THE SOUTH FLORIDA GREEN

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The South Florida Green

The Official Bulletin of the South Florida Golf Course Superintendents Association

CONTENTS

"ON OUR COVER"

PLAN: Travel from Miami to Port St. Lucie to photograph president Leroy Phillips with irrigation system going for this irrigation issue.

NOT PLANNED: Sudden rainstorm . . .

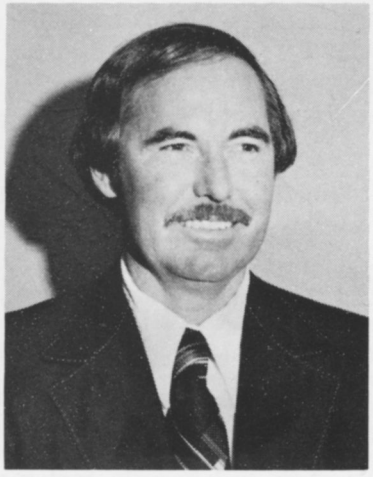
RESULT: Color photograph by Harry McCartha of a cooperative association president. (Irrigation by others).

Dan Jones, C.G.C.S., Editor
Aventura Country Club

Dr. Max Brown,
Associate Editor

NOTICE: All correspondence concerning business matters, circulation, editorial and advertising should be addressed to the Editor, 7521 N. W. 12th Street, Plantation, Fla. 33313. Opinions expressed by writers in by-lined editorials are not necessarily those of this publication. "The South Florida Green" is published quarterly; the 1st of January, April, July, October. Closing date for advertising and copy is 45 days prior to publication.

President's Message



Dear Members:

It's hard to believe that another year has passed. It has been a year of change and experience. The changes of the by-laws of the Association have been very good. The upgrading of the SOUTH FLORIDA GREEN magazine has helped us achieve our goals, for donations have been made to three major research and development areas.

1. *Tifton Turf-grass Research program.*
2. *University of Florida Turf Research program.*
3. *Dr. O. J. Noer Research Foundation, Inc.*

The programs presented at all meetings throughout the year have been outstanding, with a good variety of subjects, even though we have had smaller attendance than desired. However, those in attendance have shown outstanding interest in the wide range of educational subjects.

This year has been a great year, but we have to look ahead and pledge our help to the Association for the continuance of growth. Please make yourself available to serve with the new board members in whatever capacity you can, for becoming involved is the way we succeed.

Thank you for the opportunity to serve this past year.

Henry Phillips

IRRIGATION SYSTEM INSTALLATION

AT GULFSTREAM GOLF CLUB

by STANLEY A. CARR

This article is similar to a talk given at the 1977 South Florida Golf Course Superintendent Meeting. The information that I shall give is not totally my own. Moreover, we would not have the fine system that we have today had our general manager, Jim Briggs, not done a lot of research and worked closely with me. These comments and recommendations generally refer to an installation on an existing golf course.

Gulfstream was built in 1921 on approximately 140 acres, of which one hundred acres are irrigated.

It is of utmost importance that a superintendent employ or have on his staff a representative to work with the irrigation contractor. It is virtually impossible for the superintendent to closely monitor the installation of the system and run the course operations at the same time. This representative should have a basic understanding of plumbing, pumps, electric controls, etc., with the prospect of being the irrigation specialist after installation of the system has been completed. Many clubs are reluctant to employ such a representative just to oversee the work done but when you think of buying a quarter million dollar system, it is very inexpensive insurance indeed. This representative should see that no pipe is placed into the ground without his inspection and that no deviations from the blue prints or specifications are made without direct consultation and approval from the superintendent. As our club president once said, "the superintendent has to marry the girl." Basically, this is what we did at Gulfstream Golf Club, and I feel we have one of the finest systems available.

Listed below are some suggestions and recommendations that might prove helpful to anyone installing an automatic irrigation system:

1.) Determine the amount of acreage to be irrigated.

2.) Have a topographical map made of entire area to be irrigated.

3.) Check and select the source of water to be used.
   a.) pond
   b.) well fields

The water supply is of extreme importance and should be studied thoroughly.

4.) Have a colored aerial photograph of the course taken and keep in the superintendents office to be used for reference work between the superintendent and the contractor.

5.) Take soil samples of the types of soil and or rock to determine possible problems on installation by the contractor.

6.) Check for prevailing wind directions and favor location of sprinkler heads toward wind.

7.) Determine the number of hours the course is available to irrigate.

8.) Can any part of existing manual system be used in order to reduce costs. At Gulfstream I decided to abandon the old system completely.

9.) Determine spacing of the heads, whether they are to be installed in triangular or square spacing, a more even distribution of water will usually be accomplished with a triangular placement.

10.) Decide upon an electric control system or a hydraulic system. Electric usually has more problems in this area due to electrical storms and will cost more to install.

11.) If your course has a course architect on a retaining basis it will probably pay to seek his advice.

12.) Specify electric wiring for control clocks to be installed on right hand side of the irrigation pipe and the hydraulic tubing to be installed on the left side of the irrigation pipe. This will help in locating tubes and wires in case of repairs.

13.) Specify depths of all installations
   a.) consider pipe size.

14.) Specify color coating for electric wiring.

15.) Identify locations for all field satellites being sure to have the ability to see the heads operating and if possible to be kept from the sight of golfers.

16.) Future expansions should always be considered at the time of installation.

17.) Specify **poured concrete** thrust blocks at all dead ends and tee-joints.

Generally speaking some contractors place CBS blocks at these connections, however, I personally feel that poured concrete should be insisted upon.

18.) Divide your course into sufficient zonal areas so that certain areas can be taken out of service for repairs without interruption of main irrigation system.

19.) Include a rock clause for both the contractor and the club.

20.) Provide lightning arrestors on all satellites.

21.) Consider the installation of the rain gauge coupled with a shut off relay to cancel the central control.

22.) Be sure to specify types of satellite
   a.) Zero to 30, or zero to 60 minute timings.
   b.) Automatic and manual operation.

23.) Establish sequence of clocks to operate from greens back to tees.

(Continued on next page)

24.) Specify that no wiring, tubing, or piping shall cross over one another.

25.) Have contractor install snap valves at the back of each green and at the back of each tee.

26.) Use clay valves to regulate pressure in lines.

27.) Specify to speed heads in problem areas and have circle heads for perimeter irrigation.

28.) Do not allow any splicing between controllers and be sure to use scotch-locks for electrical connections in satellites.

29.) When gluing, specify all joints be glued **one** day before installing.

30.) Make sure that all piping is installed with slight curves to allow for expansion and contractions.

31.) All swing joints and risers should be prefabricated in a clean working area and not on the field.

32.) Specify that no more excavation or trenching is to be done in a day that cannot be restored.

33.) Specify electric wiring feeding satellites be in conduit for a minimum distance of six feet from satellites (this will protect wiring entering controllers from mechanical damage).

34.) Specify twelve (12) inch concrete pads for satellites.

35.) Determine the need for a filter system to ensure clear water from source of supply.

36.) Decide on sprinkler head types — gear or inpulse drive.

37.) Establish work commencement and completion dates of installation and decide upon penalty of performance (bond posted).

38.) If applicable check into the cost of hook up to city water.

39.) Request contractor to specialize his crew so that the same man is responsible for the same function throughout the installation.

40.) Demand a performance bond.

41.) Demand insureability and certification of contractor.

42.) Set up reasonable progress payment schedule retaining 10 percent for performance insurance.

43.) Designate responsibility for restoration of underground utilities damaged by installation.

44.) Require an "as built" drawing showing all locations of heads, controllers, valves, wiring, piping, drains, etc., to be brought up to date each week. This "as built" should be precise using bench marks for ease for identification and location. This is extremely important and vital and in many cases a failure of some installers.

45.) Require a one-year warranty and guarantee on all parts, equipment and workmanship.

46.) Demand balancing and adjustment of the system in the field to yield the greatest uniformity of irrigation. This is to be done by contractors in the presence of the course superintendent.

47.) Specify location for central control — suggest superintendent's office (in some cases under superintendent's bed).

48.) Specify adequate instructions of golf course personnel and use of new system.

I hope that this information will be helpful to those contemplating installing a new irrigation system.

SUBSURFACE IRRIGATION OF GOLF TURF

G. H. SNYDER AND E. O. BURT

Subsurface irrigation refers to underground placement and operation of conventional drip irrigation systems. It should be distinguished from subirrigation, which denotes irrigation by maintaining a water table sufficiently high to wet the root zone. Subsurface irrigation has been periodically promoted in various parts of the country, including south Florida, as a revolutionary new irrigation method which will greatly reduce water consumption, promote deeper root systems and reduce disease. It also has been promoted as a way of applying fertilizer.

