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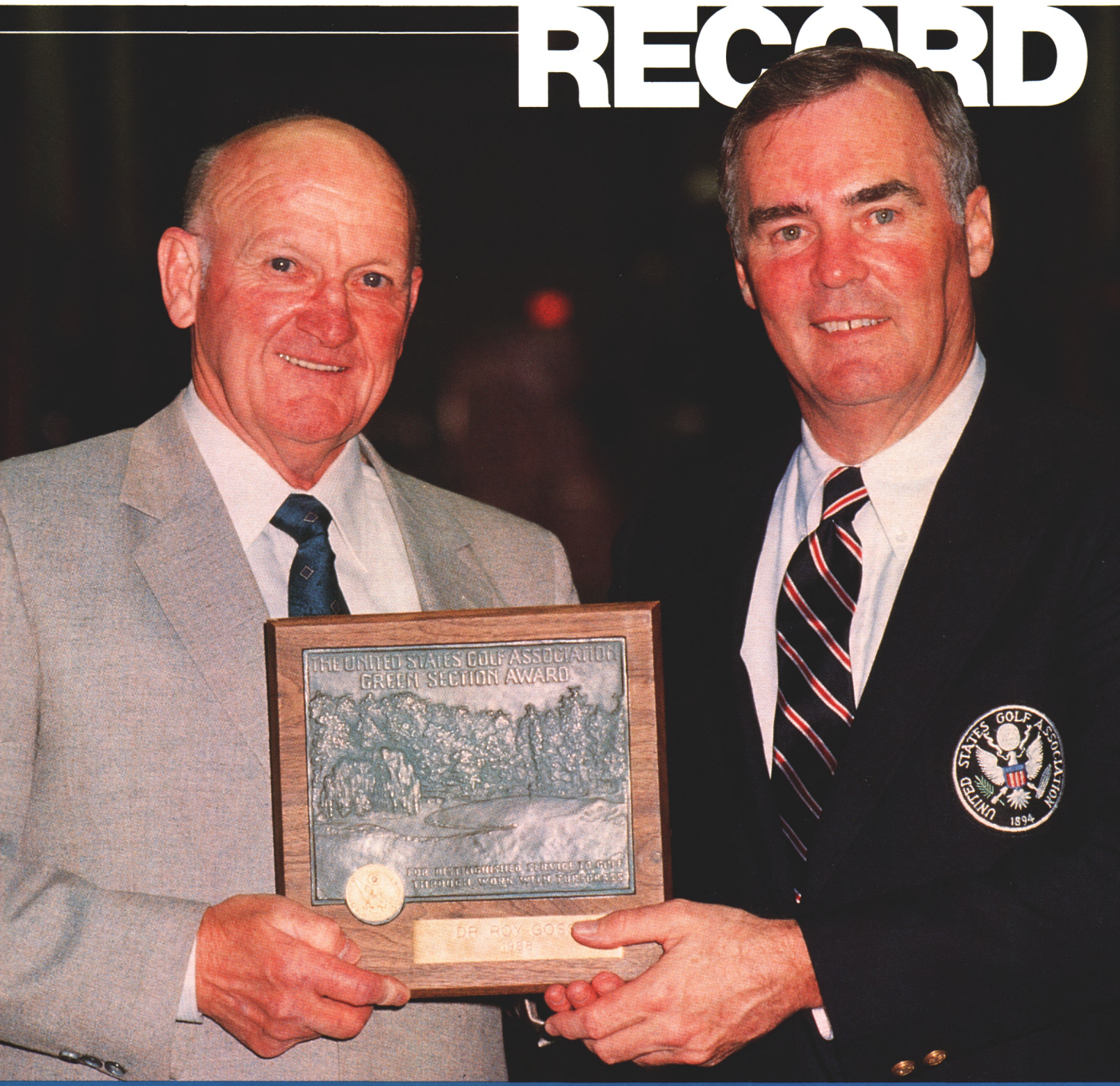

1988 USGA Green Section Education Conference Issue

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Cover Photo:
Dr. Roy L. Goss, of Washington State University, was the recipient of the 1988 Green Section Award. It was presented by F. Morgan Taylor, Jr., of Hobe Sound, Florida, Chairman of the USGA's Green Section Committee.

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Roy L. Goss — USGA Green Section Award Recipient for 1988

IN 32 YEARS as Turfgrass Extension Specialist for Washington State University, Roy Goss never shied from a direct, difficult question; he always gave a direct, reasoned, and straightforward answer. Goss has other qualities as well. He has performed brilliantly as a research scientist, lecturer, organizer, and even found time to design golf courses. He developed a successful sod farm, sailed the waters of the Pacific Northwest, and traveled the world attending turf conferences or on sabbatical leave, always carrying the message of basic turfgrass science to those willing to listen.

Roy L. Goss

On February 8, 1988, in Houston, Texas, Dr. Roy L. Goss received the Green Section Award, the highest recognition the USGA bestows in the field of turfgrass management. F. Morgan Taylor, Jr., of Hobe Sound, Florida, Chairman of the USGA Green Section Committee, made the presentation before 2,000 guests at the annual Golf Course Superintendents Association of America banquet, which traditionally closes the GCSAA International Turfgrass Conference and Show.

Roy Goss came to Washington State in 1956, bringing with him a Ph.D. in agronomy and the upbringing of a small town in West Texas. Before long he developed the first Annual Northwest Turfgrass Conference. People came not only from Washington state, but from Oregon, Idaho, Montana, northern California, British Columbia, and eventually many other states from all over the country. The conference became one of the best in the United States and Canada. It always presented a solid educational base combined with genuine western hospitality, and over the years the conference traveled to some of the most scenic resort areas in the Northwest.

Goss soon became executive secretary of the Northwest Turfgrass Association, and served as editor and chief writer for the publication *Northwest Turfgrass Topics*. His efforts were untiring. He served on the educational advisory committee of the GCSAA, and he received its distinguished service award in 1978. He has been a longtime member of the American Society of Agronomy. He has served on the USGA Green Section Committee for 25 years, wrote many articles for the RECORD, and often spoke at Green Section regional and national conferences. He was a frequent speaker at many state turfgrass conferences as well.

In science, he has been one of the most prolific contributors of new knowledge in the past three decades. Early on, he recognized the importance of controlling *Poa annua* seedhead formation if this grass was ever to be suppressed on the golf course. He has worked with turfgrass light intensity requirements, disease resistance studies with Dr. Charles Gould, the largest and most complete varietal bentgrass nursery test program in the United States, and the effects of sulfur on the turfgrass plant, particularly bentgrass and *Poa annua*. Goss's inquisitiveness led him into weed control research, grass plant nutrition, soils, and irrigation management. His dedication to his science and his contributions to turfgrass management go unchallenged.

He has been both a golfer and friend of golf throughout his remarkable career. Now retired, he leaves a long trail of golf superintendents and club officials as friends. His honesty and scientific integrity are his trademarks.

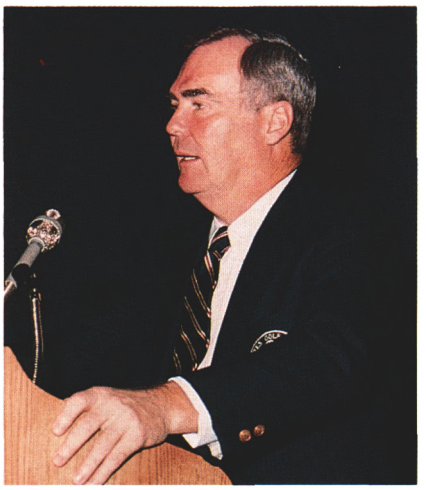
"This is a very great honor, and I feel most humble," he said as he accepted the Award, which is given for distinguished service to golf through work with turfgrass. He concluded his remarks by saying, "Marcie and I have so many people to thank. I really can't believe it."

But his great host of friends can believe it. They know no one could be more deserving.

1988 GREEN SECTION EDUCATION CONFERENCE

Understanding Some Things We Think We Know All About

February 8, 1988, Houston, Texas



F. Morgan Taylor, Jr.

THE AUDIENCE for the Annual Green Section Educational Conference, held February 8, at the George R. Brown Convention Center, in Houston, Texas, was the largest we have ever enjoyed. Over 1,300 people attended the program. F. Morgan Taylor, Jr., of Hobe Sound, Florida, Chairman of the USGA Green Section Committee, introduced the speakers of the day. It was a huge success, and the seventh consecutive year for the Annual Green Section Conference to be held in conjunction with the Golf Course Superintendents Association of America International Turfgrass Conference and Show. Herein are the full proceedings of the 1988 Educational Program.

BEST TURF TIPS OF 1987 — PART I

The Best Turf Tips have become one of the highlights of the Green Section's Annual Program. From north, south, east, and west, here are the remarkable innovations developed by golf course superintendents around the country. They were reported by eight members of the Green Section Staff, who observed these innovative tips while they were making Turf Advisory Service visits last year. We start with Part I. Parts II and III appear later in this issue.

Banking On Beauty

by JAMES T. SNOW
Director, Northeast Region, USGA Green Section

PONDS AND streams are integral features of many golf courses, contributing to their challenge, as well as improving their appearance. Beauty can slowly give way to unsightliness, though, as pond and stream banks deteriorate through erosion or from muskrat activity. As the decline continues, maintenance of the banks becomes more difficult and time consuming, playability problems develop, and bank undermining due to water movement or muskrat tunneling can threaten the safety of golfers as well as the conditions of nearby greens, tees, or other features.

When this occurs, golf courses are forced to rebuild the banks with the hope of establishing long-term stability. In certain instances it can be quite effective to regrade the bank to a more gentle slope, and reinforce it with either vegetation or rip-rapping. This procedure can be very expensive, however, demanding adequate space, and often requiring permission from various regulatory agencies. A good alternative, especially where space is limited, is the installation of a vertical wall to stabilize the bank.

Though dozens of materials can be used to construct a vertical wall, many have deficiencies that limit their effect. Characteristics of the ideal construction material would include good stability, minimum long-term degradation, provisions for lateral seepage of water through the wall, reasonable cost, and attractive appearance. Among the commonly used materials, for example, are pressure-treated railroad ties. Pylons are attractive but quite expensive, while gabions (wire baskets holding rocks) are not as elegant looking or as long-lasting as some clubs want.

At the Upper Montclair Country Club, in Clifton, New Jersey, Bob Dickison, the golf course superintendent, has developed an attractive, low-cost

method of dealing with pond and stream banks. Having tried gabions and finding their longevity and appearance were not what he had hoped, Bob built plywood forms that allowed him to produce reinforced concrete sections eight feet long, 16 inches wide at the bottom, four inches wide at the top, and 20 inches high. These sections are then tied together and stacked on top of each other to create a vertical wall as long and high as desired in a given situation. Ornamental stone is placed on the open side of the form just after the cement is poured, giving the finished product the appearance of a stone wall. (Note: The top side of the form is ultimately the vertical side, which will be seen when the wall is constructed.)

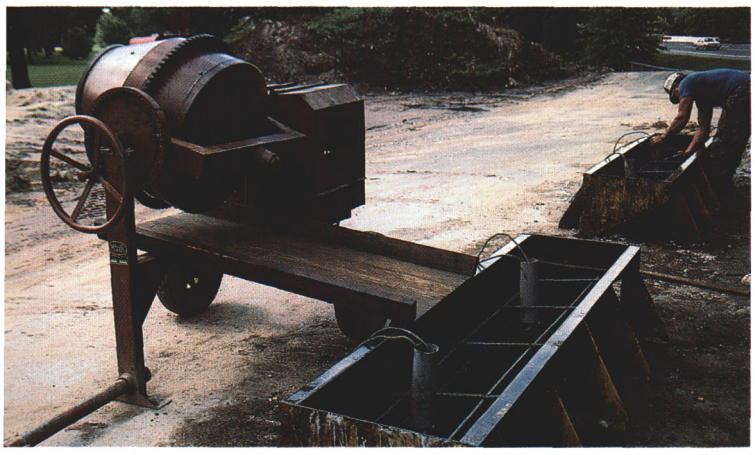
The only drawback to this method was that the plywood forms had to be rebuilt after only a couple of sections were made. This problem was resolved when a club member who owns a sheet metal fabricating shop offered to make the forms out of one-eighth-inch plate steel. Since then the forms have been used hundreds of times without showing any signs of wear. Bob has two of these forms, and can produce one section per form per day. Each section weighs about 2,000 pounds. Shorter sections can easily be made by placing a custom-cut piece of plywood at any point along the length of the form and securing it in place with 2-by-4s. Pieces of plywood can also be placed at angles to create sections used for turns in the wall. To ensure that the sections are easily detached from the form after the cement is dry, the inside is covered with a coat of old crankcase oil before the concrete is poured. To give the section greater strength, reinforcing rods or pieces of scrap metal are welded together and placed in the form before the concrete is poured.

To permit drainage through the sections, three-inch PVC pipe is set vertically in two locations in the form before the concrete is added. If existing course drainage is to be tied into the section, then six-inch pipe is used. These holes created by the pipe also serve as a means of lifting the section out of the form and maneuvering it in place when the wall is being laid. This is done by running a cable through the pipe before the concrete is poured and attaching it to a loose plate placed on the bottom of the form. After the section is removed, the plate is chipped away from the back of the section and the cable is detached from the plate.

Another feature of this method is that adjacent sections can be tied together after installation by way of pouring cement in a vertical 4-by-4 gap created by placing 2-by-4s horizontally along the ends of the form when the sections are being made. The 2-by-4s are set back a consistent five inches from the top of the form so they leave the 4-by-4 gap when the sections are butted against each other.

When installing the sections along a stream or pond bank, it is important that a firm, level base be established. Gravel should be placed on the base before the sections are laid, and should be used to backfill behind the sections after they are in place. There should be a slight angle of repose to the wall, especially if the sections are stacked several layers high.

As with any good idea, it doesn't take long for the word to get around. Ed Nickelsen, superintendent at nearby Montclair Golf Club, saw the results of Upper Montclair's bank stabilization program and ordered two of the forms for his club at a cost of about $900 per form. Using on-site rock to face the concrete sections, he estimates that the cost of materials and labor for making the sections and installing them at about $11 per linear foot, a bargain compared to most methods of building vertical walls for stream and pond bank stabilization.



(Above left) Ready to pour concrete in the form, with reinforcing frame and drainage pipe in place.

(Left) A stockpile of completed sections ready for use.

(Above) Final stages of installing a new wall.

'Hi Tech' Can't Replace 'Common Sense'

by JAMES F. MOORE
Director, Mid-Continent Region, USGA Green Section

AN EFFECTIVE MEANS of illustrating the science and industry of golf course management to green chairmen, club presidents, and other club officials is to invite them to attend the annual GCSAA conference and trade show. Invariably they are amazed at the size of the show and by the diversity of products on display.

To them, it must appear that to develop a great golf course, all one must do is buy enough equipment, an assortment of chemicals, and, of course, at least one computer that claims to do everything but change the water in the ball washers.

Although it is certainly beneficial for the laymen to learn more about turfgrass in this manner, I feel many of those who attended left with a dangerous concept of turf management: They may believe one can cookbook the management of a golf course. If they believe this strongly enough, they will logically assume the superintendent's main job is merely assembling and maintaining the various gizmos the club buys.

Such a dependence and false confidence in hi tech is a poor substitute for common sense.

