Sub-surface drainage is an important element that should be considered when construction is planned. To rectify errors after building the course is an expensive proposition.

Seepage is a compaction problem frequently overlooked. It occurs when water pressure from higher levels raises the water table above normal in lower areas. If surface soils remain wet for long periods of time, seepage should be a "suspect". Usually it cannot be identified by casual observation, as water may be held below the surface. To determine if seepage exists, dig holes two or three feet deep with a posthole digger. If the holes fill with water, seepage is undoubtedly occuring. Better drainage of the entire area is the logical solution. If limited funds are available, intercepting the lines directly above the use area will adequately protect limited areas, otherwise it's a good idea to title the entire area.

Lack of adequate provision for surface drainage may account for excess water in the soil. Greens, tees, and fairways should be constructed in such a manner as to drain surface water as rapidly as possible into non-use areas. If proper drainage of these areas is not accomplished during construction, it may mean ripping them up and rebuilding later.

One method of detecting excessive standing water is to check the leaf surface of areas having a brownish cast. When such areas are mowed the tractors and mowers squeeze muddy water over the grass blades. When this water dries, it leaves a film of soil on the grass blades causing a brownish cast. Poor surface drainage is a serious problem particularly during periods of excessive heat — the grass will turn blue, then brown, and finally black. Turf is lost very quickly under these conditions.

Poor soils, poor soil structure and poor drainage are problems that can be corrected for the most part. Once corrected, maintenance of turf is made easier but the problem of compaction is never eliminated. It is a continuing occurrence and cannot be ignored. This is particularly true on today's golf courses. They are subject to heavy and constant play — and the human foot, as well as golf cars and carts, are among the most common compacting agents. They are aided by the weight of heavy maintenance equipment — mowers, tractors, etc.

These compacting agents will always be with us — as long as grass is used for recreation. Compaction will occur and re-occur. Because it affects the medium that supports plant life, it must be given first consideration in any turfgrass maintenance program. The process of alleviating compaction must be a continuing one. Grass has the same basic requirements as any crop or garden. Like them, it requires cultivation, especially in the spring and fall. It cannot be plowed or disced, but it can be aerified with special machines that have been developed to perform cultivating task without disturbing the grass itself. Aerification is basic to healthy grass growth and it ranks as one of the most important — if not the most important — cultivation techniques on any golf course.

Aerification is achieved by the mechanical manipulation of the soil. A core or plug of soil is physically removed by the machine and deposited on the surface of the turfgrass area. This leaves a hole in the sod. These holes eventually become filled from the soil surrounding the holes, and pore spaces develop once again. A hole of one-half inch diameter in the soil can relieve compaction in any area of about two inches around itself.

The immediate and direct effect of eliminating soil compaction on the golf course is the production of healthier grass. Other direct or unseen benefits include soil and water conservation. Mother Nature has provided for a natural soil rebuilding process — dead and decaying plant life which gives the soil a continual supply of organic fertilization. If we make certain that grass can produce deep, abundant root systems, they not only give life and sustenance to the living plant, but as they die, they decay and produce needed organic material. Good soil is thus conserved.

Water can only be conserved when every effort is made to make fullest use of natural and applied water. Tests have proved that as much as 80 percent of available water is lost through run-off when soils are too compacted to receive it. Remember, too, that good soils store water against the time when it is scarce; deep roots search it out and grasses stand a better chance of survival during drought periods.

Finally, there is the question of cost. Turf is expensive to maintain, and maintenance costs are directly affected by the quality of the soil. It takes more of everything, including time and money, to keep grass growing on poor soils. Economy of maintenance can only be accomplished when the quality of the soil is the first consideration.

Reprinted from G.G.C.S.A
G. M. Kozelnicky, Editor
article by Tom Mascaro

THE SPECTACULAR AMARYLLIS

Grow an amaryllis to bring flower color to your home early this spring. Lily-like amaryllis flowers are large and colorful, and show up well from the top of a tall, stout stalk, says James A. Fizzell, University of Illinois Extension Horticulturist.

Amaryllis bulbs planted now will produce blooming plants in about two months. The bulbs should be large, firm and mold and rot free. Only bulbs that are over 2 ½ inches in diameter will bloom the first year, Fizzell says.