Certainly there are some obvious advantages to subsurface irrigation as compared to conventional overhead irrigation. For example, turf areas can be used during periods of irrigation without getting people and equipment wet. Winds will not blow water into areas where it is not wanted, distort irrigation patterns, and cause evaporative loss before the water reaches the soil. Water isn't intercepted by thatch layers. With subsurface irrigation there are no above ground water emitters that are subject to accidentaly damage or vandalism. Since pressure requirements are low, power requirements are reduced.

But there also are some obvious disadvantages. Soil water does not move very far laterally, especially in the coarse soils of south Florida. Therefore emitters must be spaced rather closely. We have concluded that emitters should be spaced no greater than 24-inches apart in a sand soil. Fortunately, drip irrigation tubing is inexpensive relative to rigid PVC and can be installed rapidly with little damage to existing turf. But tree roots and other below ground objects greatly complicate installation. The emitters should be located as close to the surface as possible which can make them vulnerable to common golf turf operations such as aerification and cup changing.

For small, heavily trafficked areas, and for irregularly shaped areas, the advantages of subsurface irrigation may outweigh the disadvantages. But it seems unlikely that subsurface irrigation will be superior to overhead irrigation for most large turf areas such as are found on golf courses.

After investigating several reports of turf subsurface irrigation in Hawaii and California in recent years, we have yet to see any successful installations on commercial turf. This indicates that superintendents who try subsurface irrigation of turf will be breaking new ground and will find few people experienced in this field from whom advice can be obtained.

Effluent Irrigation on Golf Courses

Address by JAMES W. ADAMS

Use of and interest in effluent for irrigating golf courses is growing dramatically, which means that every golf course superintendent should be asking himself, "Should I be using effluent?" We know of at least 75 courses that are irrigating with effluent. There will be many more in the future.

When we talk about wastewater re-use, or irrigation, for any purpose, we must keep in mind that we are talking about the management of a vital and precious resource, about which there is a great deal of concern. For quite some time, but especially in recent months, water has become the center of attention all over the world. Droughts, water shortages, and their relation to weather and climate are all being talked about, written about, and debated with growing intensity.

In March (last year) the United Nations convened a worldwide conference on water in Argentina. In May, the U.S. Water Resources Council had an important three-day meeting in St. Louis.

From all of the meetings, discussions, and other sources, there is a veritable flood, not of water, but of words, information, statistics, theories, and predictions about water. Some of it is fascinating; some of it is frightening; but the key question remains unanswered: Are we running out of water?

The amount of water available to the world population is a fixed stock that cannot be increased or decreased. Ninety-seven percent of the water supply is in the oceans. Two percent is locked up in glacial ice, leaving only one percent of the total supply for serving mankind. All of the scientists and experts cannot say for certain that one percent or that portion of it that is accessible is adequate for us to keep doing all of the things we want to do with water — drinking, cooking, bathing, farming, irrigating golf courses, etc. Quite obviously there are times when the supply available to specific places at specific times is not adequate for everyone to continue to use it as they would like to.

While there are many questions about water use that cannot be answered, it is known that here in Miami along with two other cities, Tucson and San Antonio, water is being drawn from the underground supply almost five times faster than it is being replenished by nature. And the problem in Miami is complicated, of course, by salt water intrusion which accelerates as the ground water supply decreases.

Wise and careful management of water is demanded of everyone who uses it and that includes those responsible for the billions of gallons discarded every day as treated sewage. Most wastewater goes into the ocean where it is lost forever, or at least until we find a way to desalinate. That is a terrible waste, especially where it could be used for irrigation. When a golf course superintendent decides to use effluent, he must recognize that, along with the many benefits, there are some potential hazards. These relate mainly to the concerns that some state and federal agencies worry about to provide a basis for resisting waste water use for irrigation. There is particular concern in Florida because the water tables are so shallow. At Innisbrook, one of the best examples of successful effluent use, the water tables are just a few feet below the turf.

Be aware of the possibility of hazard but also be aware that no evidence of harm of any kind has ever been reported. A land treatment specialist, now with the EPA, concluded in 1974 "very few, if any, public health problems have been demonstrated as a result of spray irrigation or land disposal of waste water. However, a significant number of questions have been raised and research is needed before conclusions as to the existence of a hazard can be made."

Why is Toro interested in effluent use? Like other equipment manufacturers, we have some very basic reasons for our interest. And we mean to take a strong leadership position in water management. We believe it is necessary to have an underground irrigation system in order to use effluent efficiently and effectively.

Additionally, Toro is moving aggressively into agricultural irrigation where there also is deep concern about the water supply.

As water becomes harder to get, there will be increasing competition for it. This certainly will be true in Florida. If you can anticipate access to effluent, I suggest that now is the time to go into action to assure a supply for as long a term as possible. In addition to saving money now, you might be saving a golf course in the future.

(Continued on next page)

EFFLUENT IRRIGATION (Continued)

Federal, state and local pollution control agencies are making it increasingly difficult to dispose of effluent into a watershed, lake or ocean. In some areas it will be allowed only if the effluent is treated to virtual purity. In other areas, as in California, disposal into coastal waters will be prohibited regardless of effluent quality. This means that much greater quantities of effluent will, in the future, be disposed on-land, for the additional treatment that on-land disposal provides, and it will be available for irrigation as part of the treatment process.

Obviously, if you can use waste water for irrigation to benefit your course, and at the same time provide an outlet for a municipal treatment plant, everybody wins.

Innisbrook and Pinellas County have been able to work together to provide that kind of mutual benefit for the golf courses of Innisbrook and the citizens of the county.

Currently there are more than 2,000 on-land disposal facilities in the U.S., most of which are associated with some type of irrigation.

The first golf course that used effluent for irrigation probably was Sharp Park, a public course in San Francisco. It received effluent from a nearby county jail, starting in 1932, 46 years ago. Military installations have been in the vanguard of effluent use for golf courses. Fitzsimons Army Hospital in Denver probably was the first, starting 1940. Others using effluent to irrigate their golf courses are Fort Huachuca, Arizona; March Air Force Base, California; Camp Pendleton, California; the Air Force Academy and Fort Carson in Colorado; George Air Force Base, California; Reese Air Force Base, Texas; Scott Air Force Base, Illinois; China Lake, El Toro, and Twenty-nine Palms, California.

Fort Ord California began using effluent to irrigate its two golf courses this year. The base is under a cease and desist order, banning it from disposing its waste water in Monterey Bay. The obvious solution was to go to on-land spray irrigation.

As we've been studying effluent use, I've had an opportunity to meet with many golf course superintendents who are using waste water. They've given me many suggestions — advice, really — that I'd like to pass on to you.

If you're going to use waste water:

1. Don't take unnecessary risks. Stay on the safe side.
2. Make sure you have a proper permit from the appropriate authority, even if that authority has never issued one before.
3. Know all the rules and regulations that may apply. Check with federal, state, and local agencies, including health departments.
4. Establish and maintain cordial relations with all the permitting agencies. They might not know what they want, which can get frustrating and irritating, but avoid hostility at all costs.
5. Comply with all restrictions they place on you even if you don't agree with them.
6. Don't try to keep anything about what you're doing from anyone who has a right to know or may think he has a right to know. Keep everyone informed — your board of directors, your bosses, whoever they may be, the players, the local sports editor. Remember, there is nothing whatsoever for you to be secretive or uncommunicative about using waste water for golf course irrigation. It's a well-established practice and it's the way of the future.
7. Take good care of your equipment, especially your filters and screens.
8. Before you enter into an agreement with a municipal agency or private treatment plant to accept effluent for irrigation, here are a few things you should do:
   a) Know your water needs. Be able to provide use records if necessary.
   b) Know your turfgrasses, particularly their tolerances and limitations.
   c) Know exactly what kind of effluent — the quality — you will receive and obtain assurances that it will not be changed. A municipal plant, for example, could take on waste water from an industrial plant that could introduce new, troublesome elements such as oil, toxic metals, or salts to your water.
   d) Have the effluent that you will receive chemically analyzed so that you will know exactly what you will be getting.

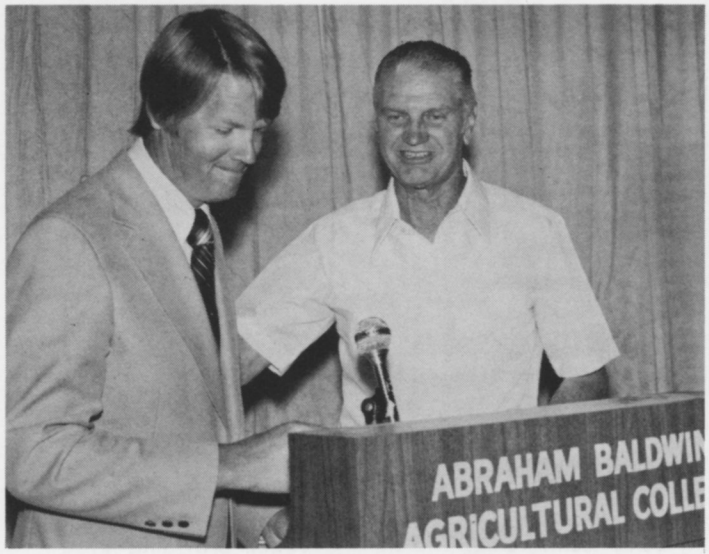
There is no doubt that the use of effluent will continue to grow. There also is no doubt that the benefits from its use will grow. I suggest that every golf course superintendent become familiar with the practice and determine, at as early a date as possible, whether its use should be considered for his course.

