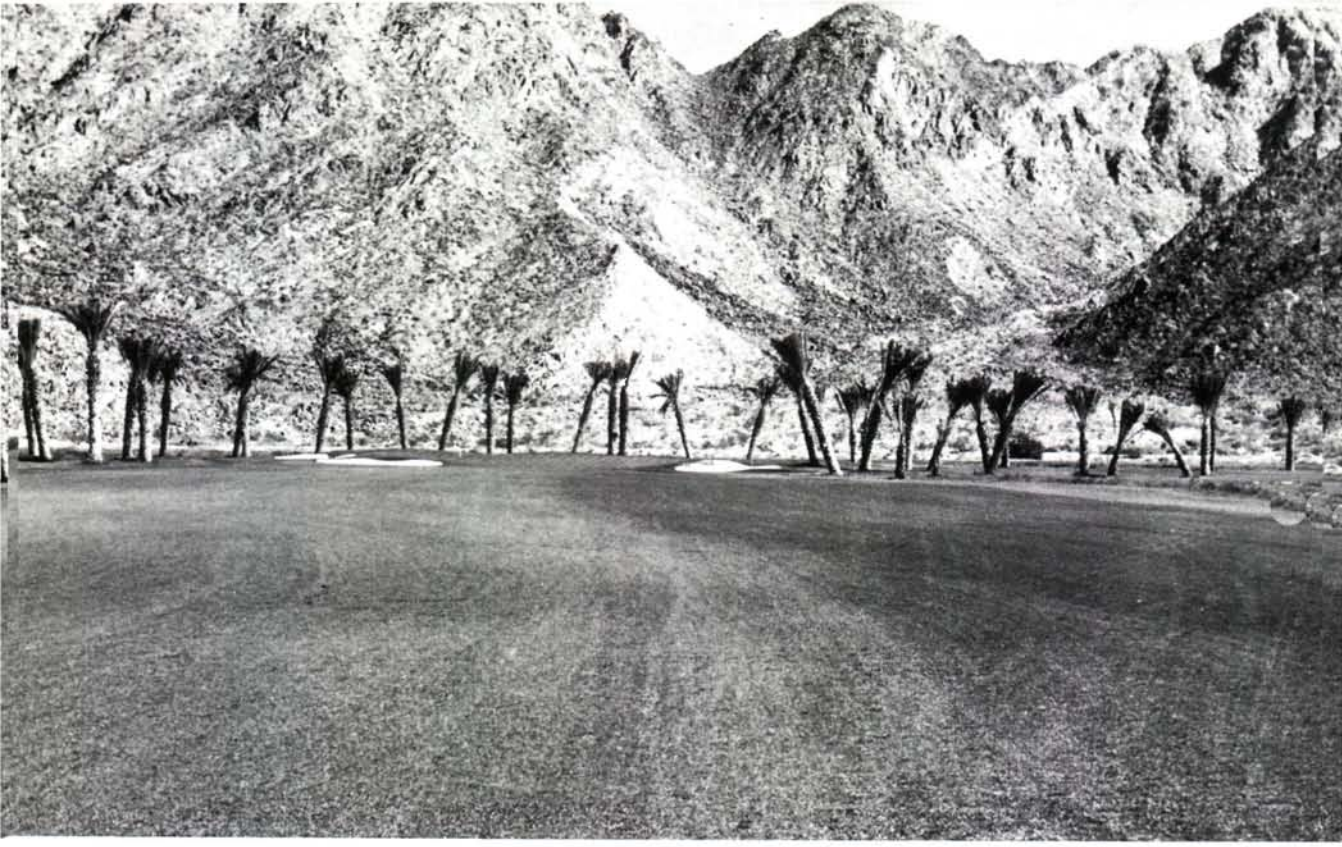


Most new golf courses are being built away from cities and are surrounded by real estate development. Water is a necessity.

The Outlook for Turf

by JAMES B. MONCRIEF, Director
Southern Region, USGA Green Section, Athens, Georgia

Few superintendents and even fewer golfers today realize that the earliest scientific observations of grasses in the United States were made by George Washington and Thomas Jefferson. No, they were not the first golfing Presidents of the country. They were, however, interested in cattle production and they worked with fescues, bluegrasses, and bentgrasses as well as other pasture-type grasses imported from Europe.

The first actual turfgrass research done before 1900 was in Rhode Island and Connecticut. Then in 1917, Piper and Oakley, two scientists with the Department of Agriculture, with support from the USGA wrote the first book on turfgrasses and golf course management. Not until the 1920s however, did the science of turfgrass culture become a separate field of study, apart from pasture grass interests.