So, the turf tips I have gathered together for this year involve common sense turfgrass management. The superintendents from whom the tips have come have found simple low-tech solutions to difficult problems.

Ball Marks

Bob Kinder is the superintendent at Rolling Hills Country Club, in Wichita, Kansas. This club consistently has some of the best bentgrass greens in my 10-state region. With such excellent greens, you would expect putting quality to be wonderful. Instead, the greens were often bumpy and unpredictable because they were pocked with unrepaired ball marks.

To illustrate this problem to the membership, Bob chose a low-tech but effective solution. White golf tees were placed in every unrepaired or improperly repaired ball mark. He took photographs and posted them in the locker rooms and the golf shop, and had them placed in the club's newsletter. It proved to be an effective teaching tool.

Irrigation Control

Nowhere is hi tech more prominent than in irrigation, but all the computers in the world will only be as effective as the design and location of the sprinkler heads. Ironically, turfgrass breeders have complicated irrigation a great deal. Because of improved turfgrasses, many superintendents maintain cool-season turfs immediately adjacent to warm-season grasses.

If you water strictly according to the needs of the cool-season green, the adjacent warm-season turfs become drought stressed. This is also true in areas where cool-season turfs surround cool-season greens but are maintained at much higher cutting heights.

If you water according to the needs of the perimeters, you can easily overwater the green itself, and we all know this must be avoided at all costs.

While watering these areas manually would use a lot of manpower, it is one low-tech solution. For a simple, more cost-effective solution, install a perimeter irrigation system. The superintendent can then precisely meet the irrigation needs of the green and the surrounding turf areas regardless of differences in species or cutting heights.

Isolated Hot Spots

Isolated hot spots have plagued superintendents for years. Roger Schmitt, at the Country Club of Paducah, Kentucky, came up with a low-tech solution that has worked extremely well.

He uses a piece of pipe, a hand valve, a hose, and a plastic plate to gently force water into the localized dry area without overwatering the remainder of the green. Water is applied deeply and exactly to the area where it is needed.

Hi tech has an important place, and it will continue to help us do a better job, assuming we combine it with good old-fashioned common sense.

White tees graphically illustrate ball marks.

"Outgoing" perimeter irrigation.

It Was a Long Time Coming

by STANLEY A. ZONTEK
Director, Mid-Atlantic Region, USGA Green Section

THE MOST significant management tool I observed this year really is the result of work accomplished last season. It just took until this year to see the effects. What was it? Deep aeration of greens.

Since the first putting greens were mechanically aerated, golf course superintendents have wanted machines capable of aerating ever more deeply. There always seemed to be one more soil layer or one more zone of compaction beyond the reach of the current aerator tines. Some superintendents even used hand soil probes or power augers to aerate problem greens. Although a slow and laborious job, deep hand aeration was effective. Now, new machines have been developed.

The two currently available deep soil aerators are the Floyd-McKay drill type and the Verti-Drain plunger type. Richard Christian, superintendent at Pine Valley Golf Club, in Pine Valley, New Jersey, has recently subjected his famous old putting greens to deep mechanical cultivation with hollow aeration tines. He then removed the soil cores and filled the open aeration holes with a modified topdressing material. This is not easy to do, but deep aeration has helped Pine Valley survive a particularly difficult summer stress season.

It stands to reason, the deeper a poor soil is aerated, the more beneficial it will be for turfgrass growth. It is well understood that if compacted or layered soils extend deep into the profile, deep coring will improve air and water movement. A hard pan layer is known to form below the penetration depth of aeration equipment. This zone of compaction, usually found about three inches below the surface, was confirmed in recent research by Dr. Paul Rieke, of Michigan State University. Many superintendents had suspected this was the case for some time, and they could often actually feel the compacted zone as they probed their greens. While it is true that deep aeration will not completely cure a terrible soil problem, it is equally true that any improved movement of air and water through a soil profile will have a positive effect on the growth of the grass and on the soil in question.

(Top) Floyd-McKay drill aerator, 1987.

(Above) Verti-Drain deep tine aerator, 1987.

It is important to add that deep aeration is not a substitute for shallow aeration, or that deep aeration is a substitute for proper putting green construction and management. On the contrary, deep aeration should be looked upon for what it is — a new and useful management option available to solve problems deep in the soil. It was a long time coming.

A number of other superintendents work with deep putting green aeration techniques. Bob Farren, of Sleepy Hollow Country Club, in Hurricane, West Virginia; Pat Gertner and Rick Christian, at Pine Valley; Earl Shafer and Donnie Ruffat, at The DuPont Country Club, in Delaware; Dave Miller, of Saucon Valley Country Club, in Bethlehem, Pennsylvania; Don Tallman, of Green Valley Country Club, in Lafayette Hill, Pennsylvania; Roy Hourigan, of Harmony Landing Country Club, in Goshen, Kentucky; and Johnny Burns, of Charlotte Country Club, in Charlotte, North Carolina. Their progressive attitudes made this presentation possible. Deep aeration of putting greens works.

The USGA/GCSAA Research Program at the Halfway Point

by WILLIAM H. BENGEYFIELD
National Director, USGA Green Section; Chairman, Turfgrass Research Committee

LIKE WATER running over stone, turfgrass research sounds wonderful, but real impressions are only made with passing time. This year marks the halfway point in the original USGA/GCSAA Turfgrass Research Program, which began in 1983. The objective: to develop minimal maintenance turfgrasses for golf, turfgrasses that will require 50 percent less water and 50 percent lower maintenance costs while providing superior playing conditions. More than superficial scratches, specific cuts into new turfgrass knowledge are now discernible and significant.

Take the Turfgrass Research Library at Michigan State University as one example. In the short period of four years, Dr. Richard Chapin, director of MSU Libraries, and Peter O. Cookingham, project manager, have developed an unequalled computer-based Turfgrass Informational Center. Over 12,000 reference sources are now in the data base, and more are added every day. The priceless O. J. Noer collection of books has been added. Within a few weeks, a comprehensive brochure will be available, providing potential users with information on how to access the Turfgrass Information File (TGIF) via computer (software soon to be available), telephone, or through the mail. Indeed, requests may even now be made simply by calling Peter Cookingham, at 517-353-7209. The day is coming when this system may serve as a golf course superintendent's personal office information filing and printout system. Current data that will meet requirements for right-to-know laws, current detailed data on weed, disease, and insect controls could someday be at your fingertips. The possibility of having the latest maintemance equipment and parts list with descriptions and specifications would be invaluable. The potential usefulness of the research library may well be greater for the practitioner and superintendent than for the researcher.

The USGA Turfgrass Research Committee believes the research program is on track. It is especially pleased to call attention to the release of two new turfgrasses in the past year. One is a seeded bermudagrass superior to common bermuda, the work of Dr. Arden Baltensperger, of New Mexico State University. The other, in fact several others, are improved buffalograsses, from the labors of Dr. Terrance Riordan, at the University of Nebraska. There is a potential market demand for these seeded grasses in the millions of pounds. They are now under commercial foundation planting increases in Arizona, and limited quantities of seed may be available by next year. If this seems agonizingly slow, please remember, Nature only works on one seed harvest a year.

At the halfway mark, dozens of other new and promising grasses are entering the long pipeline of test and development. At least seven *Poa annua* selections are to be distributed nationwide and evaluated this year. Creeping bentgrasses that withstand high temperatures, resistance to Pythium, wear, thatch development, and having good commercial seed productivity are in the breeding hopper. Zoysiagrasses with unbelievable ability to recover rapidly from divoting, scarring, and injury represent a major breakthrough. There is even the possibility of having a zoysia variety someday comparable to bentgrass for putting greens. And can you imagine a zoysiagrass successfully growing in salt levels half of that found in sea water? It is true.

By 1991, we expect several native grasses to be ready for commercial release. Breeding cold tolerance into seeded bermudagrass now seems assured, but genetically combining cold tolerance with fine-leaf texture will take another three or four years, we are told. In New Zealand, over 1,200 promising drought-tolerant Colonial bentgrasses are being evaluated, and the best ones will be shipped to the United States for turf quality and seed trials this year. From 13 foreign countries (Canada, China, England, Germany, Iran, Japan, Korea, New Zealand, Philippines, South Africa, Sweden, Taiwan, Turkey) and the U.S.A. itself, huge quantities of new turfgrass germplasm has been collected and is in use in these breeding efforts. There has never been anything like it.

With so many new, improved grasses on the horizon, how does one go about protecting the effort and investment that has gone into their development? The Turfgrass Research Committee has a concern with this question, and is taking steps to protect against pirating. Genetic fingerprinting is now possible, and will provide a means of positive identification of new cultivars. The Plant Variety Protection Act has been made law, and it will be enforced. Biotechnology will play a major role in this development.

There is another study in Plant Stress Mechanisms. It is providing plant breeders with data on root systems, canopy and leaf evapotranspiration characteristics, stomatal density and resistance, root hair morphology, leaf density, orientation, extension, and width, among other data. Cultural practice studies dealing with soil moisture levels, soil cultivation, and the interaction of seven management factors are only the forerunners of an expanding program as new grasses begin to be released by plant breeders. Studies in salt and drought tolerance, brown patch, and Pythium resistance, monoclonal antibodies, and spring dead spot controls add to the overall advance being made in turfgrass science.

Last July, 10 university researchers receiving major USGA/GCSAA grants gathered in Salt Lake City to exhibit and discuss their individual projects. The two-day meeting was a huge success. Executive Committeemen from the USGA and GCSAA were also in attendance. At its conclusion, the researchers were unanimous in their belief that the exchange was of inestimable value. The money spent on this meeting, they said, will be far more valuable than if placed in an entirely new research project. The scientists were equally supportive of the monitoring visits made annually by members of the Turfgrass Research Committee to each project. In fact, they asked for on-site visits to be longer and

more frequent, because they directly helped move the projects forward.

There is so much more to be told about this unique research program, but you now have at least an indication of its present status. A copy of the 1987 Annual Turfgrass Research Report has been mailed to all USGA Member Clubs and donors to the turfgrass research program. I believe it shows genuine, solid, and substantial turfgrass progress.

The USGA is grateful to all those who have and continue to support this effort. You have made it possible. To try to give proper recognition by naming the thousands of individuals, corporations, clubs, golf organizations, and others who supported the USGA Capital Campaign, which raised funds for turfgrass research, would take too much space for this report and would surely result in omissions of some who sacrificed time and money for the good of the cause. So excuse us for not even trying here, but all the names of donors will be recorded permanently at Golf House, in Far Hills, New Jersey. To all of our true friends of golf and the USGA, we say thank you sincerely for being there when you are really needed. Thank you for helping GOLF KEEP AMERICA BEAUTIFUL.

(Top left) Dr. Terry Riordan, University of Nebraska, with one of his improved buffalograsses now in test trials.

(Top right) Seven selections of Poa annua *strains developed by Dr. Don White, University of Minnesota, will be field tested throughout the country this summer.*

(Above) A "monitoring visit" to the Research Library at Michigan State University.

IT'S A MATTER OF OPINION

This segment of the Green Section's Annual Educational Program is devoted to the expression of opinions — not necessarily widely held. The purpose is to stimulate, to challenge, to create, and to encourage a greater exchange of fresh ideas within the professional turfgrass management community.

USGA-GCSAA Coordinated Effort Means Successful Research Funding

by JAMES G. PRUSA
USGA Green Section Committeeman, Kansas

TALK TO ANY scientist involved in turfgrass research over the past 20 years and ask what single factor has had the most debilitating effect on advancing scientific knowledge. The answer is universally funding. Funding is the lifeblood of scientific research. Money sets the pace, and turfgrass research is not unlike research in medicine or physics or any other endeavor — it is expensive to conduct properly and successfully.

Considered orphans by agricultural funding agencies in earlier years, turfgrass researchers had to scratch for funds, but available funding has greatly improved recently.

Thanks to cooperation between the USGA and the GCSAA in the early 1980s, major amounts of money have been raised and effectively dispersed to meet the serious challenges facing the future of golf. The unparalleled cooperation between the USGA and the GCSAA has created a synergism that raised substantial funds and portends breakthroughs in turfgrass management. The major achievements of this effort are just beginning to emerge, with the greatest advances expected during the next three to four years.

Why has this cooperation worked, and why should it continue? What is the payback to the GCSAA and its members from working with the USGA? What factors could threaten this cooperation? It has worked because both associations made a commitment to the project and to mutual support and cooperation with one another. Once that commitment was made, an attitude emerged that melted away obstacles faster than they could be erected.

From the beginning, this commitment to cooperate was applied to identifying the problems facing golf in turfgrass management, from fund raising to selecting researchers and research institutions, to evaluating ongoing work, and to sharing in the credit and applause.

James G. Prusa

Mutual cooperation in all areas should continue because more can be accomplished jointly than separately. For the USGA and the GCSAA to try to conduct major turfgrass research efforts separately would waste time and money.

It takes time and money to put together and administer any project. And to properly manage a major research project, an administrative committee must be formed to identify needs and select the projects. Such a committee must meet regularly to review progress and evaluate results. Thus, the committee is in itself a necessary expense. The committee expense provides for project management and quality assurance. It stands to reason, therefore, that if the USGA and GCSAA conducted separate turfgrass research efforts, two committees and two committees' expenses would be necessary. When people give money for turfgrass research, it should find its way to the researchers as directly as possible. When money is scarce, it should not be wasted on duplicated efforts or on dual committee administration.

There are other administrative expenses as well. When large research projects are developed, contracts with research institutions can normally be expected. Since committees need lawyers to draft and interpret contracts, legal fees can be expected. These and many other costs, including paid staff support and the administration of costs of fund raising, are doubled when two independent research efforts are undertaken. Donors should begin to question whether their money is going to turfgrass research or diluted by administrative costs. Imagine two separate turfgrass research committees unknowingly but very likely funding the same research scientists at the same research institutions under two separate contracts. A scene like that should chill the bones of any contributor.

One of the greatest achievements the USGA and GCSAA have made since the joint research project began, in 1982, is the elimination of duplicate fund raising. The USGA and GCSAA initiated a cooperative effort to secure donors for this project, calling on golf clubs, associations, corporations, professionals, and amateurs, which resulted in the greatest inpouring of donations for turfgrass research ever experienced. It seemed that finally the USGA and GCSAA were working from the same platform. Separate efforts would suffer while the single fund-raising drive was

a success. This alone is reason enough to justify and continue the joint effort in turfgrass research.

Beside the obvious benefits to the average GCSAA member of advancing turfgrass knowledge, the cooperative research effort has some intangible benefits.

As the project began, a not so surprising concurrent phenomenon occurred: The USGA and GCSAA began to communicate more closely. This communication spilled over into areas of interest beyond pure turfgrass science. The two groups began to talk about the golf course superintendent, the role he plays in the game, and his need to be better recognized. The results were quick and very positive.

In 1982, USGA President Bill Campbell immediately recognized the golf course superintendent at every USGA championship. At every championship, including the U.S. Open, Campbell praised the superintendent during the final awards presentation. It is important to recognize the impact of this action. The leadership of golf, the press, the electronic media, photographers, and club members were now hearing the President of the USGA declare that the golf course superintendent was an invaluable part of managing the game. It had a tremendous impact.

Ever since Campbell established this method of recognizing the golf course superintendent, recognition has absolutely snowballed, and Campbell's successors, USGA Presidents James Hand and Bill Williams, have continued the recognition and support of the superintendent. The support level has continued on other USGA fronts as well.