The planting pot should be a couple of inches in diameter larger than the bulb. Most soil mixes available in garden supply stores work well for amaryllis. To make your own soil mix, Fizzell suggests combining two parts of loam soil, two parts peatmoss or compost and one part perlite.

Put a 1-inch layer of coarse gravel or broken pot pieces in the bottom of the pot to insure drainage. Then put a little soil in the pot and center the bulb. Spread the roots evenly, add soil around the bulb and pack it gently. About ½ to ⅔ of the bulb must remain above the soil surface for proper growth. The firmed soil level should be about ¾ inch below the pot rim.

Water thoroughly at planting time, but keep the pot out of the sun. Then the soil should be kept slightly dry until new growth appears. Protect the plant from hot or cold drafts; the best temperature is about 65 - 70 degrees.

When growth starts, move the pot to a warm, sunny window and water more often. In a few weeks, flowers up to 7 inches across will reward your efforts.

To save bulbs for another year of bloom, cut off flower stalks, when the blooms fade. In late May, move the pots outside and bury them up to their rims. Water them regularly and fertilize according to label directions with a soluble plant food.

Reduce watering when the leaves begin to turn yellow and wither in late summer. Bring the pots indoors before frost and place them on their sides in a cool, dry part of the basement. Let them rest without watering for three months. When new growth begins to appear, bring the pots out of storage and begin watering them for another bloom cycle.

James A. Fizzell, Sr. Ext. Adviser, Horticulture

VACATIONING IN FLORIDA IN JANUARY.

While vacationing and relaxing in Florida this past January, I pursued one of my favorite hobbies, reading. One of the most impressive articles I read was by Sid Moody, of the Associated Press in the Tampa Tribune. It was in reference to insects as the prime competitors on this planet. And as a noted entomologist put it, ''This is not the Age of Man. It is the Age of Insects''.

Insects eat the food that sustains us, the fibers that clothe us, the buildings that shelter us. They carry diseases that kill us by the millions. And as our population increases, and demands more in the resources to feed ourselves, so they are increasing along with it. They come equipped for the struggle and because of their size it fits them into a life on this earth.

In most cases they are very prolific. An East African termite queen lays 43,000 eggs a day. Some queens live 40 years and more. If all the offsprings of one housefly couple in Indianapolis, for example, survived for a year, they would cover Indiana 47 miles deep. Insects are also very adaptable. They live in the Antartic, in tar pits, and in sulphur springs. Bedbugs can survive four years without eating. An African fly can lie for a decade in the dust of a dried lake bed. Add water, and it pops to life.

They eat anything. Wire insulation in TV sets. People. Crops. And, fortunately, each other. A species of cabbage beetle has an insect parasite that has a parasite that has a parasite. In this sequence the first parasite is deemed beneficial, the second a pest, the third beneficial again because he destroys the whole ball of wax.

Insects often mate in strange ways. The strepsipters beetle does it while the female is a parasite aboard a bee. And the dragon flies will mate while zooming through the air at 25 mph. If anyone of us feels our sex life may have lost some of its zip, maybe by practicing some of these acts could lead to a complete new and exciting life for us. Just a thought.

Insects must also be given their due. No bees, few flowers. They decompose vegetation and help produce as well as aerate the soil. And, since every insect has an enemy that predatorizes or parasitizes it, they keep things somewhat under control.

And of course, the insect's ultimate weapon is choice. If things are getting ''too hot'' in the neighborhood or the supply is running low, they can simply get up and fly away. And insects don't seem to be that concerned about man. They ought to be damn grateful. Man grows the crops they like. He builds houses for them to gnaw on. He even flies them across oceans in jets, and opens a new area for them free from their enemies back home.

Insects also have time on their hands. The cockroach has been chewing its way through life for 300 million years. Nobody ever believes that they have seen the last of him. Man's recent arrival has only meant that he now has an improved and varied diet.

