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exploratory values. Even though inaccurate, these values used in the formulas will often point out system weaknesses and indicate the kind of compromises that will need to be made.

1981

Effective Use of Our Natural Resources

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WHEN YOU ARE about to waste anything, stop for a moment and consider the energy needed to produce it. It has been said that half the world could exist on what the other half wastes. No commodity illustrates this statement more than the most taken for granted commodity on earth - water. It is the most wasted, over-used, and the most precious natural resource in many areas of the world.

While I was attending Penn State University, in 1961, Dr. Fred Grau cited the importance of water as described in the 1955 Yearbook of Agriculture, and he emphasized its usefulness in fine turf culture. His address had a great impact on many of us at that turf conference.

Since then many others have described the role that water plays in proper management of turf for golf. For example, in some of the proceedings of golf turf conferences held over the past few years, Dr. James Watson has addressed the critical water problems we must face. Within the last few years many have come to agree with the water use ethic of Sandy Tatum, past president of the USGA, and with the arguments presented in numerous articles by Joe Dey that have appeared in *Golf Digest* on the overuse and waste of our most precious commodity.

During the recent drought in the Northeast, articles concerning the water shortage have appeared daily within the first three pages of the *New York Times*. Restaurants have stopped providing water at tables unless requested, and motels have requested that people conserve water during showers, etc. How we respond to these conservation measures will determine whether or not we experience the crisis of a water shortage.

It is interesting to note the remarks of the people who visit clubs of the stature of

the National Golf Links of America, Shinnecock Hills, Maidstone, Winged Foot, Baltusrol, Pine Valley, Saucon Valley, and other courses that play so well. They comment on the firm, fast greens and the tight fairways that allow the clubface to come in direct contact with the ball. The golf course superintendents at these clubs all describe the same type of management philosophy: "Try to keep it as dry and close cut as possible."

Several years ago the Monterey Peninsula and Marin County, in California, were brought to their knees for lack of water, and in the Midwest many golf courses experienced water use restrictions. This year some of the courses in New Jersey were prohibited from using water on any turf areas.

How can we cope with this dilemma?

Grants from various turf organizations, such as the GCSAA, USGA, state and regional turf foundations and chapters of the GCSAA, provide money to develop permanent grasses for drought tolerance. Through continued research, many improved turfgrass cultivars will be developed. Through research and practical experience, several valuable lessons have been learned. Avoid overstimulating turfgrasses with nitrogen early in the spring, for they will grow when they are ready. Second, irrigation should be used only to keep the grass alive and to sustain adequate growth.

Following is the description of an experience I had involving irrigation and turf management. When I arrived at Garden City Golf Club 15 years ago, I was confronted with maintenance problems created by the overuse of water. Bunker facings near several greens eroded after every irrigation and were eventually refaced with grass. The utmost in discomfort to any golf course superintendent comes with the realization that the course is predominantly *Poa annua*. Annual bluegrass requires more water than permanent grasses, and the more you water it, the more it requires. This results in a never-ending management problem. I felt that 85 percent of the Garden City Golf Club turf was annual bluegrass, but as a result of a pumphouse failure on July 4, 1966, my estimate proved to be on the low side. On Long Island we are compelled to submit a meter reading each month to the Water Resources Commission. When I arrived at Garden City I called the Water Commission for past reports. The water use total for 1965 had been slightly over 55 million gallons. Reports from prior years showed

that water use had increased each year after 1958, when a new irrigation system had been installed. By 1978, the number of gallons used for irrigation had been cut to 12 million, and even then I felt I was over-watering.

The ability of the superintendent to coordinate golfers' demands with agronomic needs will determine the success or failure of the golf course management program. In my experience as golf course superintendent, I have observed that golfer requests and complaints significantly influence the management of golf courses and the priorities of their superintendents. Some of the members' advice and comments have included: "The greens don't hold, so give them a good soaking." "Annual bluegrass is indigenous to this part of the country and no one will ever get rid of it. Let's not waste our money on *Poa* controls." "We have our own well and the water is free and unlimited, so why not use it? Doesn't more water mean greener grass?"

"We want everything green and lush to impress our guests." "We were out this morning and we saw an area burned out on No.7 fairway (you know, that high knoll in the drive zone), so why isn't the course being watered more? It's dying!" "We saw the golf tournament on TV ... what happened to our course? It just doesn't compare." "Why do they (grounds crew) have to renovate during prime playing time in late August or early September? If they had better control of operations during the year, this wouldn't be necessary."