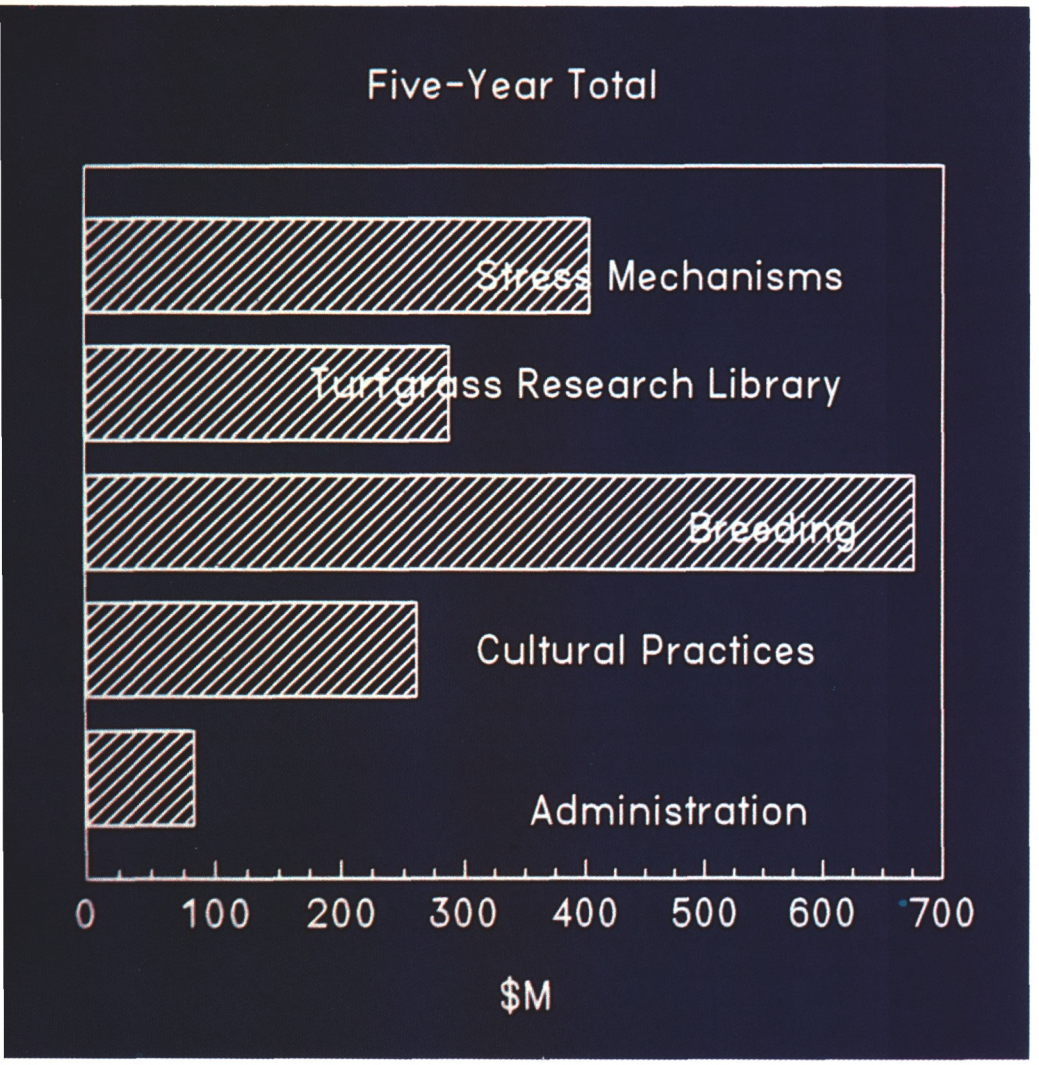
Since 1984 the USGA has allowed the GCSAA the forum of the Annual Golf Writers Banquet at the U.S. Open to publicize itself by presenting a check to the Turfgrass Research Fund.

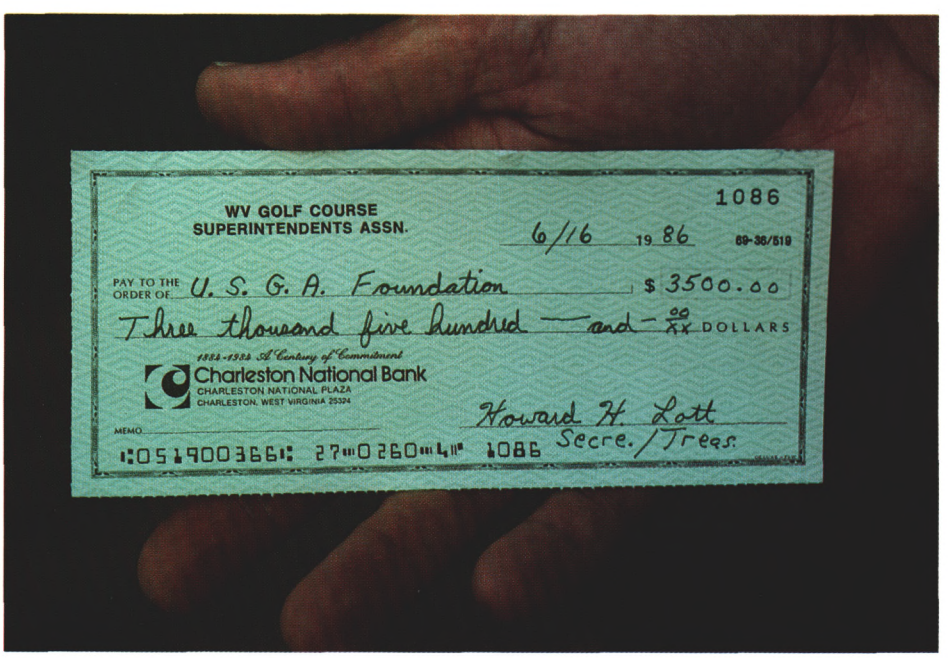
The USGA has also extended support to the GCSAA at national championships, providing accommodations in the press area and assisting the GCSAA in its coverage.

Another intangible benefit that has evolved through the joint scientific research effort has been the information gathering and networking with research institutions. Members of the USGA Turfgrass Research Committee have made annual visits to every major research site funded for the past five years. These annual visits have provided the GCSAA some remarkable opportunities.

First, the turfgrass research scientists have welcomed the visits by the Committee. Indeed, they have called for more frequent and more lengthy site inspections. These scientists have expressed their feelings that the Committee's visits provided them with a feedback on their research that they have never had before. It allows them to share and receive the latest news on other projects. This arrangement has somewhat evolved into a consulting visit to the universities not unlike the Green Section's Turfgrass Advisory visits to golf courses. Never before has any group in turfgrass research had the opportunity or resources to conduct on-site visits.

A Research Committee monitoring visit to Texas A&M, Dallas.





(Top) The halfway point in the joint USGA-GCSAA research effort.

(Above) Financial support from superintendent associations has been important.

When one considers how well this has been received, perhaps the USGA/GCSAA Research Committee should offer the same service to non-funded institutions as well!

Though the USGA and GCSAA remain committed to continuation of the joint research effort, there are forces in existence that could threaten this cooperation. Of these forces, one, an inherent function of any professional society, looms the greatest. It will come as no surprise to most members of the GCSAA that they are an association of individuals that bends to the demands of its vocal members. Not unlike how our own national politics affect the U.S. Congress, a good thing can be hamstrung by political whim and individual self-interest. GCSAA members should be on guard. It is not beyond the realm of possibility that some self-serving individuals might see an opportunity to grab the perceived glory and seek the power of a duplicate turfgrass research effort. Such a happening would be disastrous. If a scientific research project were to be motivated by the body politic, as they have been in the past, then the next progression would be for scientists to be forced to lobby for funds on their own — not an unheard-of procedure. If politics becomes involved, it is conceivable for the entire research effort to deteriorate and become a hodgepodge of uncoordinated, duplicate efforts, regionally conceived and doomed to fail.

Golf has a good thing going. The GCSAA has a good thing going. We have the best turfgrass research project ever put together, with far-reaching benefits to all of agricultural science, including food and fiber production. It is not perfect. Every human endeavor provides ample room for improvement. Democracy itself is not perfect, but it's the best form of government anyone has yet devised. Therefore, the time is now for all of us to renew our commitment to this successful joint USGA/GCSAA Turfgrass Research Program. In the best interest of the game and in the best interest of our own profession, let's put out the call not only to continue superintendent support, but to expand and strengthen it.

You Can Grow Better Golf Turf — With Less Frequent Watering

by EDWARD J. MILLER
Superintendent, Desert Forest Golf Club, Arizona

TO THE GRASS plant, soil, air, sunlight, and water are what life is all about. We fertilize the soil to help the plant grow, and we cultivate the soil to allow it to breathe. We provide water to the soil because it is essential to the plant. All of these are basic agronomic necessities that can be carried out in many ways. What I'm going to discuss is irrigating turfgrasses on an irregular basis, and what that can do for growing better turf for golf.

Turfgrasses in varied geographical and climatic situations require a certain amount of water. The USGA, GCSAA, and several key universities are in the process of finding and developing lower water-use grasses. Until these grasses become available, we have no choice but to use what we now have.

When I was in school, I remember a test question that asked us to define the effect of mowing on turfgrass. The professor was looking for a statement saying that mowing is the most critical element of grass culture. Mowing frequency and height, he believed, were the determinants of all the other cultural practices. Since then I've come to believe that mowing is important, but it is not as critical to the durability and playability of golf turf as water, applied deeply and infrequently.

We have all been forced to mow grasses closer and closer to provide fast greens and tighter fairways. In some cases this has been detrimental to the general health of the turf. After mowing bentgrass for many years at an eighth of an inch, I am convinced that overall health and the proportion of turfgrass roots to the height of cut can be influenced quite positively with deep, infrequent irrigation. By irrigating in this way, we have been able to stimulate bentgrass root growth to a depth of 12 inches; we've seen roots grow through significant layers in the soil profile, and the putting surfaces have been able to withstand extremely close heights of cut all summer long!

"You can grow better golf turf with less frequent water" fits well under the program title "It's a Matter of Opinion."

Edward J. Miller

I look at infrequent irrigation as a philosophy. There are so many variables and so few absolute rights and wrongs in this business that you really have to believe in something to make it work.

What's a good reason for an irrigation philosophy? Why do you irrigate the way you do? Do we irrigate a certain way because that's the way our system was designed? Do we irrigate because of soil conditions? Do we irrigate because that's the way people we've worked with irrigated, or do we irrigate to replace evapotranspiration? If we do, do we replace it daily, every other day, or weekly? All of these are reasons for irrigation, and a combination is probably more realistic. The primary motive behind the philosophy of deep, infrequent irrigation is to irrigate to grow roots. At Desert Forest Golf Club, in Carefree, Arizona, near Phoenix, when we replace evapotranspiration, we replace three or four days' worth in a manner that saturates 10 to 12 inches of soil, which is what we want to be our root zone. After another three or four days, when 30 to 40 percent of the desired root zone has dried out, we replace evapotranspiration again. At this point it's important to say the soil system has to be able to take three or four days' worth of evapotranspiration, usually between one-half and one inch of water under our conditions.

Once we've developed a strong root system and a soil profile able to take this amount of water, we can accomplish many things. We can develop strong, firm playing surfaces and turf stands resistant to disease, we can make our job easier through less summer stress and minimal hand watering, and if we're willing to walk the blue line, it's possible to wreak havoc on the establishment and life cycle of the grassy weed *Poa annua*.

Our green committee at Desert Forest has developed a policy for daily golf course maintenance. Fairways are maintained under guidelines derived from the USGA Golf Championship Manual, which reads, "Fairways should be maintained so as to provide a firm, tight turf. Cultivation and irrigation should be carried out in such a way that hard spots, soft spots, and overwatered spots are eliminated, thus assuring a uniformly firm playing surface."

Cultivation and infrequent irrigation go hand in hand. Again it's extremely important that the soil system be able to take the amount of water we want to apply. Once this is accomplished, we can establish a cycle of deep, infrequent irrigation that will develop a root system and turf with strong tillers, rhizomes, and stolons capable of withstanding traffic and play. Turf irrigated like this will be generally firm, because it is irrigated only once every three or four days, and after we develop a good infiltration rate, the first day will probably be the only day when the ground is wet. Most isolated dry spots will be eliminated, because the volume of water we've applied moves laterally as it saturates the root zone and picks up these areas.

TURFGRASS disease is not as much of a concern in the arid western part of the country as it is in other regions. Our disease problems occur primarily on the cool-season grasses. With an arid climate and infrequent irrigation, we do not have to apply

fungicides preventively, and we usually require only one or two curative fungicide applications per year.

The best part about infrequent irrigation is that it makes your job easier. Over the past four years I have been involved with two golf courses, one in Denver, and now in Phoenix. Implementing infrequent irrigation has virtually eliminated the need for hand watering at both golf courses. In Carefree, where we have bentgrass putting greens, the crew used to begin hitting hot spots almost daily from March through November. Now, with a little planning, we try to irrigate putting greens on Friday evenings, and we don't have to worry about the bentgrass for the rest of the weekend. We still have to hand water isolated dry spots on the third and fourth days between irrigations, but the time spent dragging hose is substantially less!

Poa annua! Poa annua does not like infrequent irrigation, especially in July and August. After it goes to seed in the spring, its weakened root system isn't capable of extracting closely held water from the soil system. It prefers more frequent, easily obtainable water. By stretching irrigation intervals, we keep *Poa* in a weakened state all summer, while deep-rooted bentgrass can regain lost ground. If we stretch irrigation intervals even further, and put up with some footprinting and blue bentgrass, *Poa annua* can actually be taken out using irrigation management alone.

All these benefits can be obtained from deep, infrequent irrigation. If you've believed me so far, you're probably thinking this sounds too good to be true. There's a lot more to it, however, and some negative aspects have to be addressed. Extensive cultivation or soil modification may be required to get the infiltration rate to one-half to one inch of water a night. Low-flying 3-woods will not hold putting greens, which will make a lot of your players unhappy.

You may have to modify the irrigation system to deliver this amount of water, and there will still be isolated areas that require special attention, like hand watering, soil modification, or drainage. Different areas of the country will require different irrigation timing and probably slightly different methods, but the benefits derived from the philosophy of infrequent irrigation will outweigh the problems.

If you believe infrequent irrigation may have a place in your toolbox of grass growing, let me suggest how to start. The best time to change irrigation practices is when you have had or are inheriting some persistent problems. When changing jobs, if the previous superintendent kept a wet golf course or did a lot of hand watering and syringing that interfered with play, the situation is probably the best possible one for you.

Communication while changing irrigation practices is extremely important. Many things will be different, and your golfers will want to know why. Why is the turf allowed to dry out? Why must we aerate so much? Why do the greens not hold all the time?

Start at the beginning. Don't adopt an infrequent irrigation program in August. In the spring when your turf is coming out of winter, whether it's in the desert in February or Minnesota in May, hold off on the frequency of irrigation. Wait to water until it's absolutely necessary, or even later. Make turfgrass roots seek deep water in the root zone. When it's time for the late spring aerification, make it an intensive aeration; punch a lot of holes. We use $\frac{5}{8}$-inch tines on putting greens, and three different aerifiers on fairways, ending up with approximately 60 $\frac{5}{8}$- and $\frac{3}{4}$-inch holes per square foot.