Ever since man came on this earth he has tried to eradicate or control insects. He is still trying. In England, Tiffin and Son advertised themselves a century ago as ''Bug Destroyers to Her Majesty''. It's a safe bet Queen Elizabeth is not alone at Buckingham Palace even at this moment. It has been the general opinion of most people, especially entomologists, that ''insects have always been the best control of insects''. In the 1880s, cottony cushion scale began to blight orchards in California. The blight was believed to have been accidentally imported, from Australia. The scientific method was employed. What eats cottony cushion scale in Australia? Entomologists brought back the vedalia beetle from Australia, and the scale was controlled.

In World War II when DDT first synthesized, it was used to halt a typhus epidemic in Naples. We thought we had the ultimate. It seemed a lethal weapon -- and was, good and bad. DDT got into public trouble in 1962 with the publication of Rachel Carson's book, ''Silent Spring''. It seemed that DDT was zapping a lot more than bugs, us included.

In the case of DDT, the argument would have become debatable in time because DDT was losing its punch. Insects, through the genius evolution, were developing resistance to the chemical. The explanation is simple. Sprays might kill 990 out of 1000 insects. But the 10 who survive have a genetic make-up that resists the insecticides, and they became the new breeding stock. So instead of eliminating the pest, the insecticide has helped to produce a super-bug. As one entomologist said, ''You're always going to have a fly that won't sit on flypaper, and their genes will be the ones that survive.

The fact that insects reproduce so rapidly and in such numbers enables them to change their genetic base quickly. And it means there is no ultimate spray. Pesticides have not permanently solved a single pest problem. This is not very good news, considering that insects eat an estimate 10% of America's food and fibers and do annual damage put at 100 billion dollars worldwide. And in order to feed the world by the year 2000, we will need this addition to what we are growing now.

Farmers have steadily increased their production since 1900, but there is a limit to how much food can be produced. A bigger crop presents much bigger opportunities for insects. At the same time, with environmentalists seemingly everywhere, everyone is taking a long, hard look at chemical pesticides. Too long and too hard, according to some. The whole DDT fight --- the chemical has been banned since 1972, along with many others now --- has spawned environmentalists, glorious amateurs, and ''aroused'' citizens with a knack for talking about what they really don't understand.

Also pesticide research has suffered because of the time and expense of meeting EPA standards. Last fall when I attended a 5 day seminar at the Purdue University on ''Use of Pesticides'', to renew my state license to apply pesticides and fungicides, we were told that the cost to chemical manufacturers to have a new product labeled was between one and three million dollars, and sometimes took three to five years for approval. It makes you wonder sometimes if the insects will get you before help is available. But, the researchers want to make sure the produce is good and safe. And how good is good and how safe is safe? They don't really have a universal standard for a risk-benefit factor. And all of us react differently to a DC-10 crash or a tumor in a bunch of mice.

Ed Wollenberg, Supt. Gary C.C.

FOR FUN ONLY - FOR TROPHY PRIZE

CHARITY GIN TOURNAMENT: Hackney's Restaurant Wheeling, Illinois. 12 Noon, Monday, March 29, 1982. Please make your check out to Multiple Sclerosis for twenty-five dollars ($25.00) and send to Paul N. Voykin, Briarwood Country Club, as soon as possible. For further information call - Johnny Berarducci, Ken Goodman, Peter Voykin.

Question: What is the maximum recommended slope or pitch that can be designed into a putting green for good surface drainage and for fairness in putting?

Answer: Generally, the maximum recommended slope is 3 percent. This is not to say, however, that some fine and challenging greens do not have slopes that exceed 3 percent. There are always exceptions to every rule, and there are those who will defend greens exceeding 3 percent to the very end ... that's what makes the 19th hole so interesting!

Question: How much harm can we do by playing the regular greens this winter?

Answer: Weather conditions change so rapidly that it is difficult to give an unqualified answer. If the ground is frozen solidly or thawed beyond the depth of one inch, there is no cause for alarm as far as soil compaction is concerned. However, some grass blade damage may occur as foot traffic crushes the frozen blades. Real injury occurs when the ground thaws at the surface but not below one inch. Traffic then causes severe soil compaction, a tearing of roots from the plant and a squeezing and displacement of the soil, causing very uneven putting surfaces. The decision to play or not to play regular greens must be flexible and must rest with the superintendent, the Green Chairman and his Committee. And it may have to be changed within a few hours on any given winter day.