However, to put all this in proper perspective, we must presume that if we overwater, the soil will often be filled to capacity and turfgrass root growth will be reduced. This will ultimately lead to soil breakdown, compaction and annual bluegrass and weed invasion. Experiences around this country and Europe have shown me that annual bluegrass is indigenous to the fine turfgrass world, growing profusely on all continents. So why don't we just seed new courses to *Poa annua* rather than bentgrass? To do nothing about it means only disaster during hot spells of summer, not to mention the winter problems and inclement springs when *Poa annua* is the most severely injured species. Yes, for many clubs water is free, but in 1977 I calculated our electricity cost to be \$.0003 per gallon. That may seem reasonable until we consider that over 12,000,000 gallons were used. This cost

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more than \$3,600. Since 1977, the cost of electricity has tripled. With overwatering, we will of course need extra fertilizer, more chemicals to control disease and, naturally, more frequent mowing. Does the result of this vanity outweigh the added expense? Because of the attention given to the high dry spots on fairways, the fate of the entire course is in jeopardy. The amateur agronomist sees golf courses on television at their peak a few Sundays each year through the wonderful world of color. If equal attention is paid to the player and the quality of turf for that tournament, there is no question that our course doesn't stand up to that comparison. However, it sometimes is too bad that television doesn't come back weeks later to show the same course as it is prepared for regular membership play. During the season we have all seen approaches to greens that are wet, soft and soggy with little grass and many weeds. The greens are so wet that algae have turned them black, and disease, carried by surface water, has eradicated grass faster than a nonselective herbicide. When excess water has finally drowned all the turf, then out comes all

machinery (the aerifiers, thatchers, slicers, spikers and, yes, even rototillers) to try to bring the golf course back. Requiring all this extra work of an already small crew, much of the normal everyday work is let go, making the course look even worse.

"A rule of thumb used by many is to try to put back the same amount of water that was taken out the day before."

The expense of all this unnecessary renovation, at an inconvenient time, certainly points out the folly of overwatering the course. There is an old adage which states that it is easy to put water on but it is almost impossible to take it away.

A rule of thumb used by many is to try to put back the same amount of water that was taken out the day before. Many superintendents play "Russian roulette" with nature during the summer. Water is not applied until the last hope of rain has faded for that night. Then the ultimate of management weapons, the automatic irrigation system, allows the superintendent to take every day as it comes. A cloudy, overcast day results in little or no water

loss. A hot, humid day results in little water loss. Rain forestalls watering that day and possibly the next. Hot, dry days and those with cool or hot breezes tend to trigger the use of the water system at times of the day that raise the ire of the golfers. This is called syringing. What this does is to slow the evaporation-transpiration rate and thereby stop the plant from wilting. Some superintendents have found that a dew syringe cycle used every morning for five minutes on each fairway head tends to keep the fairway turf in good shape for the day. This also applies to greens and tees, but the time must be increased slightly. The critical concern is that turf managers should not go into August with an overly wet soil.

Augusts in the New York metropolitan area are generally hot and humid and just bloody uncomfortable for man and, yes, grass. So, to give the turf half a chance, all our season's watering efforts should be geared for the dreaded months of July and August. With the improper management and wasteful consumption of water by so many people, it is no surprise that there is a severe water shortage in many areas of our nation. We all must share the burden of conservation; if we do not, we will have

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only ourselves to blame if and when the well runs dry!

The Changing Scene

ALL PROGRESS comes in steps. Those who would make advances in any field must first know what has come before and where things stand at present. Though each step taken is important, some prove more pivotal than others. The following is a selection of developments that have been made in the golf course management field in the 60 years since the founding of the USGA Green Section.

Greens

For many years Dollar Spot and Brown Patch were the most feared diseases, especially of bentgrass greens. And there was but one reliable fungicide, corrosive sublimate, which could quite readily cause turf damage itself. To maintain current standards, more than a half dozen other diseases must be managed as well. Today, however, some 20 distinct control materials, plus many combinations, are available. "Pushed-up" greens were the norm, generally using unmodified soil scavenged from the site. After 10 years of intensive research, the Green Section published Specifications for a Method of Putting Green Construction in 1960. These have since been refined. From the first, Green Section efforts were directed to developing improved bentgrasses for greens. By 1924 the Washington and Metropolitan strains had been selected. At the close of World War II, five more Green Section selections were in commercial production, and Dr. Burton Musser's Green Section-supported breeding program was underway at Penn State. This was to produce by the early 1950s the first improved bentgrass that could be grown from seed, Polycross (Penncross) creeping bentgrass. From this same program, now directed by Dr. Joseph Duich, another improved seed-propagated strain was released in 1978, Penneagle.