The USGA Green Section began its support of turfgrass research in 1921 in cooperation with the U.S. Department of Agriculture. Experimental plots were established at the Arlington Turf Gardens, Arlington, Va., on the very site of today's Pentagon Building. The plots were moved in the early part of World War II to the Plant Industry Station, Beltsville, Md. USDA turfgrass research continues there today. The Green Section also supported turfgrass research at Gainesville, Fla., in 1928 under the direction of Dr. Enloe. Over the years, the goal of the Green Section has been the betterment of turfgrasses for golf; not only for USGA Member Clubs, but also for golf throughout the world.

After World War II there was a tremendous expansion of interest in golf and turf. Many schools offered study opportunities from one- to two-day short courses, one- to 10-week crash programs, and two- to four-year college curriculums. But as golf course construction slowed in the mid '70s,

the turfgrass industry also slowed. It is no longer accelerating in all categories.

In 1975 the National Golf Foundation reported a drop of 15 percent in new golf course construction. Most of the new courses are profit oriented. They have not been built for memberships, and neither are they member owned. Of the nation's golfers, 45 percent use municipal or public fee facilities, and yet these facilities only comprise about 14 percent of all the nation's golf courses!

As a whole, the well established private clubs have weathered the recession quite well while other industries have suffered serious setbacks. Many club members have stayed home and used their own golf facilities more than in the previous five to seven years. Country clubs are also trying to lower the average age of their memberships. This will be a major accomplishment and will help perpetuate private club operations. New members under 35 are being recruited with reduced initiation fees and under different classifications. Expansion of tennis facilities has not created the extra income as some clubs assumed.

Energy and Turfgrass Management

Turfgrass management has been affected by the energy shortage as well as other industries. A recent agricultural engineering society meeting in Davis, Calif., pointed out that the energy sources presently used in this country are: oil 46 percent, gas 31 percent, coal 17 percent, hydro-electric 4 percent, atomic 1.8 percent, and other energy such as geothermal, tides, etc. .2 percent. One kilowatt hour of energy out of five goes for food production. People as a whole do not realize the seriousness of our energy shortage.

It is important that we become aware of these energy sources. They directly affect our operations and our future. The present rate of oil consumption in the United States is 18 million barrels per day of our domestic oil. This will last about 12 more years if we assume no new findings. With new discoveries we should be able to go to the year 2000. Imported oil is costing us about $3 million per hour! The known domestic natural gas will last about until 1982 but, with new discoveries, we can probably stretch it to 1990. At the present rate of use and with no new discoveries, coal will last about 500 years. Half of our coal production comes from strip mining.

You have heard much about exotic sources of energy such as oil from shale. The shale must first be heated to 600°F. and then processed for it to be in a form we can use. Mining costs are tremendous. The rock remaining after extraction of the oil is of tremendous volume. The present outlook is not bright. Because of high costs, some oil companies have already stopped research in oil shale extraction.

The Idaho Raft River Electrical Co-Op has just brought in its second successful geothermal well and this is a new source of energy. The temperature at 4,800 feet into the earth is about 300°F. and the hope is that by drilling another 600 feet, 300° steam may be brought to the surface. The first well, at 5,000 feet, produced over 1,000 gallons of water per minute. The Co-Op is funded by the Federal and Northwest Power Council.

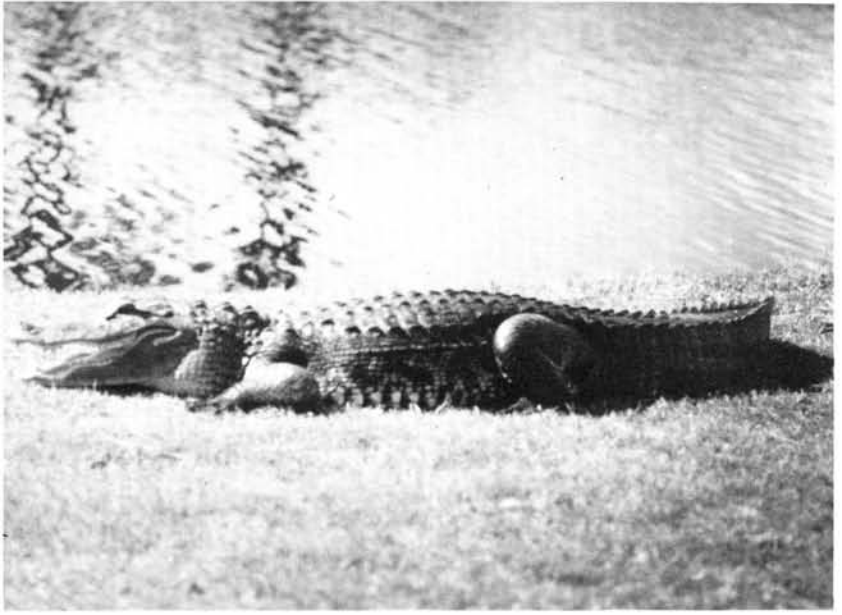
A recent Federal Institute Marketing Conference was told that natural gas is best for ammonia production. Another source of ammonia is now naptha, more costly as petroleum prices rise. A study released by the USDA showed that a 10 percent increase in agriculture would result in an additional one million tons of nitrogen per year. Additional ammonia plants are being constructed now and nitrogen will become more available.