Look what YOU did...

Phil Amman Dr. Burt

Your support of our South Florida Golf Course Superintendents and the advertisers of "The South Florida Green" made two grants possible.

Shown above on the left is Association Director Phil Amman presenting a check for $1,000.00 to Dr. E. O. Burt to be used for research at the University of Florida Station, IFAS Broward County. Dr. W. B. Ennis was out of the city on our meeting date.



Tom Burton Dr. Burton

Pictured on the left is our past president Tom Burton presenting a similar check of $1,000.00 to be used at The Coastal Plains Experiment Station, Tifton, Georgia. Dr. Burton was not aware of our grant and his surprise and pleasure is evidenced in his smile . . . (son Tom seems pleased also, as are we.)

Your continued work to help this association is certain to let us give more grants for turf research.

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Turf Nutrient Management with Fertigation[1]

E. O. Burt and G. H. Snyder[2]

While most golf irrigation systems are designed solely for the purpose of maintaining adequate soil moisture, some golf superintendents have considered using their systems to apply fertilizer as well. The pros and cons of turf fertigation (fertilization through the irrigation system have been presented many times, but the lists vary little from author to author (4, 5, 10, 12, 17, 26). The chief disadvantages cited related to engineering problems such as uneven water distribution, equipment corrosion and fertilizer precipitation within irrigation lines. Considerable attention has been paid to these problems. Methods of injecting fertilizer into irrigation systems have been described elsewhere (7, 17, 24). However, agronomic aspects of fertigation have received little attention from research scientists. In general, fertigation has been practiced on an "all or nothing" basis which makes agronomic evaluation difficult (1, 24, 25). Research is needed that utilizes randomized, replicated plots which provide accurate comparisons among treatments and statistical evaluation (Fig. 1).

We have attempted to provide scientifically gathered information on agronomic aspects of fertigation for several years (15, 16, 18, 19, 20, 21). However, considerably more time is needed to get a reasonably complete picture in our geographical region. Moreover, research by others is needed in other regions. Thus at this time agronomic discussions of turf fertigation must combine educated speculation with limited research data.

LIGHT, FREQUENT FERTILIZATIONS

The primary advantage of fertigation is that fertilizer may be applied with very little labor required beyond that needed for the usual irrigation. Because of this, fertilizer can be applied very frequently, but at low rates per application. This aspect of fertigation is sometimes overlooked or underemphasized (3, 4, 26).

It is widely felt that frequent, light fertilizer applications will minimize the effects of poor water distribution (11, 12). Observations made during the course of our research agreed with this contention (19), although the study was not designed specifically to test this theory, and the degree to which the theory holds will vary among irrigation installations. Probably the best reason for using frequent light applications of fertilizer is to encourage the relatively constant grass growth with respect to time. Particularly in the case of nitrogen (N), frequent light applications will minimize unwanted flushes of growth which alternate with periods of N starvation, a cyclic condition that generally results from periodic heavy applications of N (5). We have found little difference in this respect between daily and weekly N applications through the irrigation system (19), which agreed with data of other workers using conventional application methods (13, 22). But we feel that the above mentioned cycling may be observed with N fertigation intervals of greater than one week. Turf comes closer to requiring weekly, or even more frequent, irrigations than most other field-grown crops, and in this respect is well suited to fertigation.

REDUCED LEACHING LOSSES

Since very little fertilizer will be present in the soil solution at any one time when light, frequent applications are made, the efficiency of plant uptake should be good (8, 9). In support of this, we have observed reduced N leaching losses when daily N applications through the irrigation system are compared to conventional N fertilization at three-week intervals (16, 20, 21, Fig. 2). Fertigation is often promoted as a way of reducing fertilizer rates and less fertilizer usage under golf course conditions has been reported (5, 24). We were not able to establish that lower rates are justified when fertigation was compared with an efficient slow-release N source (19). However, the N leaching observations, cited above, suggest that fertigation may reduce the amount of N fertilizer needed as compared to rather inefficient, though commonly practiced, N fertilization methods such as infrequent applications of soluble N sources.

SIMULATES SLOW-RELEASE FERTILIZERS

In principle, fertigation can stimulate the use of slow-release fertilizers. Considerable research has gone into developing slow-release fertilizers that release nutrients at a rather constant, desired rate. This rate, however, is affected by various factors such as temperature, moisture, micro-organism activity, etc. These factors are not entirely controllable by the golf superintendent. The superintendent does have complete control over the amount of nutrients applied with each fertigation. He can use fertigation to help stabilize the nutrient status of the soil (20). This control can be useful to the intelligent, knowledgeable superintendent, but may only confuse the less competent individual who may prefer to use slow-release materials which act on their own. We have obtained growth at least as consistent, and at times more consistent, by using N fertigation as compared to a slow-release N fertilizer (19). The cost of N sources suitable for fertigation is, of course, much lower than that of slow-release sources.

N SOURCES

We are currently studying N sources for fertigation. This work is not complete. The all-ammonium (NH_4^+) source has proven superior to a combination of ammonium and nitrate (NH_4NO_3), all nitrate (NO_3) or urea under our conditions (18). This most likely occurs because we have problems with high pH. The all-ammonium source is the most acid forming N source of the group, which improves manganese (Mn) availability. In this respect, fertigation with these sources affects soil pH in the classical manner (6). Thus far, it appears that under our conditions the sources are equally effective for maintaining turf color when Mn is sufficiently available. But in some instances greater growth is obtained with the all-ammonium source. Work is needed in other regions to determine the best N source(s) in those locales. Anhydrous ammonia (NH_3) is frequently applied to field crops in irrigation water when flood or furrow irrigation is used. But it generally is not recommended as an N source for application by sprinkler irrigation because large quantities can be lost by volatilization. Volatilization is much reduced at low concentrations (23). Thus when used in light, frequent applications so that NH_3 concentration in the irrigation water remains very low, volatilization losses may be acceptable if other circumstances (price, availability, convenience, etc.) greatly favor its use.

FERTIGATION + CONVENTIONAL FERTILIZATION

Fertigation probably can be best used to apply nutrients in light, frequent applications over the large acreage of a golf course. The complexity of the system is greatly increased if the superintendent desires to use fertigation differentially over his course, to make heavier applications on greens and tees, for example. These heavy use areas, which will receive a low maintenance level of fertilizer by fertigation, can receive supplemental fertilization by conventional methods. Nutrients which are well retained by the soil can be conventionally applied, also, if desired. Using fertigation does not require that the fertilizer spreader be thown away. But fertigation does offer a simple way of fertilizing the greatest acreage of a golf course, the fairways, and hopefully will allow a superintendent and his crew more time to concentrate on those portions of the course where their attentions are more appreciated (greens, and tees, for example).

(Continued on next page)

[1]Contributed by the University of Florida, IFAS, Agricultural Research Centers. Significant portions of this article appeared in the USGA Green Section Record 15(3):10-12 (1977).

[2]Professor, Agricultural Research Center, Ft. Lauderdale, Florida 33314 and Associate Professor, Agricultural Research and Education Center, Belle Glade, Florida 33430, respectively.

NUTRIENTS FOR FERTIGATION

Nitrogen and sulfur (S) are poorly retained by most soils. Fertigation offers a means of maintaining an adequate level of these nutrients in the soil. Sand soils do not hold potassium (K) well, and fertigation may prove useful for K in sand soils. Under high pH conditions, certain micronutrients are retained so well by the soil that they become unavailable to the grass. Fertigation may be a way of maintaining adequate availability of these nutrients. It has been successfully used to apply manganese (Mn) where high pH was causing a Mn deficiency (2). Fertigation may, or may not, be useful for applying other nutrients. Much will depend on the availability of soluble fertilizer mixes at acceptable prices. A superintendent may wish to make his own mixes from dry sources, and some do (14, 25). However, it may prove more convenient and less expensive to purchase pre-mixed fertilizer as a liquid if a competent dealer is available. Expensive liquid fertilizers that are sold especially for foliar feeding are probably of no particular advantage for turf fertigation, since high volumes of water are used and little fertilizer will remain on the foliage. Most liquid fertilizers are competitively priced with their dry counterparts.

THE SUPERINTENDENT'S DECISION

Thus for golf turf, there appear to be many agronomic advantages to maintaining a relatively constant, low level of available nutrients in the root zone. Fertigation is only one of several methods that can be used to achieve this objective. Slow-release fertilizers and frequent conventional applications of soluble materials are others. Relative to these, however, only fertigation is economical both in terms of labor and fertilizer cost. But it places new responsibility on the shoulders of the golf superintendent. For this reason, a greens committee probably cannot successfully force fertigation upon a superintendent who is not convinced that it will be advantageous from a total management standpoint On the other hand, a superintendent who is properly motivated and interested can usually make a success of fertigation in spite of unanticipated problems which always arise. They can take heart in the fact that many superintendents are using fertigation successfully in Florida and elsewhere, and its use seems to be on the rise.

