGAN TURF MANAGERS ASSOCIATION

3733 APOLLO DRIVE • TRAVERSE CITY, MICHIGAN 49684 • 616-943-8343

WEDNESDAY, JULY 8th, 1987
HIDDEN VALLEY
GAYLORD

James B Beard

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Starting times are necessary and will be between 11:00 A.M. and 1:00 P.M. For reservations, please phone (517) 732-4653. Price of golf carts will be \$9.00 per person, cost of dinner will be \$14.00, prizes will be \$2.00 with TOTAL PACKAGE \$25.00 to be paid at Pro Shop when registering. Golf will be Best 2 Balls of Four with handicap. Bring your foursome or Pro Shop will pair up individual players. Dinner will be served at River Cabin as well as Happy Hour. Bus transportation to River Cabin from parking lot near Main Lodge. Happy Hour 5:00 P.M. and Dinner 6:30 P.M.

We are very fortunate in having for our speaker Dr. Wm. H. Carlson, Professor and Extension Specialist, Department of Horticulture, M.S.U. Bill Carlson got his Academic degrees from Penn State: B.S., 1963, M.S., 1964 and Ph.D., 1966. He is an outstanding authority on Michigan flowers and was the featured speaker at the spring G.A.M. meeting at Detroit Golf Club. It was there, that those who heard him said, "He must be on our program this year". If you would like to improve your club by the use of flowers, this meeting is a must and you cannot afford to miss this program. As usual, Dr. Carlson will speak after dinner.

Next Meeting is scheduled for August 26th, at LAKEWOOD SHORES GOLF & COUNTRY CLUB on the east side of the state near E. Tawas. Further details will be forthcoming in another letter. Meantime, please keep this date in mind.

Fall Regional Seminars

You won't want to miss the kickoff for the 1987-88 regional seminar schedule this year!

GCSAA and the Hawaii Turfgrass Association will co-host "Basic Turfgrass Botany and Physiology" in Honolulu. Offered in conjunction with the international Pan Pacific Conference, "Botany and Physiology" will be presented by Drs. James Beard and Jeffrey Krans on September 22 and 23, 1987. Call Betsy Evans in the Education Department at 800-GSA-SUPT for further information.

Following this exciting program, these educational opportunities will be offered in October:

- October 6-7 "Managerial Productivity," Harrisburg, Penn.
- October 14-15 "Golf Course Design Principles," New Orleans, La.
- October 21-22 "Golf Course Design Principles," Pleasanton, Calif.
- October 27-28 "Golf Course Construction and Project Management," St. Louis, Mo.

Make your plans now to take advantage of the regional seminar in your area. ■



Editor

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"THE POSTCARD"
NOW?

BEHIND THE GREENS
A MONTHLY MESSAGE FROM YOUR BOARD
BY JON SCOTT, CGCS, PRESIDENT

Is this only July? Somehow I lost spring back in March. I just know that the leaves are going to start turning next week, and we can all drop back a little. What's that you say? Eight more weeks? Not possible!!!

In any event, here we are in the midst of one of the craziest seasons many of us can remember. Yes, I know, some of our more seasoned veterans like Tuck, Bob Rieschl, Frank Hemminger, and a few others can say with great pride, "Why if you think this is bad, I remember the summer of" And so shall we do the same in years hence. If we survive.

In seasons like this, we tend to become more and more isolated with our own jobs, our own problems, and our own interests. This makes our association meetings all that much more important as a support mechanism for ourselves and our colleagues who may need our help. We must not lose sight of the need to share problems, ideas and friendship with our peers. It is easy to set our priorities elsewhere. It is more difficult to "break away" and spend a day with our fellow professionals. We need to plan for these meeting days the way we would plan for a fertilization or verticutting. Set aside some time each month to get away from your problems and learn how others are dealing with theirs. You may be surprised at what you learn. It may even help you.

Our membership book is being printed and should be out this month. Not as timely as we had planned, but under the circumstances, much better than last year. Your board will be taking steps to keep the membership roster more up to date in years to come and will be able to go to print earlier. My thanks go to all who helped get this thing on the road this busy season.