After the surface is open, see how much water it will take. I think you will be surprised. I've had to modify the irrigation systems at the last two golf courses, because the design was not capable of delivering the amount of water (.9 to 1 inch) I wanted to apply. We wired individually controlled sprinkler heads together at one golf course in order to run the same amount of heads with a quarter of the number of stations. In this way, I could generate 90 minutes of run time and apply .9 of an inch of water in one night. Fortunately, the pipe size was adequate to meet the delivery rate. After a thorough soaking, see how long you can go before the next irrigation, then do it again.

In a short time you will probably notice some of the things we talked about begin to happen. The second year will be better and easier than the first, and the third year still better.

I did not originate the philosophy of infrequent irrigation. As a matter of fact, you can read about it in chapter 14, *Turfgrass: Science and Culture*, by Dr. James B. Beard. But with all of the high tech computerized irrigation equipment available today, and the ease with which automatic irrigation systems will do the job for you, I am certain that the philosophy of infrequent irrigation is another one of those forgotten secrets from the past.

Poa annua *in a weakened stage.*

Public Golf Courses Ain't Dogs Anymore

by TED SOKOLIS
General Manager, Pine Meadow Golf Club, Illinois

WHY WERE public courses considered dogs in the past? I guess because golfers always compared public courses to private clubs, and they probably always will. In the 1960s, public courses fell short for many reasons:

1. Greens were mowed at ¼-inch or higher, three or four times a week.
2. Non-watered bluegrass tees and fairways were mowed once or twice a week.
3. Fairways and rough were mowed at the same height, about 1¼-inch, to minimize lost balls and speed play.
4. Most sand bunkers were filled in and grassed over to speed play.

What was a round like for a public course golfer in the '60s?

During a hot, dry summer day, courses were nearly empty Monday through Friday, except for late afternoon league play. Weekends were jammed with company outings as well as with players with reservations. The first tee ran on five-minute starting times, and was usually 30 minutes late by 10 a.m. Once on the course, you might find two or three groups waiting to hit on every tee, and your round could easily take five or six hours.

Ted Sokolis

The non-watered bluegrass fairways were probably parched brown and dormant for the summer. If you walked, your legs got filthy, and your leg muscles ached from pounding on dried-out clay soil. If you rode an electric cart, it probably quit on 16 or 17. Was it fun? I guess it depended on how many beers you had.

One Chicago public course operator led a dramatic change in public course conditioning. He foresaw the future of public golf: "Provide the public course player with private club conditions and service for the price of a green fee."

The man was Joe Jemsek. He began his golf career as a caddie, progressed to club pro and tour player, and eventually became owner of St. Andrews, a 36-hole course in west Chicago, in 1939. He continually made improvements, mainly by enlarging the greens and tees. An automatic irrigation system was

installed in 1965, and bluegrass fairways were overseeded to bentgrass. Weak holes were remodeled, and sand bunkers added to make the course more fun to play. In 1987, John Lapp, superintendent at St. Andrews, began construction of a first-class practice range, which is scheduled to open in the summer of 1988.

Cog Hill, a 72-hole complex, is situated in Lemont, Illinois, a southwest suburb of Chicago. This is where Joe Jemsek began his golf career as a caddie. He bought the club in 1951, when it had 36 holes, and added Course Three in 1961. In 1962, against advice from his architects and associates, he decided to build Course Four, aptly named Dubsdread. A spectacular tournament course was constructed with bentgrass tees and fairways, along with 110 white silica sand bunkers. Some other public course operators waited for Joe to go broke, but to paraphrase Joe, "You have to set the style."

Chicago golfers flocked to play these well-conditioned courses. Along with success came more change. *Golf Digest* has included Dubsdread in its selection of the top 100 courses. The 1970 U.S. Amateur Public Links was played at Dubs, along with the 1987 Women's Amateur Public Links Championship. The APL is scheduled to return in 1989. Superintendent Lapp works hard keeping four 18-hole courses in excellent condition.

Fresh Meadow has 18 holes and is located in Westchester, a Chicago suburb. The course was completely rebuilt in the late 1950s while keeping it open for play. An automatic irrigation system was added, and the fairways overseeded to bentgrass, in 1968. Superintendent Tom Savage keeps one of the heaviest played courses in Chicago in truly top condition throughout the season.

Glenwoodie is a beautiful 18-hole course in the far south suburb of Glenwood. Superintendent Rory Bancroft is responsible for keeping this public course in superb playing condition.

In a continuing quest to operate top quality public courses, Jemsek again

Pine Meadow's 15th tee — Tournament Course.

rolled up his sleeves in 1984 and built Pine Meadow Golf Club, in Mundelein, another suburb. Architects Joe Lee and Rocky Roquemore took a seldom-used college campus course and combined it with adjacent farms and orchards to create a brand-new public golf course. Pine Meadow features huge Penncross greens and tees, Penneagle fairways, and 75 white silica sand bunkers. The rolling landscape features thousands of evergreens, which are quite unusual around Chicago.

In 1986, our first full year of operation, we hosted qualifying for the Western Open, and in 1987, we had the 72-hole Illinois State Amateur Championship. Jemsek and his son Frank were honored with a plaque from *Golf Digest* when Pine Meadow was chosen the best new public course in 1986.

One of the keys to success has been to operate lean, and to continually re-invest in the courses and make them better. Plans are now made 10 to 20 years ahead.

What about the Pine Meadow player of today?

1. He has a practice range for warming up or for practice.
2. He has close-cut greens that are mowed every day.
3. He has close-cut bent/*Poa* fairways.
4. He has sand and grass bunkers, along with 2-inch roughs that gobble up errant shots.

Pine Meadow superintendent Robert Padula does an exceptional job.

Do private course conditions mean even slower rounds for public golfers? Definitely not. We opened Pine Meadows using a system called "Keep Pace." This assures average playing times of 4 hours and 15 minutes on weekends between 5:30 a.m. and 2:30 p.m. The system was created at Village Links of Glen Ellyn nine years ago. The system is now used at about 50 public courses throughout Chicago.

Have public golf courses given the public course player private club conditions for the price of a green fee?

You're doggone right they have.

The 18th at Pine Meadow.

Programs with an Eye Toward the Future

by DONALD E. HEARN
President, GCSAA & CGCS, Weston Golf Club, Massachusetts

PICTURE GOLF COURSE superintendents without an association. We would work within a vacuum — we would have few with whom to commiserate, no experiences to share and learn from, and our profession would lack plans and goals. There would probably be little consistency from golf course to golf course. Golfing conditions would surely suffer.

As outrageous as it may seem to have a golf course without a superintendent, it is equally outrageous to imagine superintendents without an association. As opposed to some who work in the same building, or even in the same office, superintendents have to make an effort to come together. An association, be it local or national, provides a means for superintendents to share experiences with those who work in the same occupation.

Professional associations consist of members who join forces for the advancement of their profession. Associations address issues of common concern, sometimes to provide money for research, sometimes to learn new techniques, sometimes for camaraderie, and in some cases, just for the sake of belonging to one's professional association.

Our association — the GCSAA — will influence our profession during the coming years.

In looking toward our future, we have to consider what lies ahead of us. I see future challenges falling into two distinct areas — skills and image. We need to think about our future, and of the skills we will need as golf course superintendents to continue to maintain excellent golfing conditions, and to further ourselves professionally.

For example, where will pesticides be 10 to 20 years from now? What will we be required in terms of our pesticide applications? What pesticides will be available to us? How will we have to change our management practices to take the best advantage of the chemicals we are allowed to use? What will the water situation be? We've seen water shortages in the Northeast, Florida, and in Arizona growing worse. We have seen examples where golf courses are considered non-essential users of water, and are prohibited from irrigating in times of drought. If this trend continues, with the projections for dwindling water supplies, golf courses are going to have a very difficult time maintaining conditions with existing strains of grass.

Donald E. Hearn

What about skills needed to master new technologies in equipment, irrigation systems, personnel management, and turfgrass varieties?

These are all needs that will present themselves in our future, and as an association we must consider today.

WE ALSO FACE a challenge to our professionalism. In another decade, what management skills will be required of us? What kind of image do we want to project for ourselves? How do we want to be viewed by our colleagues and by our golfers? What kind of income do we want to earn? If we intend to be in a good position a decade or two from now, we must determine what we want, and work toward those goals.

To meet these challenges, we will be aggressively enhancing our GCSAA programs in at least three key respects. Quality education certainly must be responsive to the challenges, and most certainly will enhance our professional image in the future.

We have a very strong education program at GCSAA, and a clearly defined long-range plan has been developed that sets forth over the coming years the framework for our continuing education.

We have in place a curriculum that is gaining wide acceptance among superintendents. We offer courses in botany and physiology, computers, golf course design, golf course construction, the Rules of Golf, worker productivity, stress management, legal liability, and much more. Last year more than 2,500 members participated in GCSAA seminars. We expect that figure to increase by nearly 20 percent this year. Compare those 2,500 participants with fewer than 300 in 1982, just six years ago.

And GCSAA's seminars have earned an excellent reputation among other professionals in golf. Our records indicate that GCSAA seminars are attended by golf course architects, college instructors, builders, green committee chairmen, club managers, golf professionals, and even by members of the PGA Tour. GCSAA's education program is designed to be flexible, to allow for the changes in technology in our future and to assure that we will be well trained and can find the specific training we need to excel.

As we all know, a person who is well read and well trained will project a strengthened professional image, and will be personally rewarded.

When we look at education in the future, we're speaking not only of continuing education for today's superintendent, but also of higher standards for young people entering the field. By the year 2000, we will probably see a predominance of golf course superintendents with four-year college degrees.

Superintendents in the last few years have demonstrated a desire to continue their education; 92 percent of superintendents who attended last year's conference in Phoenix had completed some collge, and 42 percent had a bachelor's degree or better.

As superintendents, we see the value of education in our future far more than we did 10 or 20 years ago. We can only look for this trend to increase.

This desire for more and more education is also reflected in our certification program; 77 percent of GCSAA's superintendent members are either certified or plan to become certified when they become eligible to enter the program. We are seeing increasing value in certification — employers are anxious to hire Certified Golf Course Superintendents. That's because certified superintendents are educated persons endorsed by their peers, and capable of top performance. As we move toward 2000, more and more requirements will be demanded of people seeking to become certified.

IN THE AREA of government relations, GCSAA has launched a new and important program with the employment of a government relations manager and an active government relations committee. Future superintendents will have increased awareness of the range and complexity of their statutory and regulatory obligations. For example, you will be more aware of restrictions on the use of water, restrictions on the use of pesticides, and regulations on underground storage tanks, and you will become increasingly involved in providing input into the regulatory process, not only on a national level, but also on state and local levels.

We will help ensure that those regulations will fit our circumstances, and, in following the example of some GCSAA members, superintendents will become participants in the boards and commissions that regulate the profession. We will not do well if we sit back and let others determine our future on regulatory issues.

Already we have seen substantial results from our government relations efforts. For example, the recent decision to cancel cadmium fungicides contained an allowance for using them on golf course greens, tees, and aprons.

Our ability to report on issues and trends in regulation has greatly improved. In fact, officials from the EPA and Congress are participating in this effort. Several of these government representatives attended our conference, in Houston.

As you've already heard, GCSAA is working with the USGA and with others on future research goals. For example, we're working to develop low-maintenance, less-water-consuming turfgrass varieties. These varieties, when they are available and planted on golf courses, are going to make a tremendous difference in our ability to use less water — perhaps to use more effluent water — and will allow us to continue to provide the conditions golfers expect.

Future superintendents will become more familiar with Integrated Pest Management. Everything that is done to the golf course will fit together in a cohesive plan. Physical tactics will be used to control pests on the course. More trapping to detect actual levels of pests will be used, along with chemical means, such as pheromones, repellents, sterilants, growth inhibitors, insecticidal soaps, and synthetic pesticides.

Biological controls, such as resistant varieties, natural enemies, propagation of diseases and parasites of pests, and release of sterile pests into the environment will be common.

Genetics will play a large role in the integrated pest management mode of control. We're seeing the potential for this now in California, where strawberries are treated with bacteria for frost control, and in Michigan, where work is being done with a bacterium that attacks annual bluegrass.

Cultural practices will be emphasized. The management of water, sanitation, the use of aerification and thatch control, the judicious use of fertilizer, and perhaps a reconsideration of mowing heights will all be important factors. And of course we will be functioning under regulatory restrictions as well — those imposed on us and those we impose upon ourselves, such as quarantines and seed certification.

Worker safety is a great issue in our future. In our litigious society, we are becoming more responsible for the well-being of our employees. There is more use of safety equipment and an increased emphasis on training of golf course employees. We have a responsibility to maintain a safe and healthy work environment.

GCSAA's government relations program will keep golf course superintendents aware of these issues and make sure we have significant input in shaping the decisions that may affect us.

Also this past year, GCSAA has renewed its commitment to a strong public relations program. We have made efforts to increase the awareness of the role of the superintendent as a professional in the business and the person responsible for the management and playability of the golf course.

The GCSAA also conducted focus group research in which we brought together golfers from public and private courses to discuss their impressions of the superintendent and his association. I think all of you would be pleased and somewhat surprised with the recognition these groups gave to superintendents.

Without exception, these groups credited the conditions of the course to the superintendent, and had a very strong, positive impression of him as a professional. I have to add, with some immodesty, the consensus was that the superintendent is the most valuable employee at a golf course — and that the superintendent is the most difficult employee to replace.

We need to continue to make golfers aware of the impact of the superintendent on the golf course and aware of the professionalism superintendents bring to their jobs. This awareness will bring us added stature, but it will also bring more pressure and responsibility. The expectations of golfers will increase, but so will the rewards.

DESPITE the progress of the past year, we must realize that elevating awareness of facts regarding our profession among golfers is a long-term goal — one that we should realistically expect to take many years to achieve. We must work with the media to further its understanding of our profession, we must learn to accept the criticism we receive, and we must realize that it's sometimes justified.

In the area of public relations, more than any other, we must do for ourselves. In order to make our future better, we must each work to develop our individual professional image.

Sixty years ago, a group of men banded together to form our association, and by working together toward common objectives as a unified group, we have achieved many goals. But now we face new challenges we must work together to meet. Every superintendent must work to further our common goals. We cannot return home to our jobs and allow our future to develop as it may. We must strive towards our future goals with the determination to direct our own fate, to control the path of our chosen career.

BEST TURF TIPS OF 1987 — PART II

Some Interesting Uses for Water

by LARRY W. GILHULY
Director, Western Region, USGA Green Section

GREEN SECTION agronomists traveling the country have found water the most common denominator on every golf course. When one thinks of water in terms of golf course management, one immediately thinks of the irrigation system, and the effect water has on plant growth functions. Occasionally we run into other interesting uses of water that are both unique and life-giving in particular situations.

During 1987, three examples were seen that were definitely worth noting. The first involves the use of irrigation water for reducing excess sand on bunker faces. This technique has been used with great success by Brent Weston, the superintendent at the Lakeside Golf Club, in Hollywood, California. Basically, Weston uses existing irrigation hose pressure, and begins washing the excess sand back into the bunker. As this is accomplished, the contour of the bunker edge changes, without losing any of the rooting system, or requiring the intensive labor usually associated with this type of renovation. Simple, yet effective.

The second idea was seen on the island of Maui, Hawaii. At the Makena Golf Course, Walter Mattison had a problem establishing bougainvillea plants for color in the natural lava areas without the ability to install regular irrigation. Mattison's simple and direct technique involves the use of a five-gallon bucket with a small pin hole in the bottom for a slow drip irrigation system. I am happy to report the plants are thriving.