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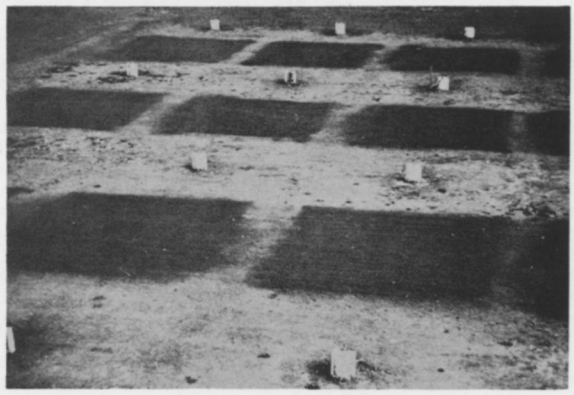


Fig. 1 Experimental area containing randomized replicated plots for studying turf fertigation which permits statistical verification of observed results.

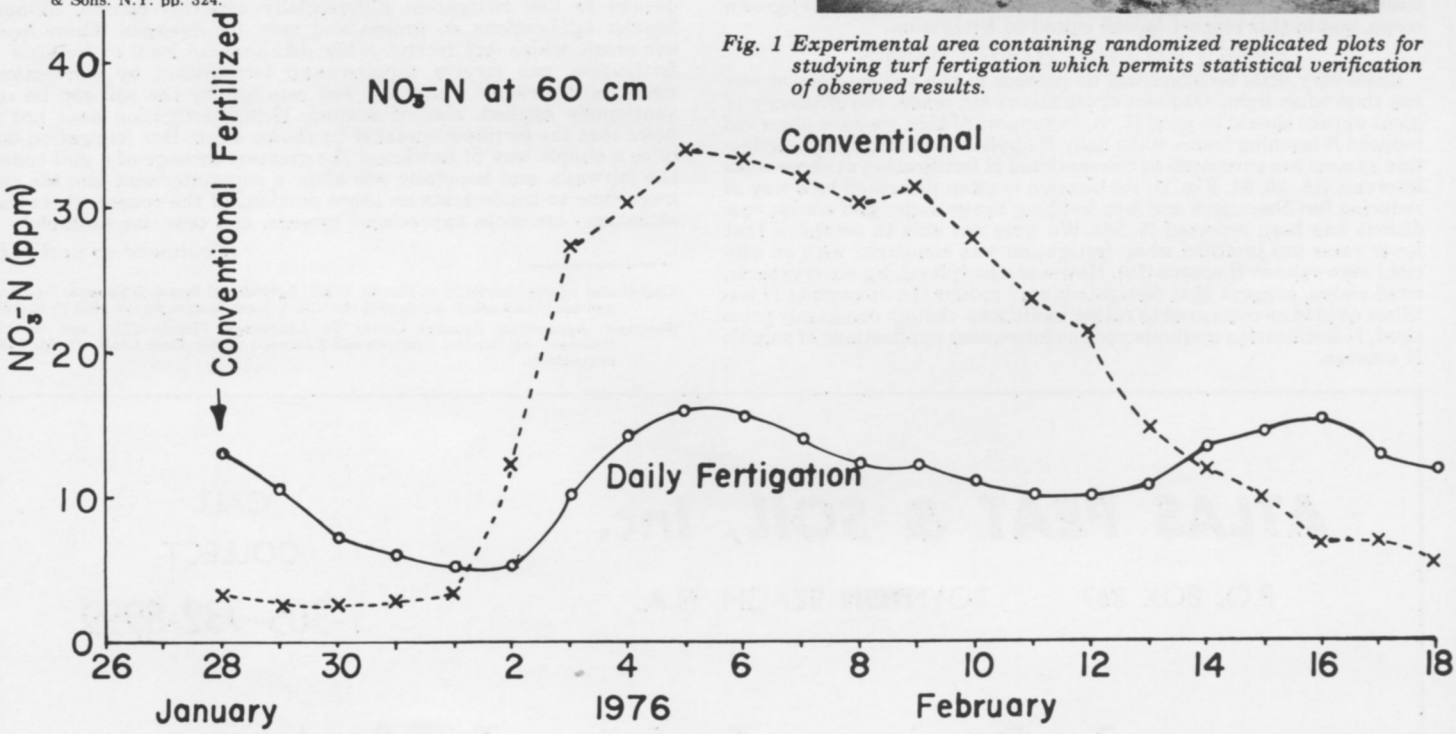


Fig. 2. Following conventional application of ammonium nitrate to bermudagrass turf, nitrate in soil water samples taken below the rootzone became quite high. This nitrogen was wasted since it was not utilized by the turf. When the same amount of nitrogen was applied through the irrigation system in small daily increments through the irrigation system over a three-week period, nitrate levels in soil water below the root zone were more constant and did not reach the high levels found in the conventional case. This indicates that fertigation helps stabilize soil nitrogen nutrition and reduces nitrogen leaching.

Looking Sharp Fellows...

Riviera Country Club was the place and the occasion was awarding Past President "Blazers" to Tom Burton, Lou Oxnevad (shown shaking hands with Leroy Phillips) and Mike Barger. Congratulations fellows from our association.

32nd ANNUAL TURF CONFERENCE

Abraham Baldwin Agricultural College, Tifton, Georgia

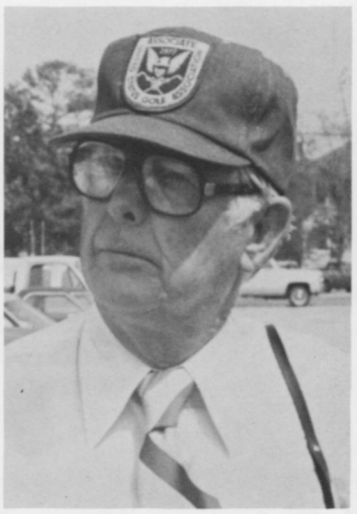
Our magazine is happy to feature this years event. Sponsors are University, Coastal Plain Experiment Station, Abraham Baldwin College, USGA, Southern Golf Association, and The Rural Development Center.

The conference dates back to 1936 when grass breeding and pasture grasses were featured. In 1948 Dr. Fred Grau and Dr. Burton changed the format to cover turf grass.

The programs are assembled by Dr. Glenn Burton, his staff and "Monty" Moncrief, USGA Green Section director. This beautiful South Georgia campus is the ideal setting for learning with attendance cost kept to a bare minimum. Many of the more than 200 attending were from south Florida. Any Company or course that sends their personnel to the conferences will reap many benefits . . . The South Florida Green Staff urges your attendance next year.

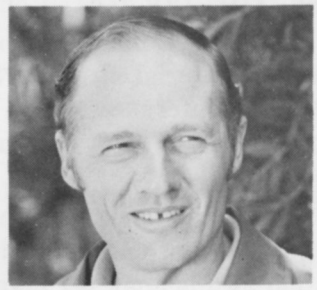
Photographs, top left — Turf Plot Examination; top right, Educational Session, Rural Development Center Auditorium.
Center left — Dr. Burton and to his right is "Monty" Moncrief, USGA.
Bottom left and right — Catfish, Hushpuppies and Fellowship at Southern Turf Nurseries . . . GREAT!

(Photographs by Harry McCartha)



ASK THE DOCTOR

By MAX A. BROWN, Ph.D.



Dr. Max A. Brown

Q. Foreign bermudagrass contamination in my greens has become a very serious problem. What can I do to control this problem? West Palm Beach.

A. In my opinion this problem is the most serious one facing golf course superintendents in this area for which we have no good remedy. There are no chemicals which will selectively remove these grasses from either Tifgreen or Tifdwarf.

You need to look at this problem from three aspects: first, the identification and location of the contaminating grasses, secondly, approaches to cure the problem you have, and thirdly, maintenance procedures to prevent the introduction and spread of these grasses in your greens.

It is very difficult to spot foreign bermudagrasses at certain times of the year. At other times they stick out like sore thumbs. Check greens in the morning with dew on, at midday, in late afternoon. Check after a day without mowing, check when hungry, check when cold, check after vertical mowing, etc. Line out areas of foreign grasses with a point gun making lines six to twelve inches out from visible signs.

Changing of cups is the most rapid vehicle for spreading contaminating grasses around greens. For this reason the man changing cups must have a sharp eye and be trained to spot and avoid cutting cups in these areas.