In 1946 turf research began under Dr. Glenn Burton at the Georgia Coastal Plain Experiment Station in Tifton. This Green Section-supported program developed the bermudagrass hybridization work that has completely changed the nature of southern golf courses - on tees, fairways and roughs as well as greens. The first release

in the early 1950s was Tiflawn (Tifton-57), followed by Tiffine (T419) in 1960, and Tifdwarf in 1965. Work is continuing to develop a fine-textured bermudagrass with greater cold tolerance for the transition zone conditions.

Topdressing in the 1920's was an arduous task, being distributed either by hand with shovels or by manually drawn spreaders. Today's equipment is motorized. With some, 18 greens can be topdressed by a crew of three in a morning.

Materials and rates have changed. At one time the Green Section discouraged topdressing because excessively high rates of silt and clay caused layering problems and drastically reduced water and air infiltration. Today's light and frequent applications of materials have been a great help in producing excellent putting surfaces and healthy turf. Attempts to monitor putting green speeds began as early as 1929 with the Arnott Mechanical Putter, a pendulum mounted on an adjustable tripod. But it was not until the USGA modified a device made by Edward Stimpson, a former Massachusetts Amateur Champion, and undertook to develop it that a reliable way to categorize green speeds existed. With the help of the Stimpmeter, the USGA has been able to help clubs to achieve uniformity in the putting characteristics of all greens.

Tees

In the 1920s teeing grounds were small, often only several hundred square feet in size, and wet sand from tee boxes was mounded up as a perch on which to tee the ball; now we have wooden pegs for tees. We also have much heavier play; consequently today's tees are built much larger. Standards of tee maintenance have drastically changed. In former years tees at many courses were cut by the fairway mowing units. Today most are cut with green-type mowers, and otherwise managed with nearly the same intensity as are putting surfaces. One of the steadily growing practices is the periodic overseeding of divot scars on tees. Many different grasses are used.

Fairways

Fairways used to be established mostly with common bermudagrass (south) or with common Kentucky bluegrass and some fescue. No more. The Tif-series of bermudas now provide the measure of excellence in fairway turf, but they cannot be grown everywhere. The first improved grass for northern fairways was Merion

Kentucky bluegrass. Today nearly 50% of this country's fairways have Merion or one or more of the 50 elite bluegrasses that have since been developed. Along with the inferior grasses in use before 1950, weed problems were tremendous. In the 1920s crabgrass was even considered by some as desirable in fairways. Many cultural manipulators were researched by the Green Section in those early years to maximize the competition ability of the turf in this unending battle with aggressive weeds. These investigations achieved considerable improvements in turf culture, and formed the scientific foundation from which have come today's techniques in areas such as mowing, turf fertilization and pest control. Perhaps of greatest significance was the recognition in 1944 by Acting Green Section Director Dr. Fanny-Fern Davis of the potential for selective broad-leaf weed control in turfgrass of the chemical 2,4-D, being investigated as a growth regulator at the time. Within just a few short years it was no longer necessary for golf courses to fight their worst enemies, dandelions and plantain, with an assortment of chemicals almost as likely to "burn out" the turf as the weeds.

It took a while longer to mount a successful campaign against crabgrass. Even though many courses were doing well with cultural programs, establishing better grasses and pest control to minimize crabgrass germination opportunities, it was not until 1952 that investigation of pre-emergence control materials began in Ohio and at Purdue under Dr. William Daniel, who was only the second man to have earned a Ph.D. degree in turfgrass management. (The first was Dr. James Watson, from Penn State in 1949.)