Our 11th Annual MTF Benefit Tournament was a huge success by any standards. My special thanks go to Tom Brogger, chairman, and his committee for organizing and handling this tremendous event. We deeply appreciate the work and cooperation exhibited by Damian Kurkowski, course superintendent, and his entire maintenance crew, Rick Smith, PGA professional, and his expertly coordinated staff, Bill Tophen, resort manager, and his excellent food and beverage people, and Mr. Harry Mellon, owner, for allowing us to use his fantastic facility for this prestigious event. We, the board of NMTMA also want to thank each of you participants and your guests for making the tournament so successful. It will be hard to top.

See you at Hidden Valley July 8th!

To overcome difficulties is to experience the full delight of existence.
ARTHUR SCHOPENHAUER

Enthusiasm is good material for the orator, but the statesman needs something more durable to work in.
JAMES RUSSELL LOWELL

MANAGING ANAEROBIC SOILS

Roy L. Goss

An article entitled "The Black Plague" appeared in the November 1986 edition of *Golf Course Management*, and a similar article entitled "An Update on the Black Layer" appeared in the February 1987 edition of *Golf Course Management*. Unless I am badly mistaken and being misled from what I read, we all should be embarrassed to admit to the world that we have forgotten the fundamental concepts of managing soil and grasses. Isn't this problem of "Black Layer" or "Black Plague" simply one of an anaerobic condition developed through neglect of one to several management practices?

Soils in the Coastal areas of northern California, Oregon, Washington and British Columbia commonly develop anaerobic conditions between October and April of each year unless they are properly managed. This time frame is characterized by heavy winter precipitation, low evaporation, low light intensity and continued use of turfgrass facilities throughout the winter.

When soils become compacted, particularly under saturated or near-saturated conditions, the oxygen diffusion rate into these soils is near zero. Organic materials, which have accumulated in the surface few inches of these soils, may break down anaerobically and many of their components are not oxidized, but are reduced. There have been comments from some writers alluding to the fact that sulfur applications are part of the problem. It should be common knowledge to these people that most of the soil's sulfur is held in reserve in organic matter. Regardless of whether we apply the material as elemental sulfur or the plant gets it from break down of organic matter is irrelevant from the standpoint of oxidation and reduction. Under anaerobic conditions sulfide ions are formed instead of sulfate ions and one of the end products is hydrogen sulfide, which is a very foul-smelling substance. Usually, the resulting color is also black. There isn't much question that under this total neglect of soil drainage and aeration that additional sulfur will cause problems. However, hydrogen sulfide can be produced without the addition of any elemental or extraneous sulfur applications. Sulfide ions can also interact with iron and other micronutrients to form insoluble sulfides. It is also common knowledge that most of these insoluble metal sulfides are usually black.

The reports from areas of the country affected by "Black Plague" indicate that the soils are somewhat compacted, whether they be sands or heavier textured soils, wet, no roots on the turfgrass, and eventual death of both *Poa annua* and bentgrass on putting greens. It is generally conceded that *Poa annua* dies first, followed by bentgrass. It was also alluded to by some of these people that the condition was significantly improved following intensive aerification. I think now we are getting down to the real root of the problem.

WHAT IS LEADING UP TO THIS "BLACK PLAGUE"

Many golf superintendents around the country have been obsessed with developing the fastest greens in town and the other golf superintendents have been forced to follow suit because their neighbor's greens were faster than theirs. The usual method of developing fast greens are to 1) cut the grass as closely and as frequently as possible, including double and triple cutting, 2) verticutting, 3) elimination of aerification - maintain firm

to hard surfaces, topdressing, etc. Reduction in irrigation water will also make the green surfaces firmer and increase ball speed. What do we do, however, when the surfaces are hard and compacted and excessive rainy periods occur? We should all remember that the respiration rate of turfgrass roots increases with increase in temperature. In the summer when we get higher temperatures and rainfall, added to compacted soils, I think we are spelling doom unless we have extremely good drainage and good gaseous exchange with the soil.

The algae factor has also been mentioned. It is not at all uncommon to observe thick algae scums that are slimy and slippery when wet, leathery and hard when dry, and literally impermeable to water or air. Algae usually follows thin turf and bare ground. These algae scums can definitely produce anaerobic conditions if the surface is not properly managed.