Dear Ray,

Time has a way of melting away, before you know it, spring fever will run rampant.

"SPECULATION"

Yuletime is over, January a part of the past.
February being a short month, one wonders,
How long can Winter last?
The maintenance shop is busy, buzzing like a bee.
Plans are formulating in the mind,
To grace the nearing season's spree.
Time for speculation, to start the season right.
Ready to face the starting time,
With equipment shining bright.
Now is the time, lest we be late,
To assist Nature to open the season's gate,
With Spring.

Superintendently,
Kenneth R. Zanzig, Green Garden C.C.

The Musser Foundation directs its financial aid toward Fellowships which are committed to Basic Research. Most Fellowship Grants are applied to Doctor of Philosophy studies. In this way we train a leader, enrich the world's turfgrass literature and assure the future of Applied Research.

GREENKEEPER, GOLF'S FORGOTTEN MAN

The feats of golf's anointed in the enlightened age
Are spread with care meticulous upon the printed page.
We read of Pro and Champion -- and of some less-gifted chaps
Who break into the 60s (with the aid of handicaps),
But it's really quite unlikely that you'd recognize the name
Of one who does as much as they to help along the game.
I mean the guy who grows the grass - the man behind the scenes,
That unobtrusive character -- the Keeper of the Greens.
He needs a milder temper than the meekest of the saints.
The only time he hears from us are when he hears complaints:
The pins are here instead of there; the rough's too rough,
The greens at once are far too fast, too slow, too hard, too soft.
His name is mentioned only when we put him on the pan--
When cheers are being handed out, he's Golf's Forgotten Man.

How often do we pause to think, when we espy our pill
Perched neatly on the velvet turf, of all the toil and skill
That put the emerald carpet there? Not often, sirs. But when
The ball is in a divot-hole, that's something else again.
Where is that dot-dash greenkeeper, is what we want to know.
We'd like to tell him off, but good, the (censored) so-and-so,
Forgetting that the cavity that's causing all the fuss
Was dug, say, half an hour ago by somebody like us.
For whatsoever circumstance our feelings may annoy
We blame the Keeper of the Greens--he's golfdom's Whipping Boy.

He's enough of a mechanic, too, to keep in good repair
Equipment that's subjected to the rugged wear and tear
Of mowing ninety acres of uneven, tough terrain,
O'er rocks and roots and stump-holes, in sun and snow and rain.
His pumps he must maintain in shape to keep the pressure high
Lest sprinklers stop a-sprinkling and precious grasses die.
Long hours he spends a-tink'ring with his gadgets and his gear
Far from the captious members' ken, golf's Unsung Engineer.

Before the sun's first level rays strike o'er the dewy lea
He's sweeping greens, or raking traps, or marking off each tee,
But you seldom run across him, for he keeps out of your way
For fear he might commit the crime of interrupting play.
Apart from human contacts he spends his toilsome days,
A man whom there are few to know, and fewer still to praise.
Still, as you proudly view, or stride across those verdant scenes,
Just think, where would you be without the Keeper of the Greens.

William F. Steedman

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When Bengeyfield joined the USGA staff in 1954, he brought considerable experience in both research and extension service work to his position as Director of the Green Section's Western Region office. In 1967 he assumed the additional duties as editor of the Green Section Record, the USGA's official publication on turfgrass management.

In his new consulting role, Bengeyfield will resume as editor of the Record and will advise the Green Section on technical matters related to turfgrass management. He will be based in the Green Section's Western Region office in Tustin, Calif.

FELLOWSHIPS, DEGREES, SCHOLARSHIPS, RESEARCH GRANTS

By Fred V. Grau
The Musser Foundation

The following definitions may help to dispel confusion about the topics in the title.

A Bachelor of Science degree (B.Sc.) takes 4 years and requires 131 hours of credit.

A Master of Science degree (M.Sc.) usually takes 2 years and requires 24 credit hours, plus a thesis.

The Doctor of Philosophy degree (Ph.D.) usually requires 3 years and 45 credit hours, plus a thesis.