Once you have the problem you must cure it. You have three choices depending upon how severe your problem is:

a). Cut out all areas you have marked with a knife, shovel and possibly a sod cutter. Dig down deep enough to remove any rhizomes. You may have to remove soil at least six inches deep. Then you must replace with clean soil, tamp and level carefully, then resod with clean grass from a nursery area. Great care must be taken since this is a very difficult job to do well. The green should be smooth and playable when you finish.

b.) A second method is to let contaminated grass areas grow up to an inch in height then spray with Round Up at five pints per acre. After a few days the grass will be totally brown. Mow down to normal green height and place many plugs of clean grass from a nursery area with a cup cutter or other tool into the brown grass area. Tamp plugs down very level, and keep liberally topdressed. The area can be played upon immediately and the plugs should grow together in a few weeks.

c.) If foreign grasses make up a large percentage of the putting surfaces the above approaches are not practical and you must totally replant the greens. This means the greens will be closed to play for about twelve weeks. All grass must be removed with a sod cutter from green tops and and a border of at least six feet and preferrably fifteen feet beyond. Some soil may have to be added to replace what was removed, then all areas rototilled repeatedly to a depth of six to eight inches, the soil fumigated with methyl bromide and the greens replanted with clean, pure, certified bermudagrass.

Once your greens are pure and clean a constant and never ending vigil must be maintained to keep them that way. Foreign grasses are introduced by golfers spikes, maintenance equipment, wind, water.

Check greens personally at least once each month. Train your greens mowers and cup cutters to recognize foreign grasses. As soon as they are noticed they should be removed by digging out by hand.

Set up maintenance programs to minimize chances of bringing sprigs onto greens: Clean aerifiers, vertical mowers, mowers, topdressers, drag matts, etc., before coming onto each green. Don't allow renovation equipment to go off and on putting surfaces and drag sprigs from fairways. Use clean top soil and keep topdressers and drag matts on the green surfaces. Careful preventive procedures and immediate removal of foreign grasses while they are small will ensure clean, uniform putting surfaces for many years.

Q. Goosegrass (Eleusine indica) is a problem weed on my golf course. Are there any new controls for this weed? Fort Lauderdale.

A. We must remember in any weed control effort that weeds are a **result** of a poor turf condition, not a **cause.** We must first find out what caused the bermudagrass to weaken and allow weed encroachment and solve that problem (nematodes, insects, nutrition, traffic, drainage, drying out, shade, etc.). Then we must get the bermudagrass healthy and growing well. Only then can we be concerned with removing the weeds.

Remember also that all herbicides have an effect on the grass and therefore should be used as a last resort. Don't be too proud to use hand methods to remove weeds.

The old standby materials of MSMA and 2,4-D with repeat applications three to five days apart are quite effective on smaller weeds. My recommendations for use of these chemicals have been discussed in an earlier issue of this publication.

Quite a bit of attention has been directed toward two new chemicals which have received turf labels this year.

Asulam can be used on St. Augustinegrass and on Tifway bermudagrass mowed at fairway height to control goosegrass. It is also quite effective in controlling several other grassy and broadleaf weeds. It is not effective against any of the sedges.

(Continued on next page)

ASK THE DOCTOR (Continued)

Dr. E. O. Burt presented a paper on his research on this material at the 1977 Florida Turf-Grass Association Conference which has been published in the Proceedings of that conference entitled Asulam — A New Herbicide for Turf.

My experience in controlling goosegrass in bermudagrass with this chemical has been spotty. One application two pounds per acre will discolor turf and give quite good control of smaller plants. A second application three to six weeks later at the same rate may be necessary for large plants. Activity is slow and it may take six weeks for weeds to die. Environmental factors such as soil moisture, etc., effect control and are not too well understood at this time.

Combinations of Asulam and MSMA have been effective for broader spectrum control of sedges, etc. However, danger of injury is increased with tank mixes and it is recommended that you apply the two herbicides separately.

Sencor has also been labeled for use on bermudagrass for control of goosegrass. We have had less experience with this chemical than with Asulam. It appears to have less margin for error than Asulam and MSMA. It will discolor grass at recommended rates, but overlaps will severely damage turf.

Sencor should be used at one-half pound of active ingredient per acre. It may be necessary to make a second application after 14 to 20 days. No more than two applications should be made in one season.

Before using either of these new products carefully read the label and observe cautionary statements thereon. I also conservatively recommend that you talk to someone who has had experience with these chemicals and experiment with small areas before undertaking any large scale herbicide programs.

THE MODERN SUPERINTENDENT

by DAN JONES, CGCS

PART VII

KEY PARTS OF THE PUZZLE

If a golf course maintenance operation is to be successful, every employee has to be an interlocking part of the puzzle. This means every employee is given a specific job, and motivated to achieve the best results. This achieves two things: a better job and a proud employee.

Upon close examination of the puzzle, we see there are four key pieces. These are often referred to as the corner pieces. They consist of the mechanic, the sprayman, the irrigation man and the cupcutter. The importance of these positions and the key personnel to fill them cannot be over emphasized. They should be the highest paid employees. Why? Because they handle more responsibility, are critical to the overall golf course maintenance operation, etc. In this article, we will look at the irrigation man and how he effects the total maintenance operation.

THE IRRIGATION MAN

Most golf courses are now equipped with automatic irrigation systems. These range from simple clock controlled electric or hydraulic to sophisticated computer controlled single wire systems. To maintain these systems in first class condition a full time irrigation man is an absolute must. The days of hit and miss emergency repairs will not suffice for today's well manicured courses.

How important is a good irrigation man? He should be considered one of the most important men on the crew. Why? Without water there is no grass, without grass, there is no golf course.

At Country Club Aventura we are fortunate to have the finest irrigation man I have ever had the pleasure of working with. His name is Ben Murray and he has worked on the golf course for eight years. He installed the irrigation system when the golf course was being buit in 1970. This makes Ben more valuable to the company because he is virtually a walking blueprint.

Ben lives near the golf course and is on call 24 hours a day. If it rains, he drives over to the golf course and turns the clocks off without me calling him. He has never refused to work overtime to repair a broken line or other emergency. Ben takes great pride in his work and this is reflected in the small amount of down time to the irrigation system.

All major irrigation manufacturers have yearly service schools at the local distributor level. It is very important to send your irrigation man to this school every year. It will accomplish two things.

1. He will be able to discuss his irrigation problems with a factory representative.
2. He will keep abreast of new products and materials. Cost to the company? One day's pay. A real bargain.

Good communication between the irrigation man and all golf course employees is very important. As employees work around a golf course they might see broken heads, caps missing, water coming out of the ground, etc. All irrigation problems, no matter how insignificant they may seem, should be reported daily. To help accomplish this, a good radio system with walkie talkies given to key employees will keep the irrigation man informed at all times. It will also help golf course superintendents, by simply calling the irrigation man when a problem arises.

The average golf course has 25 satellite irrigation controllers and 500 irrigation heads. How do you keep them in good repair? At Aventura we use the irrigation zone check sheet (see figure A) this enables us to check the operation of the clock, rotation of head, pressure at head and spray pattern. This simple procedure has reduced our wet and dry areas by 99%. Tools needed, stop watch and nozzle gauge. Each zone (25) should be tested on a quarterly basis.

And lastly pay your irrigation man a decent wage to keep him happy and enthusiastic. Your reward will be a beautiful golf course and happy members.