The third use of water involves an exceptional water fountain constructed by Ray Lozano, superintendent at El Caballero Country Club, in Tarzana, California. Lozano used brick to construct a pedestal fountain with three planters containing impatiens. Inside the pedestal, the daily application of ice provides cold water during the warm southern California summers. However, the unique feature of this fountain is what happens to the excess water. Lozano placed a drainage line to provide drip irrigation to the planter beds from the excess water from the fountain. This is another excellent example of the ingenuity, craftsmanship, and simplicity that is frequently displayed by today's golf course superintendent.

(Top right) Excess water from drinking fountain provides ample water for nearby flower beds.

(Right) Using water, changing built-up contours on bunkers can be quick and simple.

The Big Blow

by GARY A. WATSCHKE
Agronomist, Northeastern Region, USGA Green Section

AS LARRY Gilhuly has pointed out in the preceding article, one of the most enduring problems superintendents must face is the constant maintenance associated with sand bunkers. Edging is difficult enough, but of ongoing concern is the continual buildup of sand on the greenside edge of bunkers caused by explosion shots. These massive amounts of sand can kill the turf by mere suffocation or by accumulating to such depths that severe drought conditions develop. It's a vicious cycle.

Many have tried various methods of removing sand from the grass faces of bunkers. Larry Gilhuly has shown you one technique using water to wash away the accumulated sand on a steep sand bank. It's a good one and it works. Mike Rewinski, superintendent at Westhampton Country Club on eastern Long Island, has found another innovative approach worthy of our attention.

While blowing out his irrigation system to prepare for winter, Mike found a large rented air compressor ideal for blowing sand from grass bunker banks back into the bunkers. He outfitted the compressor with a hose attached to four feet of ½-inch pipe. One person can easily blow the sand back into a bunker usually in 15 to 20 minutes. Some dried grass clippings will settle in the sand but are easily cleaned up with leaf rakes.

The net result of this action is a neat, clean turf that can thrive very well and extend the life of the reconstructed grass banks indefinitely. Banks of little-used bunkers should be cleaned once a year. More heavily used bunkers should be subjected to the Big Blow as often as twice a year.

For grass banks . . . the Big Blow . . . works.

The One-Man Topdressing Operation

by JOHN H. FOY
Agronomist, Southeastern Region, USGA Green Section

THERE IS NO WAY of getting around the fact that proper golf course maintenance consumes a lot of man-hours. In addition to the routine operations such as mowing, irrigation, pesticide applications, and fertilization, additional required maintenance practices such as aerification, topdressing, and verticutting must be performed periodically. Innovations in equipment continue to improve the efficiency of these operations, but it has been my experience that superintendents are always eager to further streamline and improve operating efficiency. My best turf tip of 1987 is a simple means of reducing the labor requirement of routine topdressing operations.

This turf tip was observed at the Banyan Golf Club, in West Palm Beach, Florida, where Dan Jones is the golf course superintendent. Besides providing the membership with one of the consistently best maintained golf courses in the area, Dan is the editor of the award-winning *Florida Green* magazine, and donates hours of his time to community service projects. Obviously, good organization and efficient use of his time are necessary. These traits can be observed throughout the maintenance programs at Banyan. An excellent example of this is the one-man topdressing operation.

Typically, when topdressing is underway, two or even three men are involved, and, unfortunately, valuable man-hours are lost while the crew has to wait for various phases of the operation to be completed. At Banyan, only one man is required for topdressing, thus more efficient use of valuable man-hours is realized.

When Jones arrived at Banyan several years ago, he discovered an old three-cubic-yard trailer sitting among a number of other pieces of scrap equipment.

The setup: tractor, trailer, and topdresser at Banyan Golf Club, Florida.

(Top) Outfitted with a hydraulic lift.

(Above) Hydraulic lift control at rear of trailer.

A one-man "fill-up."

After restoring the trailer and making a few modifications, he developed the one-man topdressing operation. The basic modifications consisted of installing a hydraulic lift to the front of the trailer and an electrical control setup at the back to monitor filling the topdresser, and a three-way tailgate. The three-way tailgate improves the versatility of the trailer so that it can be used for other hauling operations. A couple of 12-volt batteries are mounted on the trailer to power the electrical control system of the hydraulic lift, but it should be noted that the batteries are also connected into the charging system of the tractor that is used for towing the trailer in order to maintain a constant charge.

The really innovative part of this operation is the ability to tow the topdressing machine to where it is to be used. The mechanic at Banyan fabricated a very simple hitch setup from a piece of steel pipe. The hitch connects to the back frame of the trailer and the front frame of the topdressing unit. Cotter pins secure the hitch, but at the same time afford a quick and simple disconnect.

Examination of this setup reveals that it is simple, yet extremely functional. Once the trailer is filled with topdressing material, one operator can conduct a topdressing operation. Jones reports that when a light application of topdressing is being made to the greens, one trailer load is enough for nine greens. Over a year's time, this very efficient operation saves a significant amount of man-hours.

Water Movement in Soils

by **DR. WALTER H. GARDNER**
Professor Emeritus, Washington State University

AS A LIQUID or vapor, water is nearly always moving in the soil. It moves downward after rain or irrigation. It moves upward to evaporate from the soil surface. It moves towards and into plant roots, and eventually into the atmosphere through transpiration. And during the night, when transpiration is greatly reduced, water moves from moist soil between roots into soil adjacent to absorbing roots that has dried during the previous day.

Horizontal movement also is important, as, for example, when water moves from an aeration hole. Water movement can be in any direction, depending on conditions.

Water flows through the open pores between soil particles. In an ordinary silt loam, for example, half the soil volume is pore space. Water and air share this pore space. For most plants it must be possible for air from the root zone to exchange with air from the surface. Air from the root zone is laden with carbon dioxide, as a result of metabolism in the roots.

Pores in different soils vary in size and number. Silty and clayey soils

Dr. Walter H. Gardner

generally have smaller but many more pores than sandy soils. Because of the number of pores, silty and clayey soils filled with water contain more total water than sandy soil with all its pores filled.

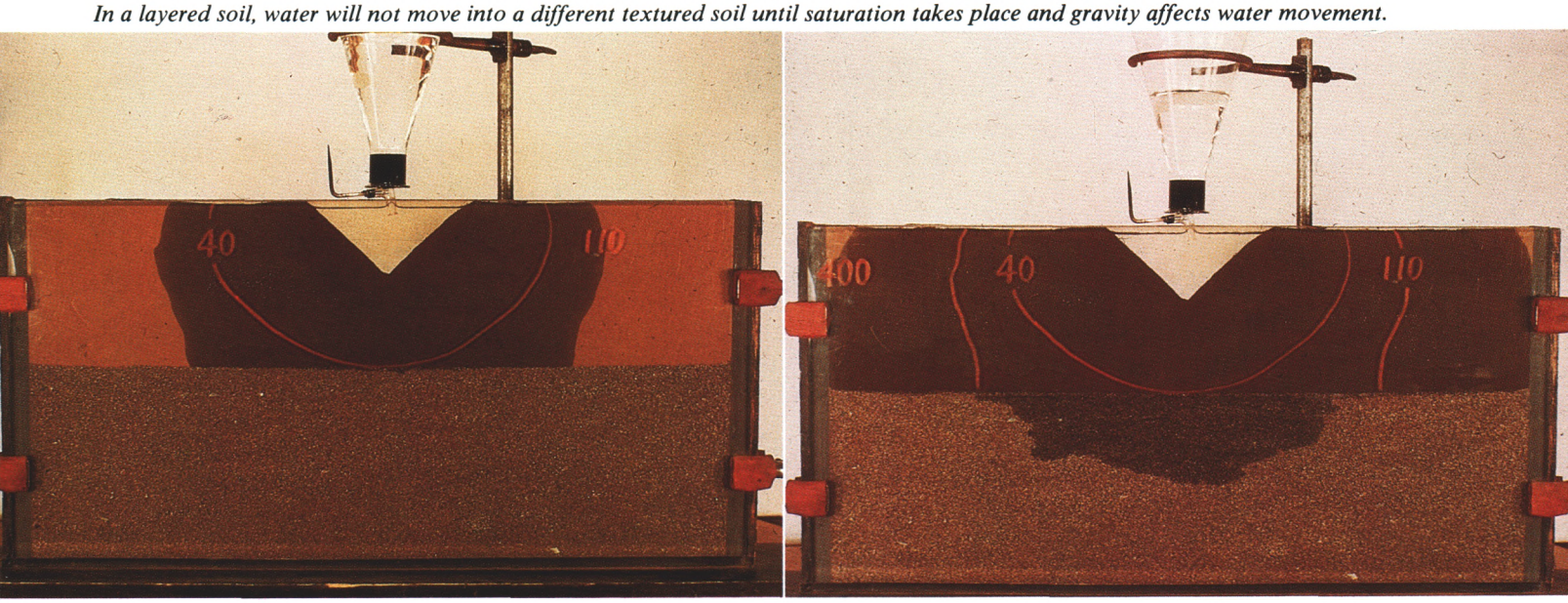
Some of the water in soils with fine pores is held so tightly the plant can't absorb it. Even so, the amount in these soils is greater than the amount available to the plant in soils with large pores.

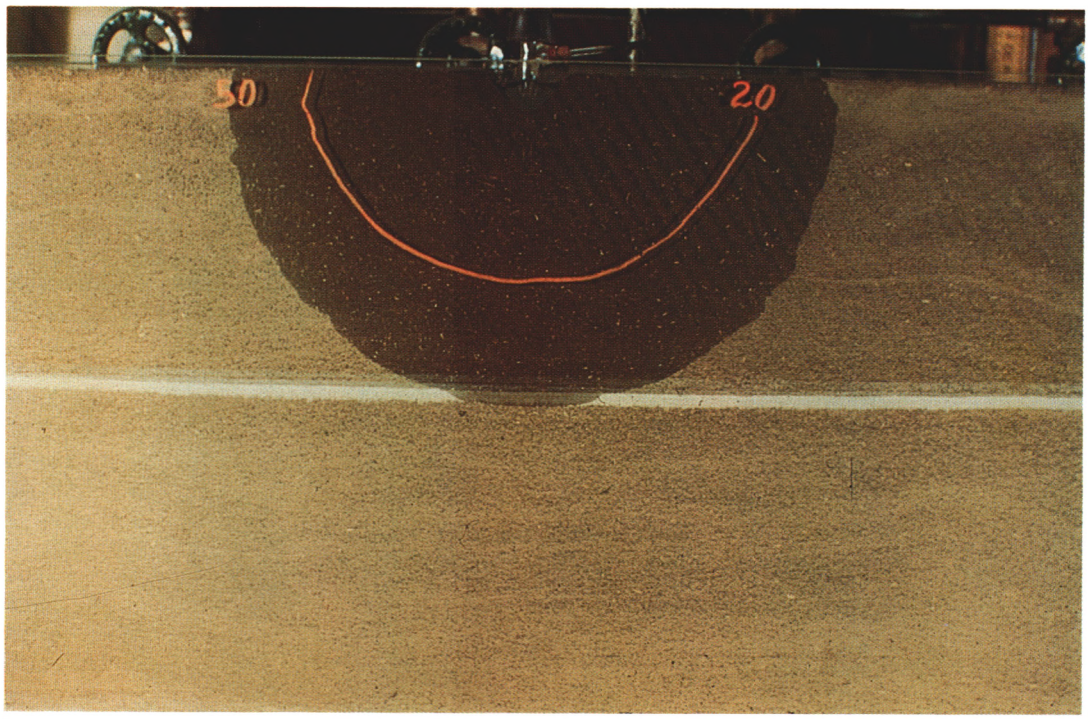
Two major forces move liquid water through the soil pores; these forces are gravity and adhesion. The movement of water is entirely different under these two conditions. To understand the differences, let me first tell you about surface tension of liquid water.

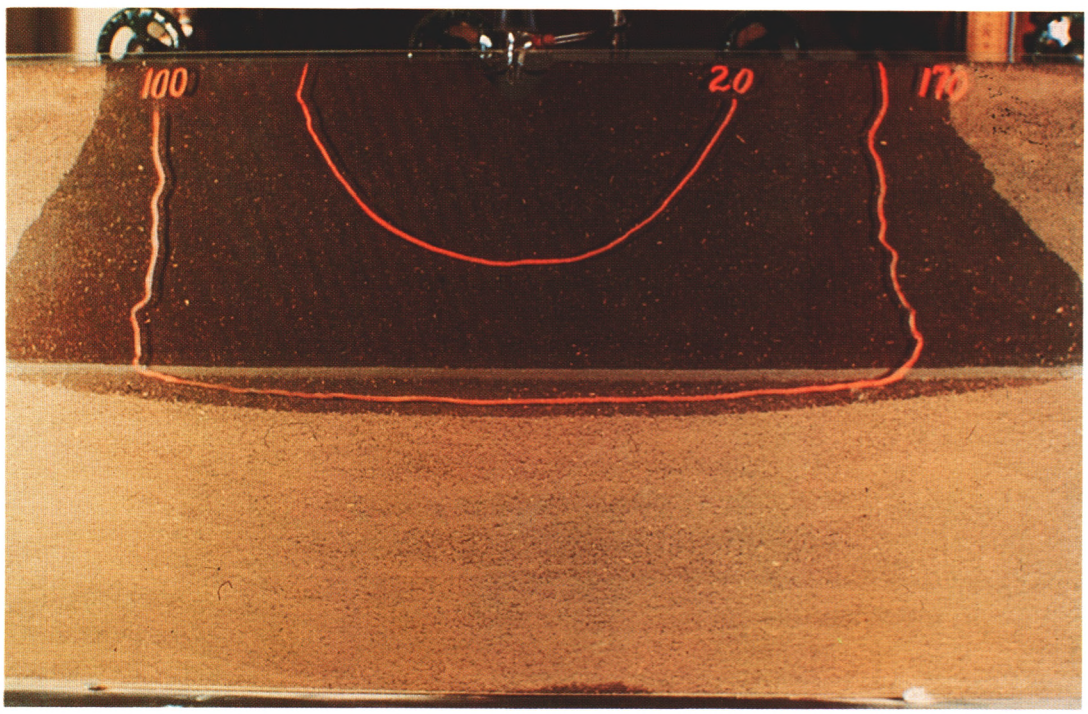
You have seen raindrops or drops from a dripping tap, and you probably noticed they are roughly spherical, with a positive radius of curvature. They are held in this shape by a force called surface tension, which acts at the air-water interface in a somewhat similar manner as a rubber balloon, opposing a positive pressure inside of the droplet. Now, much of the water you see — water from a tap, water in a lake or stream, or water in the cup you drink from — is under positive pressure. This is how most people think of water. Water under positive pressure moves in response to the pressure of a column of water or by gravitational forces.

Now, let me discuss another class of water you ordinarily think of under the term moisture. You are equally familiar with this water, inasmuch as it is the

In a layered soil, water will not move into a different textured soil until saturation takes place and gravity affects water movement.