Fellowship. This involves a money grant so that the student can devote full time to designated research and to classroom work. The obligations are heavy. Library research is required so that one learns from the research of others and so that duplication of effort is avoided. A detailed research project is pursued under close supervision by the advisor. The written thesis must be defended in oral examination and the proficiency of the candidate confirmed before the degree (M.Sc. or Ph.D.) is granted.

Scholarship. This is a gift of money to recognize scholastic achievement, creative ability, potential leadership or other attributes. The recipient has no obligations after receiving the gift. Undergraduates usually are given scholarships by turfgrass organizations, firms, and individuals.

Research Grants. These may be given by organizations, firms and individuals to accomplish specific research and to generate data on products or practices. Funding varies with the complexity of the project, the need for specialized equipment or the time required. Data and results obtained from research at a tax-supported institution usually is made public.

Assistantships. Graduate students may be given a stipend in return for assistance in teaching or research which may be unrelated to the assigned project. Tuition often is waived or reduced. At least 25% of the funding should relate to the project.

Turfgrass Research. By definition this is a studious inquiry, an investigation designed to discover facts and to explore the unknown.

Basic Research attempts to learn new and original things and to discover WHY things work as they do.

Applied Research attempts to learn HOW things work and WHAT makes them work most effectively.

The scientist engaged in BASIC research is not concerned with the practical application of his discovery. The scientist who formulated the chemical known as 2,4-D simply put it on the shelf. His was basic research.

The curious investigators who were searching for a chemical that would selectively control weeds in turf tried 2,4-D along with many other chemicals. Many tests were conducted to learn the best dosage, time of application, stage of growth of the weeds, etc. This was APPLIED RESEARCH.

Applied research is conducted most effectively by skilled scientists who have earned advanced degrees obtained through FELLOWSHIPS.

The origin of Penncross bent may not be apparent to many turfgrass managers. When I was Director of the Green Section at Beltsville I helped to test the parents of Penncross bent under stress. Penncross was the first seeded bent ever to produce uniform putting turf. The savings to golf courses have been tremendous. Professor Musser made "an investment in the future". Basically we want the people who have benefited from Musser's work to know and to understand that we, who have created the Musser Foundation, want to help people help themselves. The Turfgrass Research Fellowship Fund that we are building will help to insure the continuance of the excellent work for which Professor Musser was renowned.

The Fellowship Grants will be made on the basis of **need** and **merit**. Problems of the most pressing importance will be funded. The research institutions selected may be **anywhere** but only qualified research facilities will be chosen. The research work that we will finance will be of the highest type.

Our work is non-competitive with other groups in the field (Noer, GCSAA, USGA). We operate on the graduate level through Fellowships. The granting of scholarships is left to others since these are one-time gifts to students who may or may not stay in the turfgrass field. One who spends five years in intensive research study will be less likely to stray from turf.

We ask only sympathetic media exposure to help others understand our unbiased unselfish position. No one in MITF is paid. Since Professor Musser died I have helped to guide the progress of the Foundation for more than ten (10) years with no compensation - only meagre office expenses. Several other directors have been with me the entire time. The money from directors pockets have helped to build our Fellowship Fund. Ads will appear soon which will recognize the many who have contributed. Everyone who benefits or profits from turf should have the chance to help us build the FUND so that their names too, will live in eternity.

THE MUSSER FOUNDATION

A Brief Review

Penncross bent is known and used world wide. It is the product of Burt Musser's genius and dedication. It was one of his "investments in the future". Playing conditions on golf courses have been improved greatly by the use of Penncross bent, the first seeded bent to produce uniform playing surfaces.

Pennlawn fescue has improved millions of lawns and is favored in mixtures with bluegrass for producing quality sod. It, too, was develped under Professor Musser's guiding hand.

The book "Turf Management" was written by Professor Musser under the sponsorship of the U.S. Golf Association. What a boon it has been to golf course superintendents!

Golf course superintendents who studied at Penn State under this pioneer teacher are scattered 'round the world. What a wonderful way to make an "investment in the future" because now they are teaching others.