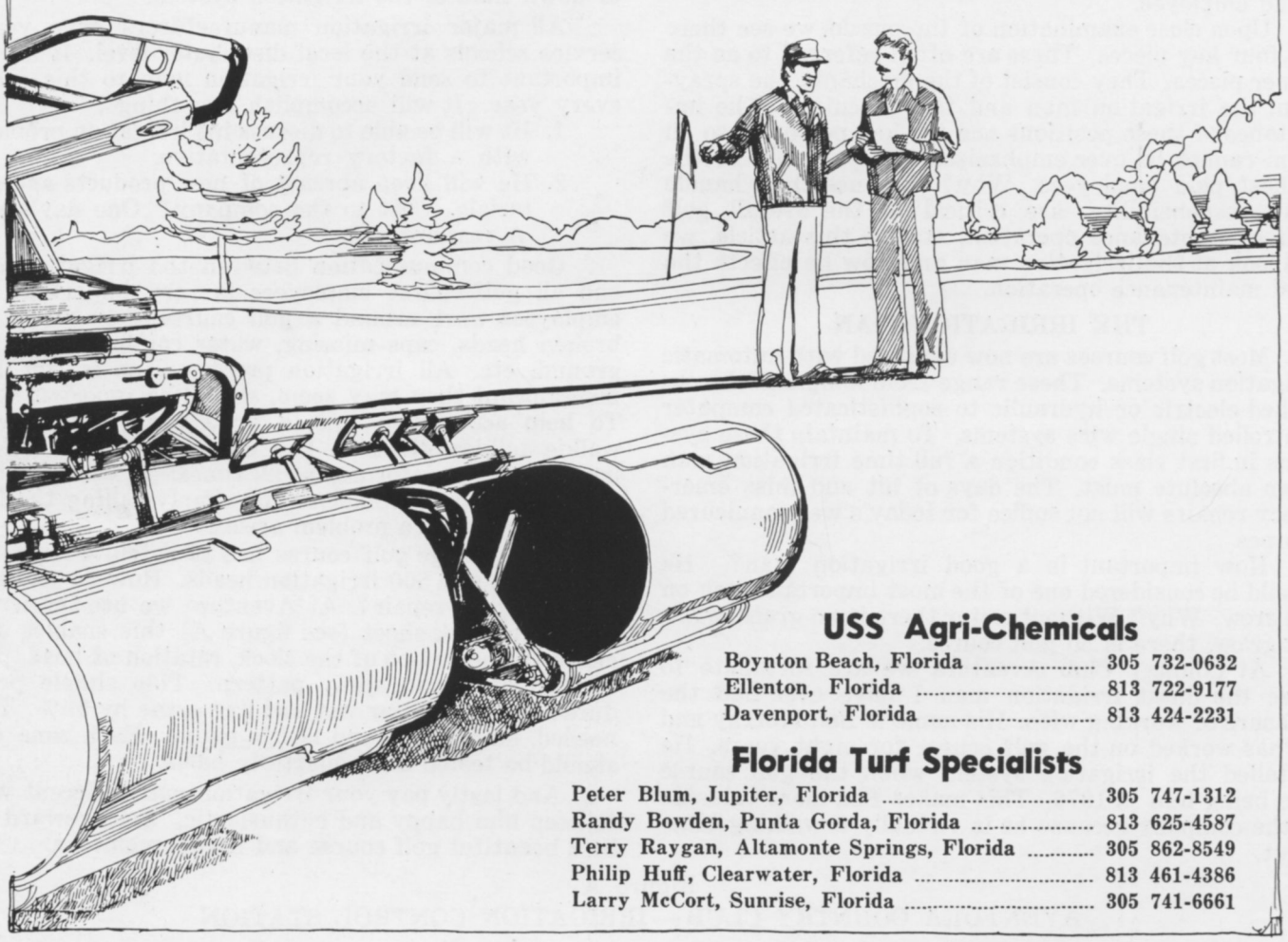
Figure A

AVENTURA COUNTRY CLUB — IRRIGATION CONTROL STATION

ZONE_____ COURSE_____

HEAD NO.	SET TIME	ACTUAL TIME	ROTATION	SPRAY PATTERN	NOZZLE PRESSURE	COMMENTS
1						
2						
3						
4						
5						
6						
7						
8						
9						

USS Tee-Green 16-4-8... When you want uniform particle size we can deliver!



USS Agri-Chemicals

Boynton Beach, Florida	305 732-0632
Ellenton, Florida	813 722-9177
Davenport, Florida	813 424-2231

Florida Turf Specialists

Peter Blum, Jupiter, Florida	305 747-1312
Randy Bowden, Punta Gorda, Florida	813 625-4587
Terry Raygan, Altamonte Springs, Florida	305 862-8549
Philip Huff, Clearwater, Florida	813 461-4386
Larry McCort, Sunrise, Florida	305 741-6661

When you apply USS Tee-Green 16-4-8 to your tees, greens and aprons you're assured that's where it will stay. There's no need to worry about mower pickup because the uniform particle size (90% minus 10 + 20 Mesh U.S. Sieve) means the granules will work their way quickly down through the grass to provide a consistent and even feeding.

Of course this is just one of the advantages of this great product. Your local USS Vertagreen distributor can tell you much more about the advantages of nitrogen derived from urea-formaldehyde, the chelated iron, sulfate of potash and the guaranteed amounts of secondary and micro-nutrients in this fine product. USS Tee-Green is another reason we say, "see the best, for the best" — and that's your local Vertagreen distributor. He can always deliver.

A product for all reasons.

USS Agri-Chemicals
Division of United States Steel
P.O. Box 1685, Atlanta, Ga. 30301

Our greatest yet...

SUPPLIERS FIELD DAY AND LUNCHEON

With tremendous help of Doug Palmer and the fine folks at the Broward Community College we enjoyed our most successful field day.

This year the committee went all out to set up 39 booths inside (to beat the rain) and 10 areas outside for machinery demonstrations. Twenty door prizes were awarded during the afternoon supplied by the commercial members. Over 150 people attended and the key note speaker was Jim Brooks, Dir., Industrial Relations, National GCSAA.

(Photographs and report by Harry McCartha)

Doug Palmer, Dept. Head, Landscape and Pest Control, Broward Community College

President Leroy Phillip conducts business meeting before Field Day.

Shown, right: Jim Brooks, National Official, presents the plaque and papers making editor and Vice President Dan Jones a Certified Golf Course Superintendent.

Dan Jones, Jim Brooks

"Man does not live by BREAD alone, or GRASS either for that matter!

"Let me tell you about my product Mr. Phillips . . ."

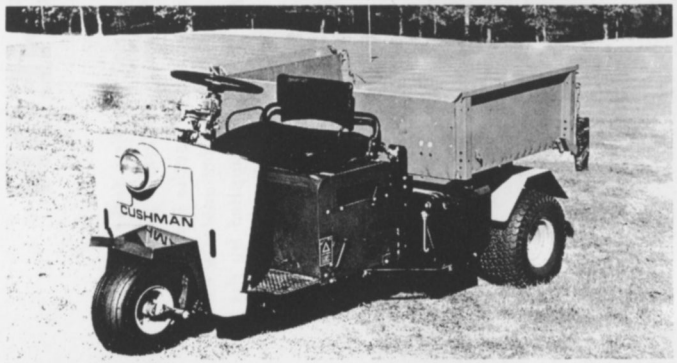
Lesco van parked in outside demonstration area.

Part of the equipment demonstrated on the school turf.

Looks like "Doc" has been eating too much of his "Bar-b-cue."

If the price is the same, what's the big difference?

Cushman makes a fine turf vehicle. But does it equal E-Z-GO? It's often difficult for you yourself to make an honest comparison. So we've done it for you. We took comparable top-of-the-line models, E-Z-GO's GT-7 and the Cushman Turf Truckster. Head to head, here's what we found.



Power Source: 18 horsepower OMC engine, tightly compartmentalized. Ground speed 0 to 22 mph.

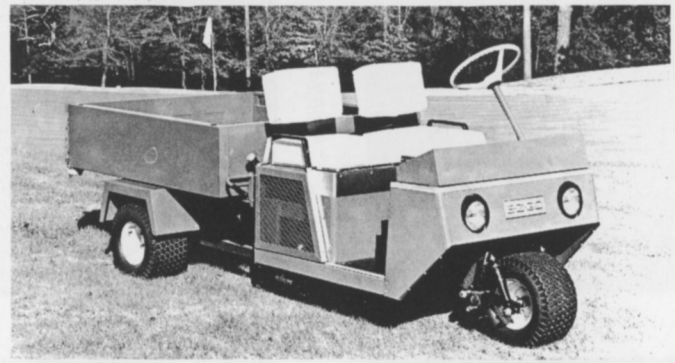
Braking: Hydraulic internal expanding.
Payload: 1000 pounds.

Suspension System: Torsion bars, leaf springs, front and rear shocks.

Dump Construction: Single wall, no undercoating.

Headlights: Single.
Seating: Single seat for one passenger with back rest and hip restraint.

Price: Virtually the same.