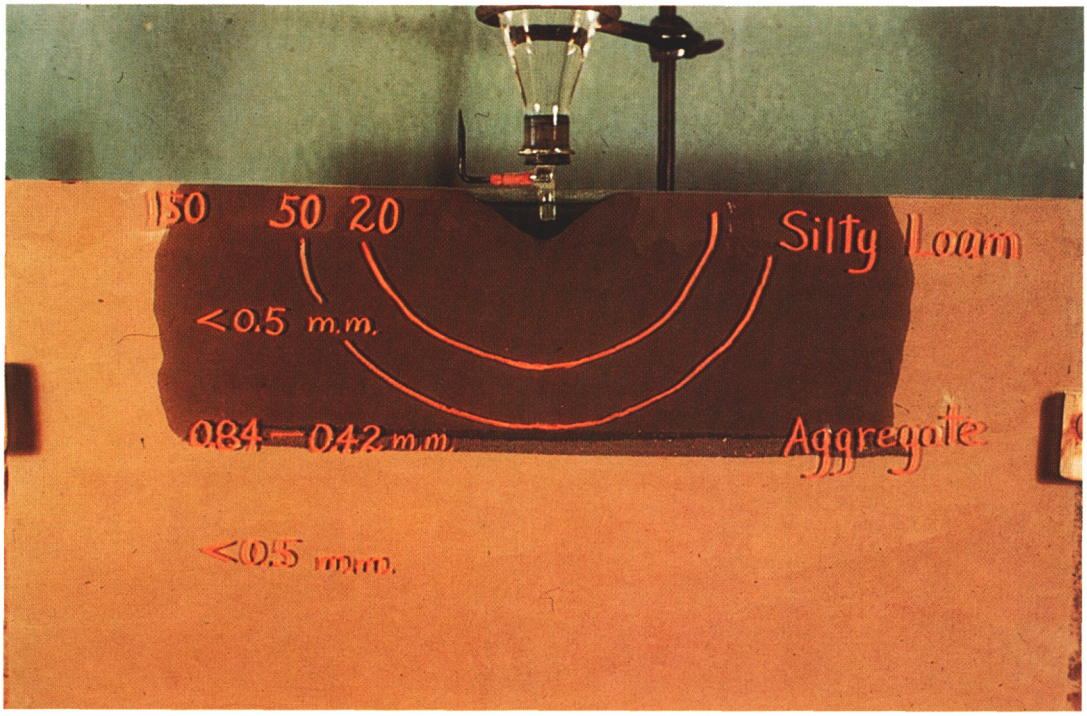


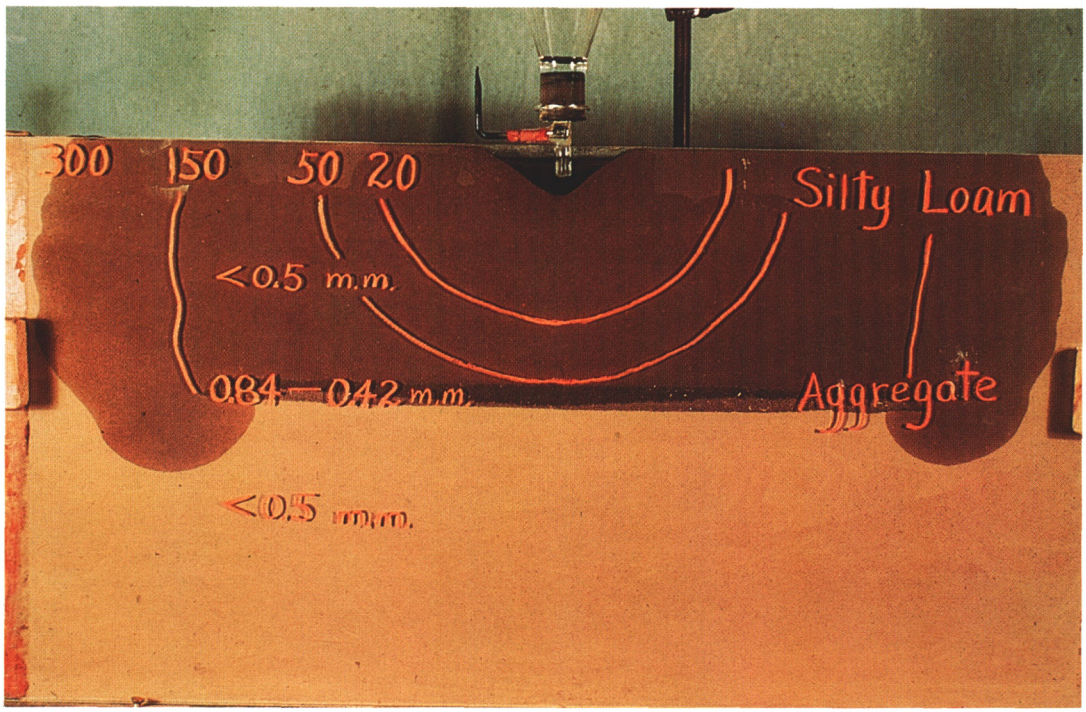


When water reaches the clay, the very fine pores of this layer resist water flow. Although water does pass through the clay, its penetration is so slow that water tables often build up above the clay. Some hardpans act similarly.

moisture in, for example, a dish-drying towel, material of your shirt when you perspire, and the soil when it is not saturated. It is the water that is said to be absorbed by a porous material, and it is water that exists with a negative curvature in the air-water interface as you would observe it under a high-powered microscope. This water is under negative pressure, contrasted to the water of the raindrop, where the air-water interface is positive and the pressure is positive. Water in porous materials under negative pressure must be pulled along by attractive forces that exist between water and the walls of the porous material associated with it, and forces in a negative air-water interface that is always present. The best example of capillary water is water pulled upward into a small tube by adsorptive and cohesive forces. The absorptive property of blotting paper is a good illustration. Adhesion — together with cohesion, which causes water molecules to hang together — makes water move on particle surfaces and through the finer pores.

The differences in the positive and negative forces that move water in the two cases make huge and often dramatic differences in phenomena that involve water. Most phenomena involving water movement under positive pressure take place in pipes and in streams and ditches. Considerable water is usually moved in





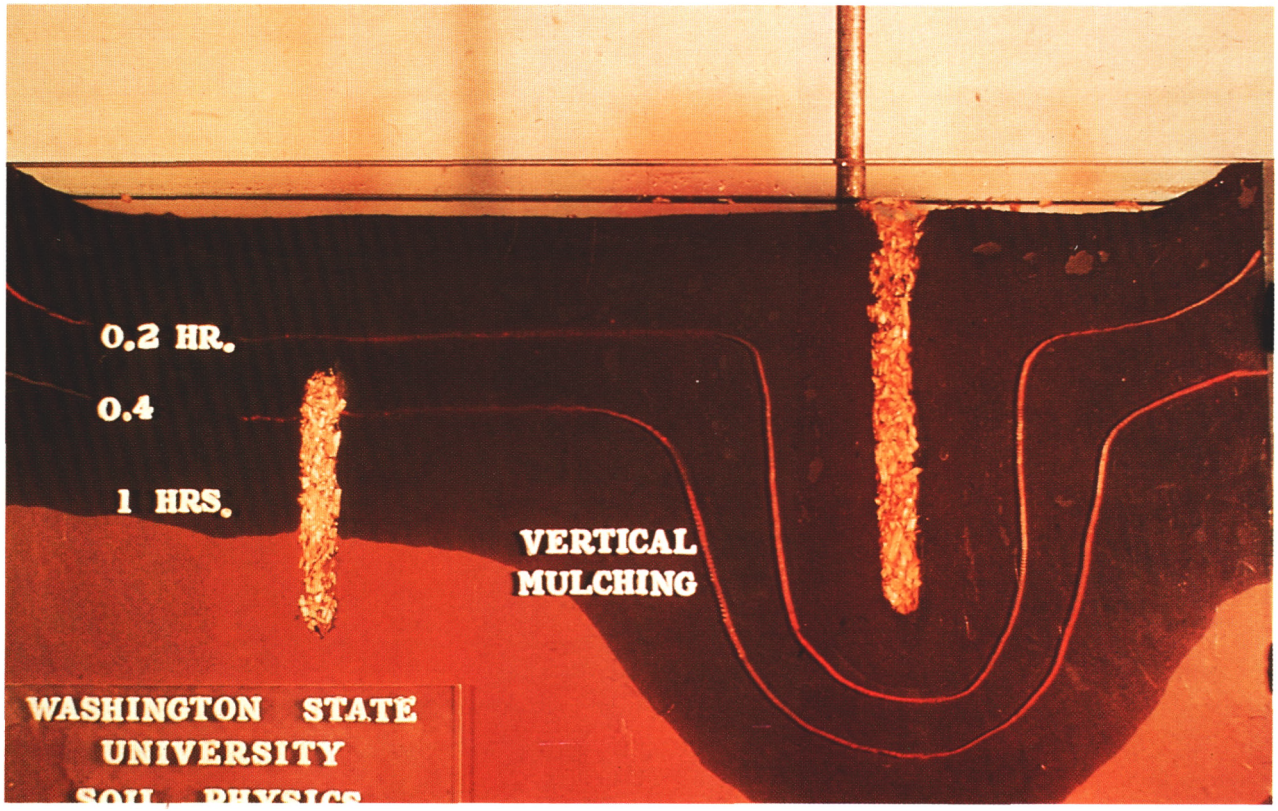
Any change in soil porosity encountered by a wetting front affects water movement. In these photographs, a layer of coarse soil aggregates acts much like a layer of sand, with one important difference: water can move through the interior of the aggregates themselves. But the relatively small number of contacts between the aggregates limits the amount of water that actually moves through this layer. Only when the soil is nearly saturated does the water move rapidly through the soil aggregate layer. Saturation was not reached in this test.

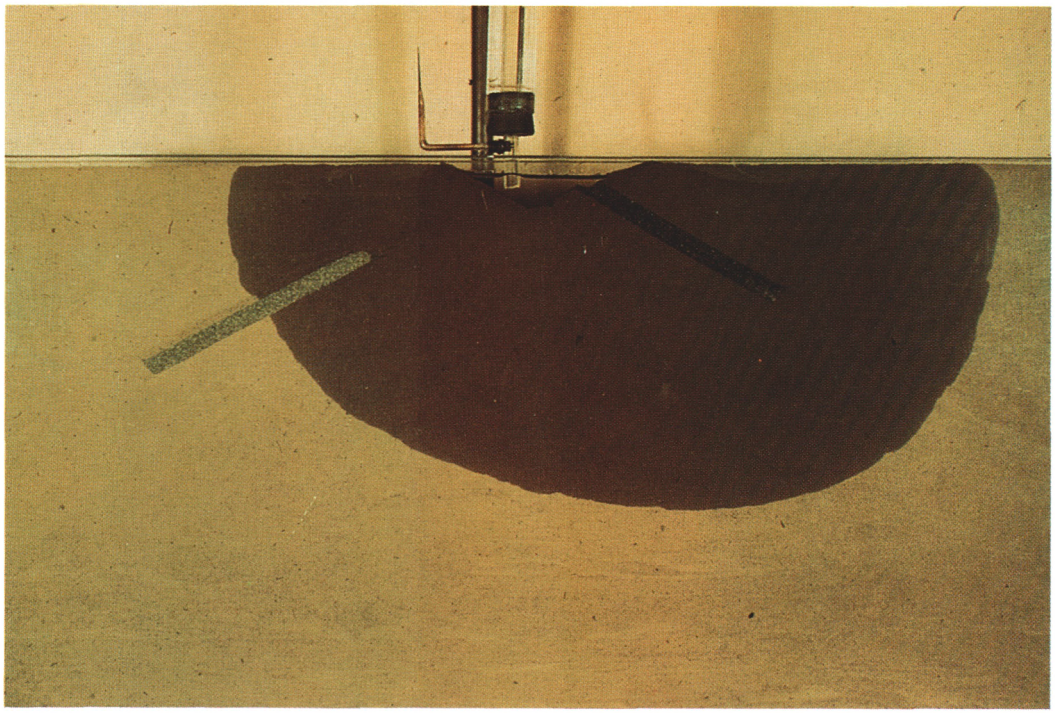
this condition. By contrast, movement in porous materials under negative pressure takes place in thin films, and consequently the quantity of water moved with a similar size of moving force is a small fraction of that where a positive pressure exists.

Water moves until the forces balance, at which point the curvature of air-water interfaces is the same, except for some vertical differences that exist because of gravity. If the soil is not uniformly homogeneous, the portions of the soil that have the smallest pores retain water most strongly.

In stratified soils — soils with various "layers" such as those recommended in the USGA Green Section Specifications for Putting Green Construction — the size of the pores in the strata affect water flow. If an advancing wetting front encounters fine materials, the resistance in the extremely fine pores may slow the movement. But the water nevertheless continues to move. If the wetting front encounters coarse materials, water movement stops until the soil becomes nearly saturated.

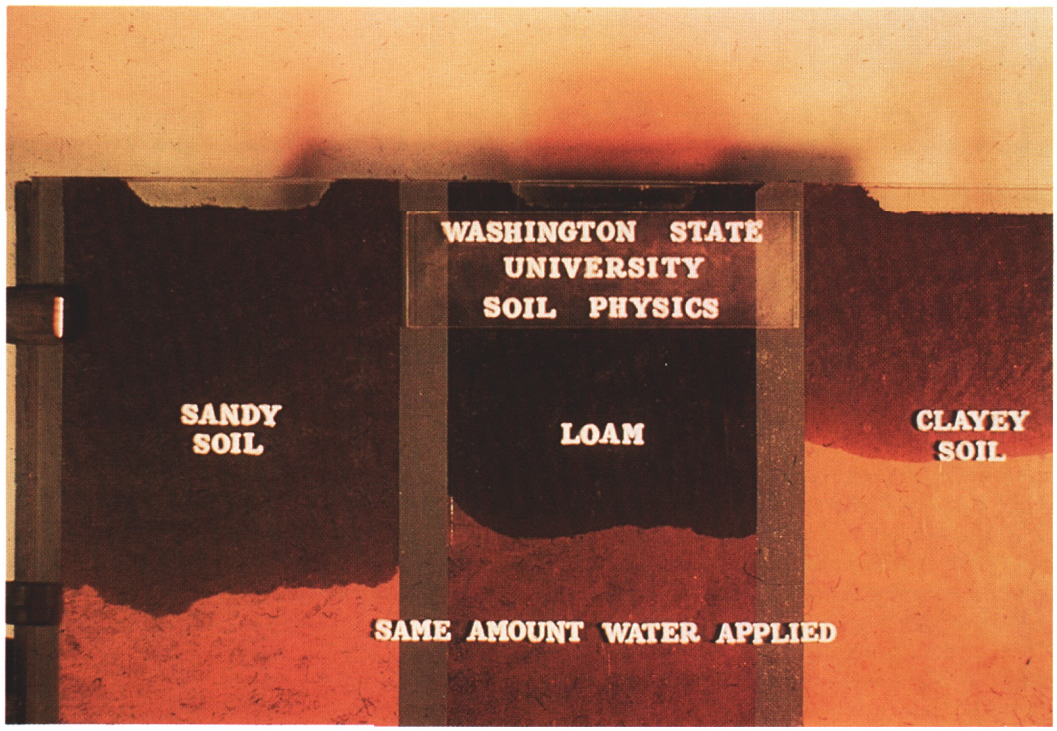
Stratified soils also tend to hold more water for plant use than uniform soils. Since the different layers slow the movement of water, more remains in the root zone. A sandy, droughty soil can thus be made to hold more water, and yet will drain rapidly when it is saturated.