Among the graduate students who earned (and I mean **earned**) their Ph.D. degrees at Penn State under this "task master" are:

Dr. James R. Watson, v.p. Toro Co.; 2nd v.p. MITF
Dr. Joseph M. Duich, Prof. Turfgrass Science, PSU; secretary, MITF (incorporator)
Dr. John C. Harper II, Extension Agronomist, Penn State

These men are leaders - a credit to the profession. The turfgrass industry has been enriched by their activities.

We honor the memory of this pioneer in turf by establishing a Turfgrass Research Fellowship Fund in the Musser Foundation which will perpetually assist deserving graduate students to achieve their degrees and to take their place among the leaders in the turfgrass industry. Some of our current scientists are facing retirement. We **must** provide for their replacement. These are the men who brought this Living Memorial into being as INCORPORATORS:

Dr. J. M. Duich
Mr. E. R. Steiniger
Mr. Warren A. Bidwell
Mr. Albert W. Wilson II
Dr. Fred V. Grau

Many others have been supportive. The Pennsylvania Turfgrass Council gave it a start when Don Krigger, then president of PTC in 1968, named Grau to head the organizing committee which included names well known in the turf industry: Hallowell, Harper, Mascaro, Miller, Shuman, Sirianni, Stolpe, Steiniger, Tenos, Watson, Wilcox and Wilson. These contributors started the Fellowship Fund with money out of their pockets (total $475.00):

Philadephia Toro Co.
Frank I. Shuman
Fred V. Grau
Dr. J. M. Duich
GCSA of N. California

They believed in the future.

Professor Howard Burton Musser initiated turf work at Penn State in 1927. The first turf conference came in 1929. He died in 1968. He was active in organizing the Pennsylvania Turfgrass Council in 1955. His work with bluegrasses laid the foundation for Pennstar Kentucky bluegrass. In weed control work he successfully blended chemicals with fertilizers.

The Musser Foundation is one of three non-profit groups which accept contributions and raise funds in other ways in order to perform needed research and to improve the quality of turf and turfgrass management. The Noer Foundation operates independently and does not conflict with Musser Foundation goals and objectives. The third group is the newly-formed American Council for Turfgrass (ACT), a group designed to correlate activities and to provide a unified voice for turf in the nation.

The Musser Foundation has grown slowly partly because many have misunderstood its function. MITF raises money in several ways, all tax-exempt:

1) Free-will contributions
2) Unitrusts which provide lifetime income (planned giving)
3) Memorial giving - funds instead of flowers to yield income forever to help students of turf.
4) Turfgrass Benefit Tournaments. There have been twelve of these: 5 in Ohio; 4 in Oregon; 3 in Delaware. One is planned for the Mid-Atlantic region June 12, 1979 at Indian Spring C.C., Silver Spring, MD. This is a painless way to raise money by having fun.
5) Turfgrass Research Fellowships named for the donor, $1,000 each. This approach is designed to let those who profit through sales & services to share with a tax-exempt foundation that will put the money to work for turfgrass improvement across the board. It includes manufacturers, distributors, dealers, seed producers, sod growers, landscape contractors, golf course architects, lawn care companies and others. Actually no one is excluded. Two such fellowships now exist in the names of individuals, Fred V. Grau and Bob Dunning; and one in the name of a seed-growing firm, the Penncross Bentgrass Association.

Dr. Fred V. Grau

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A TERSAN 1991/Daconil 2787 tank mix will give you consistent performance against brown patch and dollar spot—the two most troublesome diseases on turf each summer. You'll also get strong action on leaf spot and other important diseases. It's the kind of performance superintendents depend on when a quality course can't be compromised.

*Daconil 2787 is a registered trademark of Diamond Shamrock Company.

Tank mixing brings other advantages, too. With TERSAN 1991 in your tank, you get systemic action for protection from within the turf plant. Disease control is longer lasting and is less affected by rainfall or frequent irrigation. Tank mixing fungicides with different modes of action also reduces chances of benzimidazole resistance. You help insure the long-term effectiveness of TERSAN 1991 in your disease control program.

This year, plan on using TERSAN 1991 in combination with Daconil 2787. It's the tank mix turf diseases can't match.

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