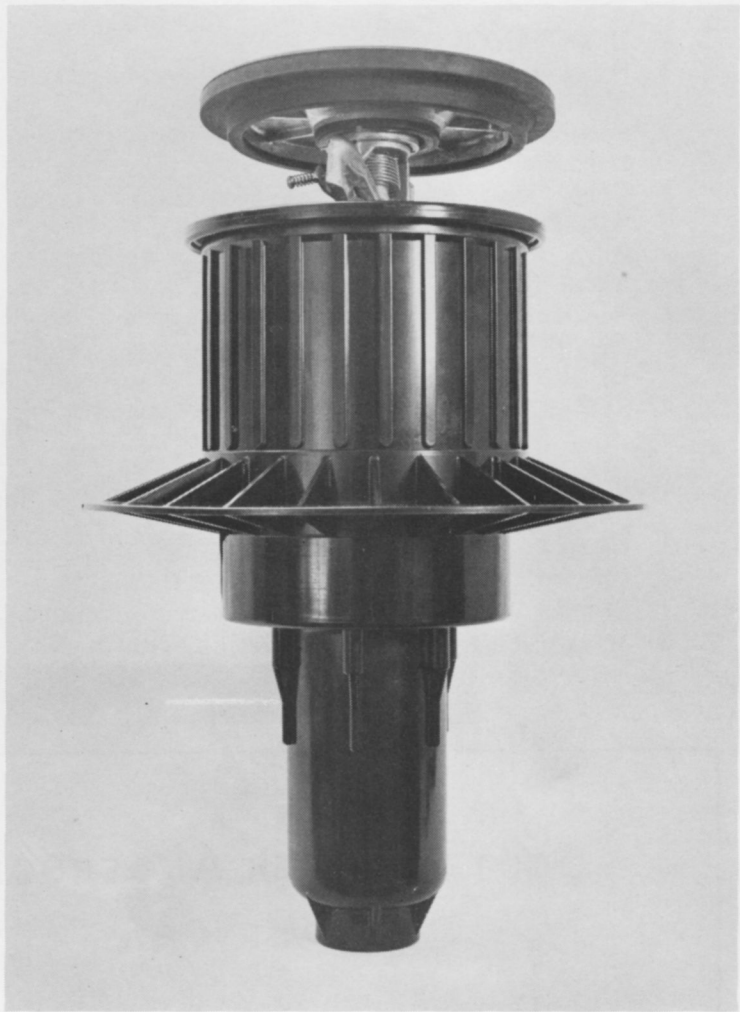


Power Source: A rugged, reliable 18 horsepower Onan engine with the power to carry a full payload up to 24 mph. Substantially larger engine compartment for easier maintenance.
Braking: Improved hydraulic internal expanding.
Payload: 1500 pounds. A massive 50% greater carrying capacity than Cushman. More cubic space for greater material volume.
Suspension System: Heavy duty torsion bars, leaf springs, front and rear shock absorbers, designed to support the bigger payload.
Dump Construction: Dual wall, double thick for heavier loads, longer life. Undercoating for even greater resistance to corrosion.
Headlights: Dual lights for greater night vision.
Seating: Dual seats for two passengers with individual back rests and hip restraints, constructed for larger men, greater comfort.
Price: Virtually the same.
Summary: E-Z-GO carries a greater payload, is easier to maintain, is larger, more durably built, and safer with a wider wheel base. E-Z-GO uses top quality components from companies, such as Bendix, Borg Warner, Dana, Onan, and Rockwell International.
For the complete story on the E-Z-GO GT-7, a demonstration on your course, contact your E-Z-GO distributor. For his address check your Yellow Pages or call or write Mr. William Lanier, E-Z-GO, P.O. Box 388, Augusta, Georgia 30903, at (404) 798-4311.

SOUTH FLORIDA TURF EQUIP. INC.

8201 S.W. 24th Street Ft. Lauderdale, Fla. 33324

THE TURF GIANT



the GREEN WORLD of S-T-L

SAFE-T-LAWN

The Safe-T-Lawn Rise-N-Rain 800 Series, **the Turf Giant,** provides an unequalled combination of performance, features, and cost. With net prices beginning at just $48.75, the 800 Series is the most economical of large turf pop-ups. It has been engineered for commercial use and designed to handle large areas easily and effectively. Models of the 800 Series are available to provide even water distribution at up to 247′ diameter at 147 G.P.M. and can be installed on 90′-100′ centers.

Standard features include diecast top with integral rubber cover for safety, ground support flange for greater stability, and 2-piece container for easy servicing. **Hydraulic valve-in-heads units are also available.**

If you're in charge of maintaining a golf course or other large playing surface, **the Turf Giant** is for you. It'll save you time, money and effort. If you're designing a new irrigation system, you'll find **the Turf Giant** will require fewer heads to meet your watering objectives.

To discover how you can take advantage of these money-saving features, call DeBra Turf. We'll be happy to show you **the Turf Giant** and help you plan your installation. Don't delay... Do it today.

DeBra Turf & Industrial Equipment Co.
1551 South 30th Ave. • Hollywood, FL 33020
921-1919 Hollywood
659-4533 Palm Beach
Miami 947-5443
Deerfield 427-7616

HURRICANE PROCEDURES

I. MAINTENANCE SHOP:

1. Store all machines and equipment possible inside Maintenance Building.
2. Secure all loose material such as pipe, garbage cans, etc.
3. Check stockade fence for loose boards; brace with 2x4's from both sides.
4. Turn "Off" main breaker switches at Maintenance Building, Pump Stations.
5. Service 2" pump for possible emergency.
6. Install plywood over all glass windows in Maintenance Building.
7. Store all damageable items above ground level.

II. GOLF COURSE:

1. Store all greens flags, ball washers, signs and moveable objects in Maintenance Shop.
2. Clean all drainage inlets.
3. Check all flap gates for proper operation.
4. Prop trailer trees with 2x4's in three directions.
5. Have backhoe, front end loader and trucks serviced and fueled.

III. COUNTRY CLUB:

1. Store all golf cars at Maintenance Compound.
2. Store all golf clubs in locker room.
3. Put 4" pump at top of cart storage.
4. Put storm shutters on windows.
5. Turn off all power except kitchen.
6. Turn off main gas line.
7. Fill kitchen pots with water.
8. Store pool lounges and snack bar furniture in locker room.
9. Remove all outdoor potted plants.
10. Remove all outdoor signs and moveable objects.
11. Store all important records from trailors in Country Club.
12. Store all water damageable items off floor.
13. Put sand bags against locker rooms and clubhouse doors.

IV. TENNIS COURTS:

1. Remove wind breaks from fence.
2. Store all furniture in locker rooms.
3. Remove all signs.

Irrigation Tables

Relation Between Volume Capacity and Time Required to Deliver Various Quantities of Water

Volume capacity, gal. per min.	Time required to deliver water to a depth of									
	½ in.		1 in.		1½ in.		2 in.		2½ in.	
	1,000 sq. ft. min.	1 acre min.	1,000 sq. ft. min.	1 acre min.	1,000 sq. ft. min.	1 acre min.	1,000 sq. ft. min.	1 acre min.	1,000 sq. ft. min.	1 acre min.
10	31.0	...	62.0	...	93.0	...	124.0	...	155.0	
15	20.7	...	41.4	...	62.1	...	82.8	...	103.5	
20	15.5	...	31.0	...	46.5	...	62.0	...	77.5	
25	12.4	...	24.8	...	37.2	...	49.6	...	62.0	
30	10.3	...	20.6	...	30.9	...	41.2	...	51.5	
35	8.9	...	17.8	...	26.7	...	35.6	...	44.5	
40	7.8	...	15.6	...	23.4	...	31.2	...	39.0	
45	6.9	...	13.8	...	20.7	...	27.6	...	34.5	
50	6.2	272	12.4	544	18.6	816	24.8	1,088	31.0	1,360
60	5.2	227	10.4	454	15.6	681	20.8	908	26.0	1,135
70	4.4	194	8.8	388	13.2	582	17.6	776	22.0	970
80	3.9	170	7.8	340	11.7	510	15.6	680	19.5	850
90	3.5	151	7.0	302	10.5	453	14.0	604	17.5	755
100	3.1	136	6.2	272	9.3	408	12.4	544	15.5	680
125	...	109	5.0	218	7.4	327	9.9	436	12.4	545
150	...	91	4.1	182	6.2	273	8.3	364	10.4	455
175	...	78	3.5	156	5.3	234	7.2	312	8.9	390
200	...	68	3.1	136	4.7	204	6.3	272	7.8	340
300	...	45	...	90	3.1	135	4.2	180	5.2	225
400	...	34	...	68	...	102	3.1	136	3.9	170
500	...	27	...	54	...	81	...	108	3.1	135
600	...	23	...	46	...	69	...	92	...	115
700	...	19	...	38	...	57	...	76	...	95
800	...	17	...	34	...	51	...	68	...	85
900	...	15	...	30	...	45	...	60	...	75
1,000	...	14	...	28	...	42	...	56	...	70

Approximate Horsepower Requirements for Irrigation

(Effiiciency of Pumping Plant, 50 per cent of theoretical. Use for estimating purposes only.)