There was also comment about sand layering over slower draining, finer textured soils. To my knowledge, this condition has never been observed in the Pacific Northwest where we probably have as long a history or longer than any other part of the country in sand topdressing putting greens, tees, fairways, sports fields and other areas. If you place 1 to 4 inches of sand through topdressing programs over slow draining, fine textured soils, you will achieve greater surface stability during most of the year, but it may not necessarily always be dry. Wet sand is generally considered to be more stable than wet fine textured soil since we can destroy the structure of normal soils containing silt and clay and sands have no structure since they are single grained. If anaerobic conditions develop at the interface between sand and heavier textured soil, it is obvious that we need to improve our drainage situation. Since it is nearly impossible to drain deep, fine textured soils on flat grades through artificial drainage techniques of drain tile, it is important that we try to practice subsoiling, deep aerification or other methods of relieving the saturation, or simply build deeper profiles of sand. I would ask you, how else can it be done on a practical basis.

Mr. Tom Lubin wrote an article for *Divot News* from the Southern California Golf Course Superintendents a few months ago describing similar conditions that occur in southern California generally in August of each year. The symptoms on greens are yellow, especially the *Poa*. After a period of time, if not treated, the *Poa* will die, but the bent still has a healthy look. The root system is shortened, and there is a black or dark brown color to the soil, sometimes in bands. The soil samples have the smell of a stagnant pond. The symptoms do not respond to fungicide applications. He also indicated that in areas of poor water quality or high salt content in the soil that salt levels were found to be high enough to cause severe problems due to lack of drainage. We all know that good infiltration and permeability and good subsoil drainage is most essential to the reduction of salts to a level where plants can survive. Mr. Lubin also points out that good aerification and water management programs can shift the equilibrium to one of oxidation over reduction and create healthy conditions frequently as early as one week.

I hope that the foregoing discussion will help to clear up any questions that our readership may have in mind, and I would hope that turf managers around the country would remember to practice good management of soil aeration, compaction reduction and good internal drainage to prevent these problems - there is no mystery here.

Black Layer: A Western View

Tom Lubin 3/16/87

As more soil samples have been analyzed and as the subsurface black layer was analyzed separately, the following observations continued to be made. The metal ion concentration was higher in the black layer. The heavier metals, manganese, zinc, iron, and copper as well as boron, were observed in higher concentrations in the layer than in the soil above. It is at that black layer that the root system stops and in the presence of the black layer that severe turf damage shows. After looking back over hundreds of soil samples taken from greens over the last years, the most marked difference observed between normal turf and affected turf was that the metal ion concentration and the ECEs were higher in the affected turf samples. Not only were the metal ion concentrations higher, but the available phosphorus concentration in many of the samples was low.

The turf areas studied were bentgrass and bentgrass-poa mixed greens in the coastal and desert regions of California. The data was taken on greens that had distinct black layers and other greens that showed the same type of damage but had a clay layer but because of the management practices the layer was not black or dark colored. When tissue and soil samples were analyzed from greens that were under stress, a number of things were observed:

- 1) The affected turf tissue from greens with either type of green, the metal ion concentration, especially the manganese, zinc, and iron was found to be much higher than in the "normal" or normal looking turf.
- 2) In all cases so far, in the turf affected adversely, the tissue analysis showed low phosphorus concentrations in both the soil and tissue.
- 3) So far the problems are most prevalent on courses where phosphorus applications have been minimized in order to control poa seeding.
- 4) When phosphorus was applied to the affected areas in a spray application of MAP (monoammonium phosphate), the turf improved quickly.
- 5) In all cases, the black layer or the clay layer showed much higher metal ion concentration than the soil above (three to five times as high).

It is proposed that much of the "black layer" - like symptoms that are observed and are looked at as being a unique problem because there is no black layer are really the same problem. In fact, the same type of damage occurs without a "black" layer on many greens, but, because the greens are not anoxic, the color of the layer that does exist is not dark or black. The metal ions can accumulate in the clay layer that has build up in the greens. A natural separation of the fine clay particles from the other material in the sand mixtures will occur and layering is the result. It can also build up from wind-blown fine clay particles that move down through the green to a depth where they begin to form a layer. Some fine clay is also added when various carrier materials in some granular fertilizers are added to the greens as well as from particulate matter in the irrigation water.

As the clay layer builds, the metal ions can be held on the sites on the clay and can build to a concentration where problems can occur. The concentration of the metal ions around the roots can build and be picked up in quantities that can severely stress the plants.