Most of us think atomic energy can be used immediately as a substitute for oil and gas, but the facts do not bear this out. It cannot be considered as a substantial and immediate source of energy for many, many, years. We must live with present energy sources for at least the next 15 to 25 years while developing new ones. To preserve the energy we have, we must initiate a real program of conservation. We must change our complete attitude toward energy. It is not inexhaustable. Automobile consumption is still great, our homes are insulated poorly and we can no longer afford to be a throw-away society.

Research and Education

I would say the turfgrass manager faces a tremendous challenge, although American ingenuity will surely cope with the energy situation. Colleges with turfgrass curriculums continue to graduate students in the same numbers as before the energy crunch. Many turfgrass school professors

We still have Poa annua *in spite of research from 1934 to 1976.*



Some golf course pests are still difficult to control.

find that about 40 percent of their graduates become assistant superintendents, 10 percent or less superintendents, and 50 percent go into turf-allied interests, such as sales of chemicals, nursery stock, sod farms, large greenhouse operations, and others.

Researchers will always have turfgrass problems to solve. It seems as if as soon as the solution to one is found, two or three new and unrelated problems develop.

Researchers are now working on techniques for better timing of chemical applications, fertilizers and pesticides. The Pesticide Control Act has caused the turf manager to plan his chemical program, keep better records, and have a tighter grip on timing for maximum results with a minimum amount of chemical. The synergistic effect of two chemicals has proven a real advance. Within the next five years there will be newer chemicals for our use, including weed problems such as goosegrass, *Elusine indica.*

New seed selections are being developed for all of golf. The problem of overseeding bermudagrass greens each fall is constantly under review and rechecking. The introduction of improved grasses into existing fairways should become a common practice as new techniques are developed to minimize disturbance to play. We can look for more new grass selections to be released and probably more seed imported from Europe.

We may lose a number of turfgrass researchers over the next few years, but the quality of research should stay about the same. If a smaller number can work on the most pressing problems and solve them faster, it will be to our advantage.

No Substitute for Good Planning

Budgeting will be even more important, and close attention should be paid to the amount of each product you order. Comparison shopping is necessary because several thousand dollars may be saved with this technique. As in the past, all increases in cost will be passed on to the golfer and, therefore, you, as the golf course superintendent, can directly affect the cost as well as the quality of the game.

You may be using less personnel in the future and paying them more, including fringe benefits.

The number of golfers and golf cars continue to increase. Sea Island Golf Club, St. Simons Island, Georgia.

Summer training is an important requirement of turfgrass school curriculums.

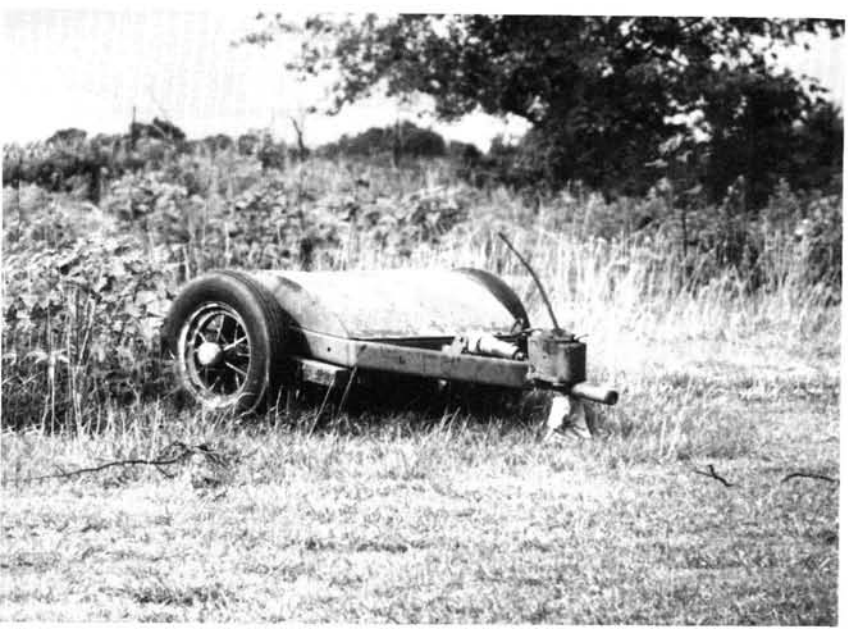
But there is an advantage to a smaller crew if the crew is productive and dependable. Your ability to train them and develop maximum efficiency will be essential. Training should be a continuous procedure with each employee checked out at least twice a year to assure high operational standards. Time and motion studies are now being used on some golf courses in Florida in a thorough study of the total operations.