In the early 1950s, Dr. Fred Grau, then the Green Section Director, once commented that to grow good turf, the insect pests must be controlled and that "with the excellent insecticides available ... there is no excuse for permitting insects to bring crabgrass into otherwise good turf." He was speaking primarily about mole crickets in bermudagrass, chinch bugs in many areas, cutworms, sod webworms and the rapidly spreading Japanese beetles. The insecticides were lead arsenate, DDT and chlordane - none of which is any longer available for use on turfgrass. Today's turf insecticides are predominantly organophosphates, which in general have a higher acute mammalian toxicity, higher cost and shorter effective life span than their predecessors. In the manufacturing boom which followed World War II, machinery

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specially designed for golf course use began to appear and by 1947 a machine for "tubular time for king" and the "motorized caddie cart" had made the scene. The first was badly needed for improving root-zone aeration and the penetration of water and fertilizer and for relieving the surface compaction that was already a serious problem.

Today most courses have at least one aerifier. Roughs in the early 1920s roughs often grew up to three feet high in the spring and it was common for them to be cleaned of accumulated organic debris through controlled burning every couple of years. In order to ease maintenance and stem the complaints about lost golf balls, roughs began to be cut more often and shorter through World War II. Today most roughs are predominantly an "improved" turf species, usually receive some irrigation, occasionally are fertilized or limed, and are mowed regularly. Undoubtedly the changing nature of roughs has been greatly influenced by developments in various aspects of turf management, most especially in mowing equipment. The first tractor-drawn mowers replaced horse

power for fairway mowing in 1921 but were not, for a time, able to cope with the roughs. Today multiple gang units cut most turf areas. For higher heights of cut and improved maneuverability, heavy duty riding rotary mowers have come into use. Irrigation & Annual Bluegrass (*Poa annua*) subject areas are linked together here because, in reviewing the history of turfgrass management, the development of irrigation is strikingly paralleled by the development of annual bluegrass problems. The earliest fairway irrigation systems date from 1931, long after supplemental watering for greens was utilized. Discussions of annual bluegrass problems then begin to appear some 10 years later. In 1946, O. J. Noer is quoted as saying, "Lessons learned during the war indicate that fairway watering in the future will be less frequent to avoid excessive encouragement of clover and *Poa annua*." In 1948, Fred Grau observed, "It is obvious that the demands of golfers to have green turf have greatly encouraged *Poa annua* by virtue of the large quantities of water applied to turf. Once a water system is installed, the tendency is to use it to excess. Green Committee Chairmen have been known to say, 'Why do we have this \$30,000 water system if we don't use it?' This is the first step to a *Poa annua* turf

" The first Ph.D. program in turf management involved a study of irrigation and compaction. In discussing Dr. Watson's thesis results, Professor Musser in 1950 summarized, "We cannot escape the task of re-examining our watering programs in the light of the capacity of our soil and the rate at which it can take the water we apply. At least we will recognize that good watering practice must be based on something more than the capacity of our system and the size of the sprinkler heads."

Today irrigation systems are considerably more sophisticated and may easily cost 10 times more, but the more things change, the more they remain the same. The anonymous conclusion to a May 1946 treatment of this subject in the Green Section's Timely Turf Topics is probably still accurate: "There is no simple, direct answer at present to the problem as a whole." As Professor Lawrence Dickinson, of the University of Massachusetts, is reputed to have said many years ago, "When we do learn how to control *Poa annua*, we will have to learn how to grow grass." The Green Section has been helping people to do just this for 60 years and looks forward to continuing to play a vital role in the future.

Reinders Inc. Continues to Grow, Distributor Adds Sales Representatives

Reinders, Inc. is pleased to announce that four new sales representatives have joined the company to help serve the Minnesota market.

Dale Parske is the new Western Region Sales Manager. He brings more than 35 years of industry experience in sales and golf course management. Dale resides in Lakeville and can be reached at 952-250-8742.

Jeff Schmidt is a Territory Manager responsible for sales and product support for golf customers in the west metro and outlying areas of Minneapolis. Jeff has 18 years of industry experience, including 6 years as an assistant golf course superintendent. Jeff resides in Eden Prairie and can be reached at 952-237-0160.

Scott Gilbertson is a Territory Manager responsible for turf and aquatic sales and product support for customers in Minnesota and western Wisconsin. Scott has 19 years of industry experience, including 5 years as a golf course superintendent. Scott resides in Holmen, Wis. and can be reached at 608-790-7667.

Bill Gauwitz is a Territory Manager responsible for sales and product support for golf customers in east central and southeast Minnesota as well as west central Wisconsin. He has been a certified golf course superintendent for 20 years and a member of the GCSAA for the past 32 years. Bill can be reached at 507-269-0230.

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- Respectfully submitted by *Brian Brown*
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