Phosphorus applications have been reduced or eliminated for years on greens in order to reduce poa seed head production, and, in the cases of new sand greens either minimized or eliminated from the green during construction. Moreover the fear of poa encroachment has caused some people to have never applied phosphorus to their greens. In the extreme conditions on the greens tested, phosphorus was down to a level that was barely detectable. Grass cannot build a root system without phosphorus. "To grow good carrots, you add phosphorus not nitrogen", yet we want healthy turf, with no applications of phosphorus to promote root growth. The golf greens cannot be cut extremely short and remain healthy if the root system is not supplemented. It is impossible to promote a healthy turf while eliminating one of the major nutrients. There must be a balance between root growth and leaf growth, a balance between phosphorus and nitrogen.

We may have outsmarted ourselves:

- 1) We create good drainage on greens and allow the water to move through the soil easily. Over the years, what phosphorus was in the soil mix is leached out to the point where there is a problem.
- 2) We acidify the greens with sulfur applications and with acidifying nitrogen fertilizers which makes the phosphorus more soluble which allows it to be leached away faster.

- 3) We promote leaf growth and remove the clippings which carry away the phosphorus.

- 4) When we acidify the greens, we increase the metal ions such as manganese, zinc, copper and iron that are available to the plant. Many of these ions, can in high enough concentrations, cause problems if the plant can not pick up enough phosphorus.

- 5) We have used some sands that have appreciable clay content, which can, after a period of time, form layers.

- 6) We use irrigation water year round which may have appreciable concentrations of metal ions as well as silts, clays and organic matter which can build up in the clay layer.

- 7) Year round irrigation speeds the leaching of the phosphorus.

Phosphorus cannot be effectively utilized by the plant if one of the following conditions exists:

- 1) If there is little phosphorus in the soil to begin with.

- 2) If the temperatures are low, this will reduce the ability of the plant to pick up the necessary phosphorus, even though phosphorus is present. Under these conditions, bent grass turns purple (phosphorus deficiency), the poa will show stress and will seed.

- 3) High pH soil conditions where the phosphates are very insoluble.

- 4) In high salt content soils the phosphorus absorption is blocked.

- 5) Under high temperature conditions the plants seem to show similar stress. It is not known whether it is temperature alone that is the problem, or whether it is a salt build up caused by the increased temperature that affects the phosphorus uptake.

The result of low phosphorus:

- 1) Grasses will show very short, weak root systems.

- 2) Ion concentration of manganese, zinc, copper, sodium, boron, and iron can build up in the plant and become toxic.

- 3) Without phosphorus, normal growth in the plant is restricted and the plant cannot recover quickly from physical damage or stress.

- 4) The turf color and texture is affected. The greens are mottled in color, whether pure bentgrass or bentgrass-poa mix.

- 5) The growth rate is very inconsistent and by afternoon the green can become bumpy.

- 6) Poa will show tipburn, dieback of the older leaves, and produces more seed when under stress.

Continued 5

If we all did the things we
are capable of doing, we would
literally astound ourselves.
THOMAS EDISON

Because phosphorus is slow to dissolve and be used, the problems of the deficiencies of phosphorus did not show for years. The problems like the black layer creep up on us, and it is hard to point a finger at the phosphorus as the problem, because the grass was able to tolerate the lowering phosphorus levels with only a discoloring or slight damage. Until the phosphorus levels got so low that the damage became severe, the problem was not easy to isolate to one nutrient.

A number of courses, Old Ranch Country Club of Seal Beach CA, (Don Parsons), Los Coyotes of Buena Park CA, (Bill Gallegos), and the City of Anaheim Golf Courses, (Don Marshall Director of Golf Operations. Gary Wimberly, and Don Lewis) have been very helpful in evaluating the effectiveness of the phosphorus in treating the problems on various types of greens. One course in particular that had "black layer" symptoms after over 20 years of no applied phosphorus, was started on a program of light, soluble phosphorus applications four years ago, has had little or no trouble with the greens since the soluble phosphorus applications started. A number of other courses here in the southwest with problem greens are now in the process of applying soluble phosphorus to attempt to control the "black layer" symptoms. A number of courses have included phosphorus as a regular part of their greens program especially when the greens show stress, have not shown the black layer or the damage associated with the metal ion build up.