More emphasis will be placed on water availability, cost and use. You will probably compete more for water than in the past. Food production and human consumption come first. As the population increases, municipalities will need one and a half times as much water by the end of the century. Many superintendents are aware of the increasing demands for water, and they have developed certain commitments as to how much water they need and use on their golf course.

I can foresee an increasing use of effluent water for golf course irrigation. Golf course land is an excellent area for filtering and purifying water and returning it to the water table and aquifers below. There will also be an increasing concern over sources of chemicals entering the water tables under our land. Fortunately, chemicals placed on turfgrass areas have a minimum effect and minimum movement. The overall contribution of a golf course to a balanced environment weighs heavily in our favor.

It will be essential to become familiar with the metric system as this country gradually moves toward it. We will soon have the first domestic steel company offering products in metric sizes. U.S. Steel will offer the bar and rod in metric, then wire, plate and sheet products. With numerous foreign cars already on the scene, metric hand tools are readily available. Our money is based on the metric system and there are many other areas where we will use the metric system without a major adaptation. For a while however, you may be confronted with both metric and standard tool sets on inventory.

Our society is a multifaceted technical, political, and economic one with interactions too complex and too subtle to be mastered by any regulatory



We can no longer afford a "throw-away society."

bureaucracy. We are self-sufficient in only four strategic mineral commodities; molybdenum, phosphate, borate and bituminous coal. We will have to compete with other countries for scarce raw materials. We will be self-sufficient in phosphate and nitrogen and, with the help of Canada, can have an adequate supply of potash and sulfur. But western Europe and Russia are also in need of potash and sulfur. To be an efficient turfgrass manager, you will need to know more about the utilization of fertilizers by the grass plant and the type of sand or soil series you have under your supervision. You will need to get maximum utilization from the fertilizer to keep your golf course in first class condition at the lowest possible cost at all times.

Turf management for golf, along with the entire turfgrass industry, will have its ups and downs in the years ahead. Indeed, the U.S. Department of Agriculture has a Committee on Land Use Policies. Its mission is to preserve prime lands. Land use planning by local and state authorities will become more pronounced and could influence future sites for golf courses. But the golf course plays an important role in green belt area development, and even if, as some predict, the coast lines of the United States become one line of continuous lights by 2000 golf will still be there and enjoyed. The golf course superintendent will contribute much to the growth, health and happiness of our future generations.

A GREEN SECTION SUPPORTED RESEARCH PROJECT

Nitrogen Losses From Golf Greens

by
K.W. BROWN[1], R.L. DUBLE[2] and J.C. THOMAS[3]

Although only a small portion of a golf course is devoted to putting greens, they are given first priority for fertilizers and irrigation. Poorly constructed greens often have low infiltration rates and excess water may run off the surface. Greens constructed to USGA Green Section specifications have higher infiltration rates and excess water moves through these greens quickly. Water lost from golf greens through runoff or leaching carries with it nitrogen from the fertilizer as either nitrate or ammonia.

Nitrate is known to cause eutrification of lakes and can be harmful to humans and livestock if consumed in drinking water. The Federal Water Pollution Control Administration (now the EPA) has established limits for the concentrations of nitrate in drinking water. These regulations call for not more than 45 ppm (parts per million) nitrate in water.

The amount of nitrate that may be lost from golf greens will depend on many factors. Among them are the following: the nitrogen source in the fertilizer applied, the time between fertilizer applications, the amount of irrigation or rainfall, the infiltration rate of the greens mixture, and the season of the year (soil temperature).

Research was therefore undertaken at Texas A&M University, under the sponsorship of the USGA Green Section, to obtain data on the amount of nitrate lost. If pollution hazards do not exist, the data would serve to protect the golf superintendent from undue scrutiny; and on the other hand, if hazards do exist, recommendations can be developed to reduce or eliminate the hazards.

Individual isolated golf greens 10 feet on a side, with gravel underdrains, were constructed on a raised subgrade. The drains and, in the case of the greens with low infiltration rates, the runoff collection troughs were fed into collection barrels. Top mixtures included pure sand, sand-soil-peat mixtures which met USGA specifications, and a fine sandy loam soil typical of many older greens. Treatments were designed to provide information on all the factors mentioned above.

When soluble forms of fertilizer, including ammonium nitrate and ammonium sulfate, were applied, high concentrations of nitrate were found in the leachate from all greens. The concentrations were highest and occurred earliest in the greens constructed of sand alone. As much as 22 percent of the applied nitrogen was lost during the first three weeks after application and concentrations in the leachate reached over 300 ppm for periods of two weeks. Such concentrations are six to

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