(Top) Here, deep vertical channels are cut in the soil and filled with coarse material. If the channels remain open to the surface, the large pores in the coarse material take free water from rain or irrigation and transmit it deep into the soil. Then it is absorbed by the soil. If the channels are not open to the soil surface, vertical mulching does little good. Holes left in the soil by angleworms, rodents, or aerification act like vertical mulch channels. If they remain open to the surface and exposed to free water, they carry water readily.

(Above) Note channel open to the surface rapidly moved water into the soil. Buried channel has no effect.



The same amount of water was applied to each of three soils. The clayey soil holds water in a smaller column than loam or sandy soil. This indicates that clay soils can hold more total water than loams or sands. Under irrigation, the poor water-transmitting properties of such soils make them less desirable than sandy soils.

Dye tracers indicate the direction of water movement in soil. Water and soluble fertilizers move almost radially away from the point where water was applied. After the wetting fronts join, the direction of flow changes slightly. Above the water level, the movement is upward toward drier soil. Below the free water level, soluble materials move downward. In addition, evaporation from the soil surface causes an upward movement of soluble materials in the soil solution.

These principles of how water moves in soils have been incorporated in the construction of USGA Green Section greens. The effect on water penetration of such practices as a physical soil analysis, off-site uniform soil mixing, adequate soil depth, a sand and gravel layer, tile lines, mechanical aeration of the putting surface, and the importance of keeping vertical aeration channels open to the surface through the use of sand cannot be overemphasized.

The knowledge of these principles and their application are essential to proper management of turf areas.

EDITOR'S NOTE: This article is based on direct excerpts of Dr. Walter Gardner's talk and film presentation during the 1988 USGA Educational Program in Houston and from an American Society of Agronomy 1979 reprint, "How Water Moves In Soil," by Dr. Gardner.

For details regarding the 27-minute, 16mm, color, time-lapse, sound motion picture film or video cassette, please contact your regional Green Section office or the Agronomy Club, Department of Agronomy and Soils, Washington State University, Pullman, WA 99164.

If It's Tuesday, This Must Be Ladies' Day

by **JUDY BELL**
USGA Executive Committee, Colorado Springs, Colorado

BACK IN THE EARLY 1900s, Victor Herbert wrote a song, "Every Day is Ladies' Day with Me." I think he had something different in mind from the topic, "If It's Tuesday, This Must Be Ladies' Day." I have golf in mind. He had romance.

I'd like to talk about women's golf in general with the focus mostly on areas involving every golf course superintendent: course preparation for Tuesday's play, as well as the play of women's championships. From my years with the USGA, I've been heavily involved in such preparation for our national championships, whether it was the Women's Open, or Girls' Junior, or our latest championship, the Women's Mid-Amateur.

Course preparation is as important for women's club events or women's regional competitions as it is for us at the national level, or for that matter for LPGA tournaments. It is easy to assume that what is sauce for the gander is sauce for the goose; that is, there's no difference between preparation for a men's or for a women's event. Wrong!

Let's have a look at the average woman who plays on Tuesday. Call her Mrs. A. She has a handicap of from 28 to 31 strokes. She hits her drive about 130 yards. Now her counterpart, Mr. B, has a handicap of 18 and drives the ball 200 yards, including roll. Two of Mrs. A's shots cover about 240 yards, while Mr. B will average 370 yards after two shots.

Next, a look at how Mrs. A plans to get around the course and what part of the game gives her the most difficulty. The obstacles defined for rating a golf course will give us some insight.

Water Hazards — To be honest, there is no number within our handicap system that reflects the effect of crossing water for the average woman player. At the same time, Mr. B has more problems with water along the side. The better the golfer, the more trouble the lateral hazard gives, and the less crossing a hazard gives.

Fairway — Most landing areas for the really good man player are tight, while Mr. B generally has the widest landing area. Lots of times, because she is driving from forward tees, Mrs. A must play into the tightest landing area, sometimes only 20 yards wide, with bunkers on both sides. Now Mrs. A has a problem. Nevertheless, the woman player with a scratch handicap will usually play over the trouble.

Topography — Studies indicate women can handle topography better than men. The great minds can't figure out why. The members of the Women's Handicap Procedure Committee suggest this theory — "Have you ever teed off from ladies' tees? Women have learned to adjust."

Out of Bounds — Out of bounds is really less an obstacle for Mrs. A than for Mr. B, because Mrs. A doesn't hit it far enough to get into that kind of trouble.

Bunkers — They're less of an obstacle because, again, Mrs. A hits such a short ball. You must remember, Mrs. A can't reach most par 4s in two, so she is chipping or pitching to the green.

Green Target — Par 3s are killers for Mrs. A. Most of the others aren't, because she is coming in from such a short range. A 100-yard par 3 with water is one of the hardest holes on the course for Mrs. A. For the last few years on the day after the United States Women's Amateur, a group of women with various handicaps have played the course just as it was set up for the championship. The purpose of this exercise is to help the USGA Women's Handicap Procedure Committee know more about what is going on. Dean Knuth, USGA Director of Handicapping, interviewed each player after her round at the Rhode Island Country Club last summer. Flo Tiles was closest to the hole on the 130-yard 17th. Asked what club she used, she said, "I hit an easy driver."

Green Surface — Mrs. A can't handle quick surfaces. Firm surfaces affect the scratch player more, because Mrs. A is going to run the shot in anyway. The superintendent is in for it if the greens are fast and steeply contoured.

Judy Bell

Rough and Recoverability — Big problems! Severe rough around the greens really kills Mrs. A's score. She is going to waste enough shots getting to the green. Chipping out of the rough in the landing area doesn't bother her as much as tall stuff around the green.

Distance — This is the biggest obstacle for Mrs. A to overcome. Mr. B and his friends more often than not play from different tees, and that is exactly what needs to be done for the ladies. I'm 100 percent for two sets of tees for the everyday woman golfer. Rating teams are now rating from two sets of tees (forward and middle). The rating from the middle tee is useless for 98 percent of the women players. We are on the right track but the wrong tees!

Some golfers have more fun playing a course of 4,900 yards — I'm all for it. Flexibility is the key. We set up golf courses for championships based on the players' level of skill, so why won't that work for the everyday player? Think about it.

Architects and golf course superintendents can't impose their views on women golfers, but once the women make it clear a shorter course is desirable, I believe a new set of tees will appear in the design stage, and not as a makeshift afterthought. I'm not suggesting

(Top) The green looks good, but the rough's a little high and the hole location is a bit tight. (Above) "Ladies' Day." It looks like "Them vs. Us."

separate tees when it isn't practical, but I am suggesting two sets of tee markers positioned around 4,900 and 5,700 yards for the ladies who play on Tuesday. Think of it. If women should play a course set up to 80 percent the size of the test for men, a 6,000-yard course for women is equivalent to 7,500 yards for men.

WHAT can you do to help Mrs. A have more fun playing golf?

Hole Locations — Nothing extreme, not too tight, either forward or rear. A nice flat surface around the cup is important. Can Mrs. A get to the hole with the length shot she has to play?

Landing Areas — As much width as possible.

Height of Rough — One inch to two inches at most. Actually, Mr. B would like that, too.

Tees — Who knows what the future might bring, even beagle tees. But for now we need at least four sets of tees on most holes to cover all golfers. And these should be level tees large enough to place both feet firmly between the markers!

There are some misconceptions among the ladies who play on Tuesday about you, the golf course superintendent. First, they think you bring out all the equipment you can get your hands on as soon as they arrive at the course. Second, they think that the first directive you learn in school is "to dig on Tuesday." The moral of these misconceptions — no digging, no surprises, and forget special projects on Tuesday.

What about women's championship play? Women's golf and its champions have changed a great deal through the years — in their dress, their levels of skill, and their numbers. The Women's Open course generally rates and plays three strokes harder. Ours is 78 and the men's is 75. In fairways hit, women average 67 percent and men 57 percent. Women are 60 percent for greens hit, men 55 percent. Women average 32.3 putts per round, and men average 30. And women's average putts are more than twice as long as men's. The cost of playing out of the rough was the same last year at The Olympic Club (U.S. Open) as at Plainfield Country Club (Women's Open). I can vouch that Olympic had six inches of rough in places and the Plainfield rough was two-and-a-half to three inches.

Yes, we are interested in the same playing factors being part of the examination, but the emphasis is different for women. These factors are length, accuracy, touch, and ability to play a variety of shots. Some of the conditions we keep an eye on to make sure our test is fair are: height of rough, quickness and firmness of the putting surfaces, firmness and height of grass in other closely mown areas.

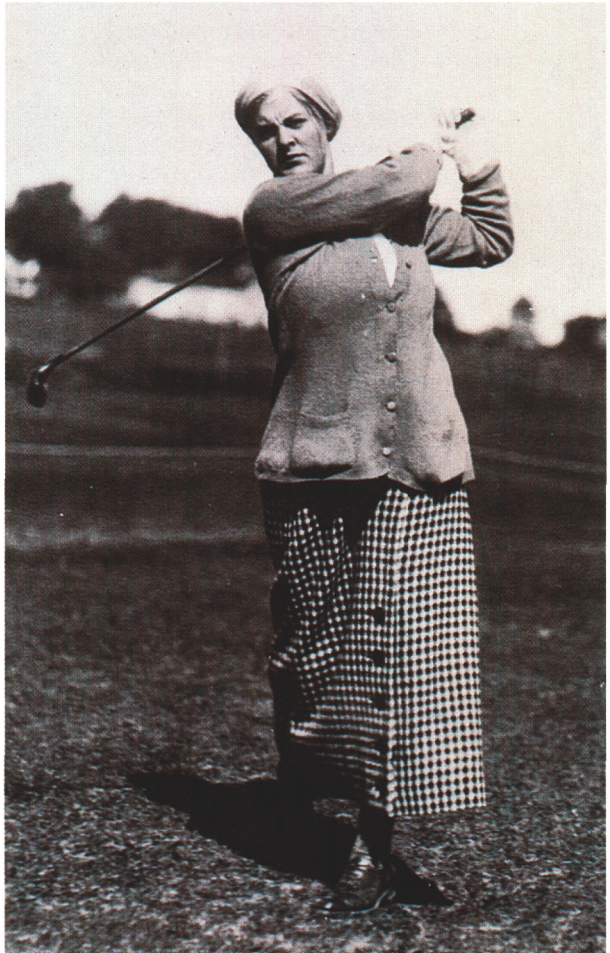
Length — It would be very easy to set up a golf course too big for women. A very long course wouldn't be fair, and would place too much emphasis on length. Tom Burton, superintendent from Sea Island, Georgia, where we will play the U.S. Senior Women's Championship, in September, will develop four new forward tees for this championship. He told me 35 percent of the golfers at Sea Island Club are women. Variety in length tests a player's ability to play a variety of shots. Ideally, we would ask a player to range from a 4-wood to a 9-iron on the par 4s at most women's championships.

Accuracy — Just ask Merrill Frank, from Five Farms (Baltimore Country Club), site of this year's Women's Open. The width of fairways ranges from 39 yards to 25 yards. Generally, the shorter the hole, the more accurate we require the player to be.

Touch — This is a very important factor on the greens and around them. We are asking Merrill for a Stimpmeter reading of nine to nine-and-a-half feet, and I've got my fingers crossed on that speed at Five Farms. Bob Randquist, at Southern Hills, taught me something last October during the first Women's Mid-Amateur Championship. From the superintendent's standpoint, it is easier to slow things down just before the championship than to speed them up at the last minute. Hard, firm greens are something the best women players in the world can't handle. It takes the skill out of the game for women.

Height of Rough — In general, we ask for an intermediate cut of one-and-a-half inches, with the primary rough at two-and-a-half inches. Because of the narrow fairways at Indianwood Golf and Country Club in Michigan, in 1989, we are asking for two-inch primary rough.

The USGA influences the setup preparation of all the USGA national championships, but it is the golf superintendent who makes it all happen on the national and local scenes. You greatly influence the enjoyment of the game on every level at your course, and no one knows the territory better than you. I personally think we couldn't be in better hands. You are professionals who work hard at what you do and from what I observe, yours is a continuing educational program. Just keep in mind that now one out of every four golfers is a woman. So in reality, you may soon be coming closer to Victor Herbert's song.



(Opposite page) Tuesday — a day for serious digging.

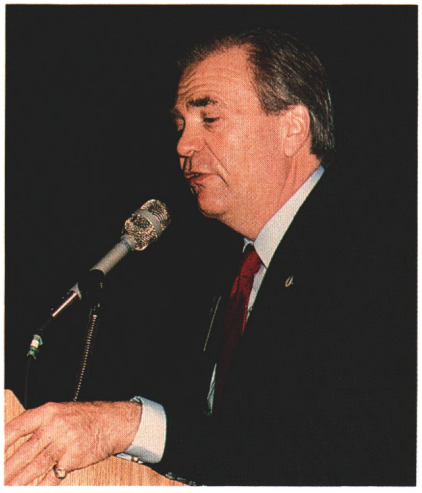
(Above) Tuesday — geyser day.

(Far left) Ladies' golf.

(Left) Prettier today (Juli Inkster).

Joining Efforts to Bring The Course Up to Par

by JOHN D. LAUPHEIMER
Commissioner, LPGA



John D. Laupheimer

MANY FACETS of an LPGA tournament must be brought together in order for the event to be a success. One of the most important areas is that of tournament course conditioning.

The condition and appearance of the course at any given tournament depends on the teamwork of the sponsor tournament committee, the course superintendent, the LPGA tournament staff, and the USGA Green Section. Of course, the ultimate responsibility for the course lies with the superintendent. However, he receives input from, and his work is greatly influenced by, many different entities not only leading up to but also during an LPGA tournament. The ability to blend these entities and come up with a course in prime condition shows not only the superintendent's skill, but also how he manages himself and other people.

The process of preparing the course for an LPGA event begins with choosing the venue. The sponsor tournament committee will select a course it feels will suit all purposes for an LPGA tournament. Influences on the committee's decision will include reputation, accessibility to the public, aesthetics of viewing, and the club members' desire to hold the event. The LPGA operations staff looks at the course for many of the same reasons, but it adds a few items to its checklist to determine if it is to be approved as a tournament site. Of these, the most important is whether or not the course can be adapted to LPGA tournament play. At this point the superintendent is brought directly into the picture. It must be determined if the superintendent can groom the course to our tournament standards in terms of mowing heights and frequency, fairway size and contouring, green speed, bunker consistency, and the peripheral things that ensure all specifications are met.

As the LPGA grows in size and popularity by the year, it is important for the course to have the capacity to comfortably hold a gallery of up to 20,000 on any day. We also need plenty of room for physical structures such as concession stands, restrooms, leaderboards, and hospitality areas, enough room so that these entities serve as a convenience and not a hindrance to the spectators' experience.

The superintendent is not necessarily directly involved in the construction of these items, but he knows his course better than anyone, and his advice is essential.

To cater to the growing number of spectators now attending LPGA events, there needs to be ample parking facilities, either on the site or in the vicinity. From these areas it often occurs that spectator entrances must be created. In doing so, we must consider how this will affect the superintendent's work in maintaining the course properly. Careful thought also must be given to the adequacy of the practice facilities. Professional golfers spend a great deal more time on the practice areas than amateurs do. A large hitting area and putting green are paramount for a professional tournament. Hence the superintendent will be asked to maintain and save areas exclusively for the professionals.