Upon application of phosphorus at 0.25-0.50 Lbs of P₂O₅ per tho. sq. ft. in a soluble (MAP) form seemed to eliminate the problems. The root growth was amazing at Victoria Club in Riverside where the greens were sprayed with a solution of monoammonium phosphate. During the application, areas of the greens were covered to leave the area untreated. The treated area gave a three inch increase in growth of roots in less than a week, compared to the untreated area. This test was done in February of 1987 with the help of Mark Livingston the superintendent of Victoria Club. This course was picked because this particular course is five to ten degrees colder than the other area courses, and purpling was still very evident on the bentgrass.

The addition of phosphorus will help to control the metal ion concentration in the soil by forming metal phosphate compounds that have low solubility. The ions are still in the soil but are not in high enough concentration to become a problem. Moreover, when the metal ion is released, a phosphate ion is also made available for the plant to absorb, and any problems are minimized.

These conditions are more severe on new sand greens where little phosphorus had been applied and percolation rates are high. One explanation for this is that the sand greens may hold only one third the water as a clay green. If the ECE is the same on a sand and a clay green, in effect, the concentration of the total salts in general and metal ions in particular are three times as high around the roots of the grass on the sand green. The response to a phosphorus application on a sand green is very rapid.

The application of soluble phosphorus compounds is necessary. The use of phosphorus should help to improve stressed areas on the greens by allowing the root system to be made stronger. It is hoped that this work will give some people the confidence to use the phosphorus at times when the greens are under stress and that it will help some people to solve some of their problems. Remember that anything used in excess can cause problems. If small applications of phosphorus are placed with a balanced feeding program, no great excesses will occur and any imbalances will be avoided.

CREDIT: DIVOT NEWS

Nematode Nemesis

The nematode may be brought to heel by an extract of crab shells.

Nematodes are tiny parasitic worms that dwell in the soil and cause an estimated \$3 billion of damage a year to crops and gardens. Unlike other soil microbes, the nematode larvae contain a complex sugar called chitin, explains Robert Milch, the president of Igene Biotechnology Inc. in Columbia, Md. If extraneous chitin is mixed in the soil, it will trigger other soil microbes to produce an enzyme that destroys it. Thus, mixing chitin with soil sets off a kind of chemical warfare that destroys nematode larvae.

Crab, oyster and clam shells are rich in chitin and Igene has found an inexpensive way to extract it, Dr. Milch says. After extracting residual meat from crab-shell wastes to produce a flavoring compound, Igene dissolves away the calcium with an acid. This leaves a chitin-and-protein mix that Igene has turned into a product it calls ClandoSan. The protein spurs the growth of fungi and other microbes thought to attack adult nematodes.

Igene plans to market ClandoSan later this year, after tests of its effectiveness are completed at Auburn University in Alabama and Hebrew University in Israel. Since chitin is a natural pesticide, formal federal approval may not be needed for ClandoSan, Mr. Milch says. Igene notes that most synthetic chemicals formerly used against nematodes have been banned because of environmental problems.

IT IS NOT EASY -
 To apologize
 To begin over
 To be unselfish
 To take advice
 To admit error
 To face a sneer
 To be charitable
 To keep on trying
 To be considerate
 To avoid mistakes
 To endure success
 To profit by mistakes
 To forgive and forget
 To think and then act
 To keep out of the rut
 To make the best of little
 To subdue an unruly temper
 To maintain a high standard
 To shoulder a deserved blame
 To recognize the silver lining
 B U T I T I S C H R I S T I A N !

Golf Cart Path Planning

By Grant T. Spear

INTRODUCTION

Are golf cart paths really necessary on the average golf course? The use of golf cars and paths on courses is a highly debated issue among individuals within the golf industry. Most Southern and many Northern golf course superintendents believe path systems maximize golf car revenue. Whether or not golf cars are good for the game, even wider use of cars is anticipated in the near future and planning should reflect this fact.

PERSONAL SAFETY OF GOLF CAR DRIVERS

From the initial planning stage, one must fully realize that responsibility for the safety of people and property exposed to the finished path is an inherent aspect of all design activities. The number of golf car connected liability and damage suits has been rising. In some cases the golf course owner, the golf car manufacturer, the car dealer, the course's golf car mechanic, the course architect, the paving contractor who installed the path and others are all named as defendants. Losses in such lawsuits can be well over a million dollars so precautions must be taken in designing golf cart paths.

"The best way to deal with potential litigation is through the use of documentation, (which should be) sufficient to establish what the superintendent and staff have done or observed with regard to the course (Ochs 26)". Equipment maintenance records should be kept which reflect routine maintenance as well as periodic safety checks done on each individually numbered golf car. A list should be made of exactly what is checked in each inspection.

Other precautionary steps should include the following:

- (1) Ask golf car suppliers, before signing a contract, to have an engineer on their behalf inspect the course, slopes, bridges and paths for safety. Get a written affidavit stating that an engineer inspected conditions and certified that the equipment is capable of safely and routinely negotiating them, even with inexperienced drivers.
- (2) Install all safety features recommended by the designer like curbs, speed bumps, traction grooves, warning signs, barriers route indicators and anything else.
- (3) Clearly post driving instructions on golf cars for new and inexperienced drivers. This should include a warning about drinking or using "judgement impairing" drugs while operating a car.
- (4) Rental slips should contain a liability disclaimer protecting the owner which was written by a lawyer.

These extra measures may be costly, time consuming, and bothersome, but they may be the difference between winning and losing a court case. Besides, the records may also save money in maintenance and repairs; personal

computers are handy for such records.

RULES OF THUMB FOR GOLF CART PATHS

No standards of placement exist for golf cart paths. The extensiveness of paths on a golf course can vary from limited paths near tees and greens of certain holes to a system covering the entire course. The factors in deciding the extend include: (a) the course design relative to traffic intensity, (b) the intensity of play, (c) the funding available, and (d) the personal feelings of members toward golf cars.

WHEN TO INSTALL CART PATHS

Regardless of cultural practices on a course, scarred bare areas may result from intense traffic. Soil erosion is increased in such areas. Also, traffic tends to move around these bare spots enlarging the damage more and more.

The common solution is to install a path to confine the intense traffic and allow turf to grow back into the surrounding area. "Cart paths are the only realistic solution to bare, eroded areas (Beard 536)." Other specific reasons for installing paths include minimizing washout areas on hilly courses, increasing the safety of golf car operation especially when the course is damp, reducing soil compaction in heavy traffic areas and directing traffic flow to minimize slow play problems.

GENERAL GUIDELINES

Paths should be as close to the tees as possible without completely destroying the aesthetics. Ideally, run the path parallel to the length and flow of the tee so golfers will spread possible wear all along the margins. Place the path close to where most people are expected to hit the ball in the fairway, yet reasonably out of play. Although close placement evokes the controversy about the balls hitting the path, if the paths are too far from the fairway, either use of them will slow play or nobody will use the paths. The superintendent and designer must decide on the placement on an individual basis for each hole. Also, one well placed path segment can often serve two holes in the case of parallel fairways.

A combined golf cart path and service road cuts the amount of paving and the overall costs. A double duty path obviously will be built of stronger materials and therefore could also provide random security and emergency help service to stranded or distressed golfers. It is generally wise to locate irrigation satellites near paths, to allow for emergency vehicles to easily penetrate the central core of the course and to design bridges, tunnels and crossings to accommodate light trucks.

MINIMIZING POOR AESTHETIC QUALITIES

Since golf cart paths generally disturb the landscape, conceal them as much as possible. The path can sometimes

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Golf Cart Path Planning

periodically needed to replace losses from erosion, weathering and decomposing else they will too rapidly soften and degrade. Another potential disadvantage to organic products is that availability problems may drive up the cost.

Improved Weathering Resistance. A further improvement can be made by installing an engineering fabric between the surface material and the soil. This cloth provides dimensional stability so the path materials cannot be pushed down and provides some underdrainage, as well.

Additional costs of such materials is about 20 cents per square foot, but it may triple or quadruple a path's life. However, these engineering fabrics may have environmental limits since some will become brittle and break in extremely cold environments.

Without these improvements these cheaper paths are short lived compared to paved surfaces. They may last anywhere from a few days, in extremely wet conditions, to about a year prior to maintenance.

Hard, Long-Lasting Surfaces. Pavements better resist environmental and traffic wear. Although the initial investment is higher, they are more maintenance free.