Once these details have been agreed upon with the superintendent, the sponsor will arrange for various committees to perform the many duties necessary to the production of a successful tournament. Some of these committees are assigned to the sales and marketing areas of the event, while others look after the many operational aspects. These committees need to communicate closely and cooperate with the superintendent, because any decision they make will affect his preparation of the course. For example, no construction will be done on the course without the

superintendent's prior knowledge and approval. Therefore, it is critical that we maintain this communication between the sponsor committees and the host club and superintendent throughout the tournament process.

In its sponsor manual, the LPGA suggests each tournament have a green committee chairman, preferably a representative from the host club, to liaise with other committees. This chairman works particularly closely with the construction committee chairman to ensure that all signs, concessions, and the like are properly installed, and that damage to the course is kept to a minimum.

Now to the superintendent's primary involvement with the tournament. The LPGA's operations staff become the host club superintendent's main resource on course conditioning. Our specifications for tournament preparations do not vary a great deal from the club's day-to-day maintenance. We attempt to ensure that our players generally have consistent conditions throughout the year, subject, of course, to local variances, such as types of grass, weather, and time of year the event is played.

It is a standard policy for the LPGA to send one of its tournament officials to the tournament site a week before the event begins. During this time he becomes acquainted with the superintendent, will prepare hazards, boundaries, and note other course conditions for the information of the LPGA staff members who arrive the week of the tournament. The tournament official and the superintendent will spend the week discussing course setup and the maintenance plan. If any minor changes need to be made, the official and the superintendent can set things in motion prior to the extra commotion and pressure of tournament week.

Once the tournament is underway, the superintendent uses his management and personnel skills to their fullest. By this time, he hopes that the fruits of a year's labor to bring the course to its peak have paid off.

As good as the condition of the course may be at this stage, the superintendent does not have time to sit back and enjoy watching the Tour members play his course. Not only is he answerable to the LPGA tournament staff for course conditions (literally because he carries one of our hand-held radios), but he also has to respond to the other tournament committees through the club's course liaison. The superintendent will become probably the person most in demand during the week. The term "no rest for the weary" is very appropriate to this individual throughout the tournament.

In everything I have already mentioned, I gratefully acknowledge the service the USGA Green Section provides to it all. Unfortunately, this usually goes unnoticed to the public, even though it is an essential part of the tournament's makeup. The LPGA recommends as a matter of course that host clubs use the Turf Advisory Service as a tool to ensure top conditions for tournament time. As the Green Section will heartily agree, this also makes for better playing conditions year-round for the club members. We believe that experts talking to more experts can only be better for the course conditions that our players enjoy.

I CANNOT say how important it is that the course be perceived in a good light by the sponsoring company and the public. The work a superintendent does in preparing the course for an LPGA tournament has a tremendous impact on the feel and ambiance of the event. If he has been able to manage his course and staff properly, and Nature has been reasonably cooperative, the tournament's image will be greatly enhanced. A sponsor is always more inclined to entertain his clients in pleasant surroundings, and what can be more conducive than a well-groomed course?

A local course may be using the tournament to increase its membership, to further promote itself as a resort facility, or to sell property within a real estate development. A course that can boast the "tournament look" always enhances this goal, and this may continue to be a reson for the tournament to return to the same venue. Galleries also enjoy the aesthetics of a lush, green golf course, although I don't need to tell any superintendent that green doesn't necessarily mean good. However, a course that is well maintained for a tournament will still give the galleries the feel of a quality event, and that is an image the LPGA is eager to portray.

As every superintendent is aware, the greater his budget, the better he can prepare and maintain his course. A tournament brings increased money to the club to use for just this, and that means better year-around care. As I already have discussed, the LPGA's specifications are not very different from what a course should be doing normally. However, the superintendent often feels the need to have a little extra in his budget to be sure he can do things properly and make sure that his course is the best it can be.

Projects such as new cart paths, larger tee areas, and a change of landing areas in fairways can do a number of things for both normal course play and the tournament. The superintendent can protect worn areas from play easier, which improves the playing surfaces of fairways and areas near greens for members and tournaments alike. A larger tee can allow him to use and save more places on the tee, and create new challenges for his members. If the LPGA suggests a different fairway contour, he can do it, and at the same time give his members a new look on a hole, and better provide the LPGA with a good tournament hole.

It may be that a club committee can be convinced to make these changes when an LPGA tournament is coming to the course. There also is the possibility to convince the sponsor to assist in the financing of such ventures. This way, everyone shares in both the cost and the benefit of a well-conditioned course.

In reviewing just a few parts of the well-oiled engine of an LPGA tournament, we have seen that although golf is itself very much a game of individual skill and achievement, the venues at which the professionals display their abilities are really the result of a team effort. The sponsor committee, host club, LPGA, superintendent and USGA Green Section mold the tournament idea into reality by working together and understanding and respecting each other's responsibilities.

In doing all of this, everyone can take pride in the effort when a great LPGA champion is crowned with her title, and the local charity is presented with a handsome check of the proceeds from yet another successful tournament. The team concept never worked better in any other sport.

Artificial Surfaces for the Golf Course

by PATRICK M. O'BRIEN
Director, Southeastern Region, USGA Green Section

MOST GOLF COURSE turfgrasses suffer in very high traffic areas. In many cases, artificial surfaces such as asphalt or concrete are used. Unfortunately, when a golf shot strikes these hard surfaces, the golfer is either too severely penalized or rewarded. Ideally, a low-maintenance, playable surface resistant to wear would better suit the golfer.

Synthetic turf has historically been used as coverings for football, soccer, baseball, or tennis, but it may also have potential for golf course cart paths and practice tees.

One type of artificial surface is synthetic turf topdressed with sand. Synthetic turf has been tried recently on golf cart paths and practice tees on several courses in the Southeast. For a long-lasting effect, Dick Schulz, of the Atlanta Country Club, in Atlanta, Georgia, suggests proper installation is the key. Ideally, tee and path surfaces should be smooth without bumps or rolls. For golf cart paths, the synthetic turf can be placed over an existing asphalt or concrete path, or on a gravel drainage base. The terrain may be level or undulating, but the sub-base must be compacted with a roller so the finished surface is smooth. Any defects in the sub-base are magnified on the finished cart path surface.

Golf cart paths are usually eight feet wide, and the artificial materials are packaged in 15-foot rolls. To be affordable, the rolls are cut to seven-and-a-half-foot length, allowing a three-inch border on each side for an eight-foot-wide cart path.

The next step in installation is the application of construction or topdressing sand. The sand must be dry so it will penetrate between the synthetic fibers. The sand's weight actually anchors the carpet. Fill the surface with sand, allowing only 1/16 inch to 1/8 inch of fiber above the sand layer. A second topdressing in four to six weeks compensates for settling the original application.

Most golf courses in the South allow bermudagrass to grow to the edges of the artificial surface and finish off by laying sod or by seeding. The new synthetic cart path is more aesthetic than black asphalt, and being softer, it allows the path to be located closer to areas of play. Since golf balls don't bounce as far after striking this material, the golfer is less likely to be penalized. Golf cars have good traction with artificial surfaces. If the golfer chooses, golf shots can be played from the artificial surface, too.

Artificial carpet on the practice range.

For maintenance, brooming or dragging weekly keeps the fibers erect. Light topdressing periodically keeps the surface looking good, too. One warning is to stay away from these surfaces with any leaf-blowing machines. The intense air pressure can destabilize the artificial surface.

The practice tee is another possible area for the carpets. Iron or wooden clubs will not scratch the material, and golfers find it a nice, tight surface for practice shots. Several clubs provide an eight-foot-wide strip on the practice tee for the winter and for rainy days. Golf courses with small practice ranges or with the policy of unlimited free range balls may also benefit from this material. The superintendent will be able to reduce overseeding, mowing, fertilizing, watering, and divot repair. The surface is easily installed by removing the practice tee grasses and laying the material on a final sub-base.

In an effort to attain natural-looking, minimal-maintenance conditions on certain areas of a golf course, this type of artificial surface may be worth consideration.

(Left) Blacktop path.

(Below) A smooth sub-base is important.

(Bottom) Carpeted path.

Tiny Bubbles Keep Small Ponds Alive

by JAMES M. LATHAM
Director, Great Lakes Region, USGA Green Section

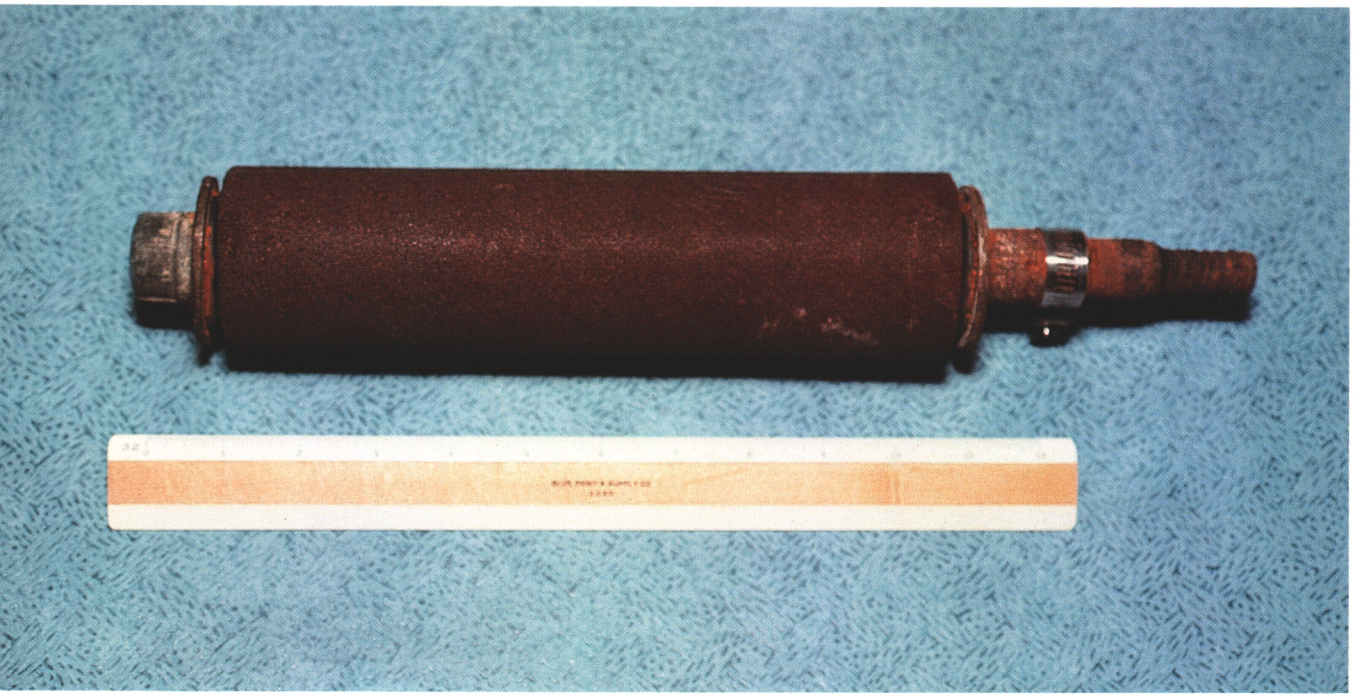
SMALL PONDS in the middle of a golf course can be great assets in both playing strategy and cosmetic appeal. They can also be stagnant, smelly eyesores unless wave action, stream flow, or some other process provides for oxygenation of the water. The normal biological cycle includes the decomposition of water plants, which creates a biochemical oxygen demand and can, if not met, cause a sort of aquatic black layer, in which the water has an inadequate supply of dissolved oxygen. This is usually accompanied by a fish kill.

Several electrically powered aeration devices accomplish oxygenation quite well. Some aerate the water by spraying it into the air, while others achieve the same goal by injecting air from the surface into the water. These operations require that electricity be brought to the pond.

At the Saginaw Country Club, in Michigan, that was more easily said than done. In the first place, the pond was some 500 yards from the nearest power line, thus creating a high cost: benefit ratio. In the second place, the necessity for permits and the other red tape required to pull underground electric cable through the golf course became overbearing. These roadblocks do not apply to an empty plastic tube, however, so superintendent Jerry Faubel and his staff simply pulled in a pipe and pumped air from the power source at the edge of the property to the pond. The heart of the system is a Gast centrifugal air compressor, which provides a low-pressure, high-volume air supply.

The unit is located below the ground level, and is serviced through a conventional, covered manhole setup — an essentially noiseless operation. The compressor supplies air at 70 to 140 cfm, operating at 9-12 psi. The 30-pound unit is powered by a ¼ hp 110 v electric motor that requires 15 amps to start and 5.4 amps to run. The air supply is piped through one-inch diameter flexible plastic pipe to three porous ceramic diffusers resting at the bottom of the pond.

The results have been excellent, even during the prolonged period of hot, dry weather last summer. Given the impetus of necessity, golf course superintendents are retaining their inventive qualities where even the most modern equipment falls victim to bureaucratic hindrance.



(Opposite page) It's not spectacular, but the air, bubbled into the water through three diffuser units, maintains an adequate supply of dissolved oxygen in this small pond. The nearest power source is 500 yards beyond the willows.

(Top) Three ceramic diffusers like this provide the tiny air bubbles to meet the biochemical oxygen demand of the water.

(Left) Superintendent Jerry Faubel and the air intake, manhole, and power supply for aerating the pond 500 yards away.

(Above) This small centrifugal compressor supplies the air for oxygenation.

TURF TWISTERS

CAREFULLY

Question: I always see LD-50 numbers listed as the measure of the toxicity of a chemical. I understand well that the lower the number, the more toxic the material. My question is, just how much material does it take to affect a person at various LD-50 levels? (Wisconsin)

Answer: In material from the *Clinical Handbook on Economic Poisons* by the U.S. Department of Health and Human Services, it lists the probable lethal dosage of a technical material for a human adult in this manner:

Acute Oral LD-50 Range	Amount Needed to Affect Adult Human
5 - 50 mg/kg	a few drops
50 - 500 mg/kg	1 teaspoon to 2 tablespoons
500 - 5,000 mg/kg	1 ounce to 1 pint or 1 pound
5,000 - 15,000 mg/kg	1 pint to 1 quart

Thus, by knowing the LD-50 numbers for the pesticides you are using and referring to this general chart, you will perhaps have a better idea of the amount of technical or active ingredient needed to affect an adult.

No matter what the toxicity level, always handle pesticides according to the label, and use them carefully.

PLANT CLOSE

Question: There are several areas around our course where we would like to plant annual flowers. Some of these areas are located in light to moderate shade. Which annuals will do best in this situation? (New York)

Answer: The three most popular annual flowers for use in the shade are impatiens, begonias, and coleus. Other useful shade-tolerant annuals include browallia, lobelia, myosotis, sweet alysum, and torenia. When planting flower beds, be sure to space plants close together (6 to 12 inches). Wide spacing is a frequent cause of disappointing flower beds.

FOR A GOOD CATCH

Question: Each spring muskrats dig unsightly holes around my pond, and golfers don't like them. I've had no luck catching them, either. Do you have any ideas on how to trap muskrats? (Georgia)

Answer: Many clubs use this technique to catch muskrats around ponds and lakes. Drive a six-inch-diameter PVC pipe into the ground to a depth of one foot adjacent to the pond. Allow four to six inches of the pipe to stick above the ground. Slide a rock into the bottom and then place an apple into the pipe for bait. The muskrat will usually go into the pipe after the apple, but is unable to escape by digging out (with the rock blocking the bottom escape way) or climbing out (he cannot turn around or climb out of the pipe). Good luck!