A simple form of paving, known to some as "chip and seal", is made by preparing a smooth base, applying a thin layer (about 2 inches) of gravel chips, covering it with tar and rolling. Repeating this process to a 4 inch depth reportedly works well for light vehicles. An underbase of gravel (4 inches), engineering cloth, or both will extend the life of this paving by reducing soil water effects.

Chip and seal costs about 75 cents per square foot. This low-maintenance, lower costing pavement has a textured look and will last nearly as long as blacktop (Hurdzan 16).

Blended asphalt, or blacktop, is a commonly used surface (see Table 1) and costs as little as \$1 per square foot to \$2 per square foot using a gravel base and engineering clothlayers to reduce weathering (Hurdzan 16). All blacktopped surfaces are very low maintenance, long lasting and smooth riding.

Many superintendents have found that gravel subbase for blacktop negatively influences drainage unless tile drainage is added. Hence, most pavers recommend direct placement of blacktop layers over the soil over engineering cloth. Usually at least two inches of course asphalt is used for the bottom layer, followed by another 1 to 2 inches of coarse asphalt or fine asphalt which feels better under spiked golf shoes. Finally, cement, which has high rigidity, nearly no maintenance requirements, practically endless life and the best ride, is the most expensive paving surface. Water and acid-forming and acid-based chemicals are hard on cement. Reinforcing rods can be added to cement for increased strength much like the addition of engineering cloth to asphalt.

For higher traffic roads carrying heavy equipment, at times, cement is the paving of choice. Good underdrainage

is still necessary even though resistance to weather is better than other materials. A gravel subbase (4 inches thick) and tile is usually used. Pavers recommend a 4 inch thickness of concrete with expansion joints in Northern climates. A rough textured surface is preferred in areas of foot traffic since golf spikes don't mix with smooth cement.

Alternatives. Recent innovations not yet fully tested under golf course conditions are honeycomb or matrix structures. Composed of wear-resistant materials ranging from concrete to plastic, these structures are designed to carry the weight of repeated golf cart, vehicle and foot traffic. Such a material with regularly spaced openings or cells in various geometric configurations, if properly installed over a well drained subbase with a coarse textured root zone, allows adequate water infiltration for turf to grow in the spaces (Beard 539). Interspaced vegetation provides cooling of the surface and it blends into the adjacent turfed landscape. The full potential of such a material is yet to be determined.

ENCOURAGING PATH USE

The main way to get golfers to use any golf cart path is to have the proper placement as was stated earlier. Most golf courses have to route their cart paths in a few areas in patterns that are less convenient or different from previous traffics patterns. The addition of traffic aids to encourage use such as signs, chains, ropes, lines, landscape plantings or movable barriers. They are positioned to direct traffic to the path. Golfers will hopefully adopt the new patterns and allow the eventual removal of the aids.

More drastic measures like new bunkers, trees, grassy mounds or shrub plantings may be necessary in extreme

TABLE 1

Cart path construction materials by percent use.

Asphalt	65	Gravel	45
Other:	17	Don't have cart paths	12
9 mentions: Cement/concrete			
3 mentions: Dirt			
1 mention each: Limestone-Shells-Lava rock-Sand-Woodchips.			

cases. On golf courses with complete path systems, carts are sometimes restricted to the paths. Even with incomplete paths, courses sometimes restrict cart traffic to the paths on the holes where which have them. These regulations are best enforced by meetings with the club membership.

There are obviously no absolute guidelines for golf cart use on a cart path system. All decisions should be made on the basis of the course's topography, the extent of the cart path network, the physical soil conditions, and perhaps most importantly, the opinion of the course's clientele.

Grant is a senior majoring in Turfgrass Management at Iowa State University. This paper was part of his required study in Horticulture 451. (Credit: IOWA GCSA)

Public Relations And The Golf Course Superintendent

Because we tend to keep in the background, we sometimes find it difficult to keep the members informed on what we are doing or trying to do. All of us agree that we should keep them informed, mainly because they have a sincere, natural and personal interest in what is happening to their golf course, and how their money is being spent. From the superintendent's point of view, letting the members know gives us a chance to favorably impress them with our ability to make plans and get the work done. For the golf course superintendent, public relations is like grass, "when it's good, everyone takes it for granted, but when it's bad — watch out."

There was a time when a man who didn't like people could make his way as a golf course superintendent. This is not true today and you know it. Not only must the superintendent like people, he must make people like him or his life will be in torment, and his program and operations will be weak and limited. Just what is public relations? Some say that public relations is the art of putting your best foot forward — instead of putting your foot in your mouth.

You can be the greatest golf course superintendent in America, and still fail if you ignore the principles of good public relations. By the same token, you can be merely a good course superintendent and achieve great success if you make it a point to practice good public relations in all ways, at all times.

Invariably, the man with the sound approach to public relations will succeed, where the man who has equal ability in the same field, but has poor public relations, will fail. To put it another way — you have a choice these days. You can either learn and use good public relations practices in your present job or you can risk losing your job to a man who may have less ability, but who has better public relations. This is not a happy situation, however, this is the situation as it stands today. The wiseman will use it to his advantage — some will buck the trend and try to hold back the time.

No individual, or group, is powerful enough or rich enough to ignore good public relations. Yet good public relations is something that you, as a golf course superintendent, can have for nothing. Individually, you can do the job better than any high-priced public relations counsel can do it for you. Have you ever been guilty of making the statement, "Mr. Chairman, I wish to decline the nomination. I am just too busy to accept the responsibility of the office"? Have you declined an opportunity to speak as a golf course superintendent with the excuse that it is the busy time of the year? The real reason for refusal to speak might be that you were too timid or lacking in confidence.

To sum up — the best personal public relations program for the golf course superintendent is that of the "do it yourself" variety. It doesn't cost you a cent. All you have to invest is a little of your time each day. Can you afford to devote a little time each day to the development of good public relations at your present position — in your neighborhood and in your city? You can't afford not to, unless you really don't need your job. I recommend spending one or two Saturdays at your clubhouse. Talk to your

Course Superintendents Merit Respect As Turfgrass Doctors

Golf course superintendents are professionals, not magicians. An analogy between superintendents and medical doctors can be drawn to illustrate the point.

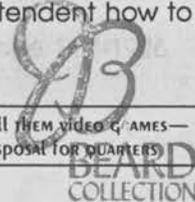
After years of training and experience, both superintendents and doctors are prepared to examine ailments and prescribe treatment. Both are dealing with a living object. Both are concerned that the life continues. A great deal of mystery and misconception surrounds both occupations and their practices. Often the cost of their services is considered too high, in some instances exorbitant. Appreciation is expressed only when the "Patient" approaches some near tragedy and is "saved," to be useful and complete again.

One major difference between superintendents and doctors is that superintendents must work to keep their "patients" — on the verge of death — through extremely close cutting, followed by an armada of golfers and carts. The "intravenous bottles" of fertilizer and other soil conditions can never be turned off, and should some virulent "infection" invade the course in the form of fungus, insects, drought, etc., the superintendent cannot let the "patient" recover through bed rest. He is lucky if he can keep the carts on the paths, but cannot keep the golfers off the course so it can recover naturally.

Each year stories circulate of how a superintendent has been fired because the "course didn't measure up". Seldom do we hear of those who overcame tremendous odds and did keep the course in great condition, and hardly ever do we hear of course officials recognizing the real cause a course does not measure up without pointing a finger at the superintendent. The common cold can remain uncured, but superintendents can be nothing short of perfection.

There are those who contend that all of this is what the superintendent gets paid for, and few superintendents would argue that particular point. What they might like to add, given the opportunity, is that should the "patient" suffer a setback or lose some vitality, conditions other than the superintendent's abilities and actions should also be given consideration. Superintendents are professionals not magicians and they can only perform minor miracles, regardless of budget, golfer's desires and demands, or other factors. Although there may be a few charlatans in the business, superintendents over-all are more interested in and aware of the conditions of their course than any golfer — professional or amateur — could ever know. If you wouldn't tell a doctor how to remove an unsightly wart, golfers shouldn't tell the superintendent how to perform his responsibilities.

frankly, i don't know why they call them VIDEO GAMES—
THEY'RE MORE LIKE A GARBAGE DISPOSAL FOR QUARTERS



members and keep them informed. You'll be surprised to find the friendly, warm and sincere interest they have toward the golf course staff. Plan on being at your clubhouse next Saturday — you will notice quite a revelation.

Credit: New Mexico GCSA