Gal. per min.	Horsepower required for elevations of											
	10 ft.	20 ft.	30 ft.	40 ft.	50 ft.	60 ft.	80 ft.	100 ft.	125 ft.	150 ft.	200 ft.	300 ft.
10	0.05	0.10	0.15	0.20	0.25	0.30	0.40	0.50	0.62	0.75	1.00	1.50
20	0.10	0.20	0.30	0.40	0.50	0.60	0.80	1.00	1.25	1.50	2.00	3.00
30	0.15	0.30	0.45	0.60	0.75	0.90	1.20	1.50	1.87	2.25	3.00	4.50
40	0.20	0.40	0.60	0.80	1.00	1.20	1.60	2.00	2.50	3.00	4.00	6.00
50	0.25	0.50	0.75	1.00	1.25	1.50	2.00	2.50	3.12	3.75	5.00	7.50
60	0.30	0.60	0.90	1.20	1.50	1.80	2.40	3.00	3.75	4.50	6.00	9.00
80	0.40	0.80	1.20	1.60	2.00	2.40	3.20	4.00	5.00	6.00	8.00	12.00
100	0.50	1.00	1.50	2.00	2.50	3.00	4.00	5.00	6.25	7.50	10.00	15.00
125	0.62	1.25	1.87	2.50	3.12	3.75	5.00	6.25	7.81	9.37	12.50	18.75
150	0.75	1.50	2.25	3.00	3.75	4.50	6.00	7.50	9.37	11.25	15.00	22.50
175	0.87	1.75	2.62	3.50	4.37	5.25	7.00	8.75	10.94	13.12	17.50	26.75
200	1.00	2.00	3.00	4.00	5.00	6.00	8.00	10.00	12.50	15.00	20.00	30.00
300	1.50	3.00	4.50	6.00	7.50	9.00	12.00	15.00	18.75	22.50	30.00	45.00
400	2.00	4.00	6.10	8.00	10.00	12.00	16.00	20.00	25.00	30.00	40.00	60.00
500	2.50	5.00	7.50	10.00	12.50	15.00	20.00	25.00	31.25	37.50	50.00	75.00
600	3.00	6.00	9.00	12.00	15.00	18.00	24.00	30.00	37.50	45.00	60.00	90.00
700	3.50	7.00	10.50	14.00	17.50	21.00	28.00	35.00	43.75	52.50	70.00	105.00
800	4.00	8.00	12.00	16.00	20.00	24.00	32.00	40.00	50.00	60.00	80.00	120.00
900	4.50	9.00	13.50	18.00	22.50	27.00	36.00	45.00	56.25	67.50	90.00	135.00
1,000	5.00	10.00	15.00	20.00	25.00	30.00	40.00	50.00	62.50	75.00	100.00	150.00
2,000	10.00	20.00										

Metric Conversions of Weights and Measures

	METRIC	U.S.
Length		
	1 millimeter	= 0.03937 inches
	1 centimeter	= 0.3937 inches
	1 decimeter	= 3.937 inches
	1 meter	= 39.37 inches = 3.280 feet = 1.094 yards
	1 dekameter	= 32.808 feet
	1 kilometer	= 3280.8 feet = 0.621 miles
Area		
	1 square millimeter	= 0.002 square inches
	1 square centimeter	= 0.155 square inches
	1 square decimeter	= 15.500 square inches
	1 square meter	= 10.764 square feet = 1.196 square yards
	1 are	= 119.599 square yards = 0.025 acres
	1 hectare	= 2.471 acres
	1 square kilometer	= 0.386 square miles = 247.1 acres
Volume		
	1 milliliter	= 0.271 fluid drams
	1 liter	= 1.057 liquid quarts
	1 dekaliter	= 2.642 gallons
	1 hectoliter	= 26.418 gallons
Weight		
	1 milligram	= 0.015 grains
	1 gram	= 15.432 grains = 0.035 ounces
	1 kilogram	= 35.274 ounces = 2.205 pounds
	1 metric ton	= 1.102 short (U.S.) tons = 2,204.623 pounds

	U.S.	METRIC
Length		
	1 inch	= 2.54 centimeters
	1 foot	= 0.3048 meters
	1 yard	= 0.9144 meters
	1 mile	= 1,609.3 meters = 1.609 kilometers
Area		
	1 square inch	= 6.4516 square centimeters
	1 square foot	= 9.2903 square decimeters
	1 square yard	= 0.836 square meters
	1 acre	= 0.405 hectares
	1 square mile	= 2.5899 square kilometers
Volume		
	1 pint	= 0.473 liter
	1 quart	= 0.946 liter
	1 gallon	= 3.785 liters
Weight		
	1 grain	= 64.799 milligrams
	1 ounce	= 28.350 grams
	1 pound	= 453.592 grams
	1 short ton	= .907 metric ton

HANDY APPROXIMATE EQUIVALENTS

Many people have ways of making approximate measurements. A man might measure off a room by pacing it off and calculating that his foot equals 12 inches. A woman might measure a length of fabric by stretching it from her nose to the end of her fingers and calling it a yard. Or you might figure that the distance from the tip of one finger to the first knuckle is an inch. To begin thinking in metric terms, you could easily become accustomed to calling your 12-inch foot 30 centimeters, your 36-yard almost one meter, and your inch 25 millimeters. Follow this by thinking of your pound of butter as almost half a kilogram and your quart of milk as almost a liter and you have begun to visualize metric measures.

U.S. TO METRIC APPROXIMATE CONVERSIONS

	When you know:	You find:	If you multiply by:
Length	inches	millimeters	25
	feet	centimeters	30
	yards	meters	0.9
	miles	kilometers	1.6
Area	square inches	square centimeters	6.5
	square feet	square meters	0.09
	square yards	square meters	0.8
	square miles	square kilometers	2.6
	acres	square hectometers (hectares)	0.4
Volume	ounces	milliliters	30
	pints	liters	0.47
	quarts	liters	0.95
	gallons	liters	3.8
Weight	ounces	grams	28
	pounds	kilograms	0.45
	short tons	metric tons	0.9

METRIC TO U.S. APPROXIMATE CONVERSIONS

	When you know:	You find:	If you multiply by:
Length	millimeters	inches	0.04
	centimeters	inches	0.4
	meters	yards	1.1
	kilometers	miles	0.6
Area	square centimeters	square inches	0.16
	square meters	square yards	1.2
	square kilometers	square miles	0.4
	square hectometers (hectares)	acres	2.5
Volume	milliliters	ounces	30
	liters	pints	2.1
	liters	quarts	1.06
	liters	gallons	0.26
Weight	grams	ounces	0.035
	kilograms	pounds	2.2
	metric tons	short tons	1.1

EDITORIAL

I don't know personally of a lawyer who doesn't practice law, a doctor who doesn't use his knowledge to heal, an automobile mechanic who does not keep his hands at least partly greasy. I don't know of a chef who doesn't cook, and so on, ad infinitum.

I do know of clubs that do not allow their superintendents to play golf, except rarely. I even know superintendents who have never even played golf. I question either of these practices. Having been active since before grade school in the golf profession, and having had a father who had over 50 years in the business and other relatives in other parts of golf-related activities, from club members to employees, I just don't understand why a golf club would restrict the golf superintendents activity, playing golf. And I sure can't understand the superintendents who can't, or refuses to learn how to play the game.

How in the world can a non-golfer even understand all the intracacies of the game, much less the prime requirement of the game, a grassed golf course, if he can not personally play the game, and come to appreciate the golfers' point of view?

I wouldn't want a non-participating doctor removing my appendix. I would not want an auto mechanic repairing my roof, and vice-versa. That's how important it is for the golf course Super to play the game. Years ago, my father was required to submit to the board two attested golf scores each and every week. No excuses were accepted for failure. It meant instant discharge.

His predecessor had been on the property as superintendent for over 20 years, and didn't even know the names of the clubs, much less how and where to use them. This golf club was probably one of the first in the country, back in 1928, to recognize this very important part of being a golf course superintendent.

In all the years since then, and even after Dad's retirement and passing that club has had only one superintendent who did not play the game. He didn't even finish two years on the job before he was discharged.

When you go from the best to the worst, spend $50,000 more in an annual budget, and can't give a golfer a golfer's reason for the existing conditions, it must be that you don't know the game. Consequently, he was fired.

Your golf course superintendent doesn't have to be a par buster. Even if he can't break 100, you should see that your pro, or your superintendent set themselves a goal of getting him to shoot to at least within the 85 to 95 range consistently. Their mutual effort at this task, and its being accomplished, will almost automatically make them work together for other good benefits from which the club and its members will profit from in all ways.

A superintendent who can play within the desired range can more adequately satisfy the golfers and committees. Logical answers will be given and accepted. If you know he doesn't play the game and question him about the something, the first thought in your mind is "How the hell does he know, he can't even play the game!"

One of the greatest assets a club can have besides a golfing superintendent, is to allow him to have other superintendents over to play with him periodically. He can get peer opinions from professional people for whom he has great respect. No one knows better the way to travel than a man who has already been there and back. Everyone benefits from such an extended privilege, especially the golfers at the four golf courses these four men represent. After all, the golfers are the people whom we most want to benefit.

I've learned more during the 4-5 hours playing with golf course superintendents than I did in the previous four years of college.

There was theory in print. On the links, it was fact, in the presence of growing turf. If a picture is worth a 1,000 words, problems solved on the spot, by group professionals mutually linked to the common good of all involved must be worth millions of words, and therefore, dollars.

So, get that superintendent out on the golf course, play with him if you're the chairman, or on the committee, or are a board member. Don't take his mind off the game while you're playing, you're both out for that, but try to mutually make the course better for all players. Then after you've finished the round, talk about the problems, then, it will be fresh in both minds.

I'm glad I play the game, and even more glad that some of my fondest memories are of people who helped me be a fair golfer, and at the same time, made me a better golf course superintendent. It's a great challenge and one of the best tools of my trade.

The results for playing and recognizing the golfer's problems helps me give my members a better, more challenging golf course. Afterall, that's what they're paying for, and I like to feel that most of them are happy and proud at our course.

Reprint: "Florida Golf Week". Dan Hall Jr. is superintendent at Countryside CC in Clearwater. He is Vice President of the Florida West Coast Golf Course Superintendents Asso.

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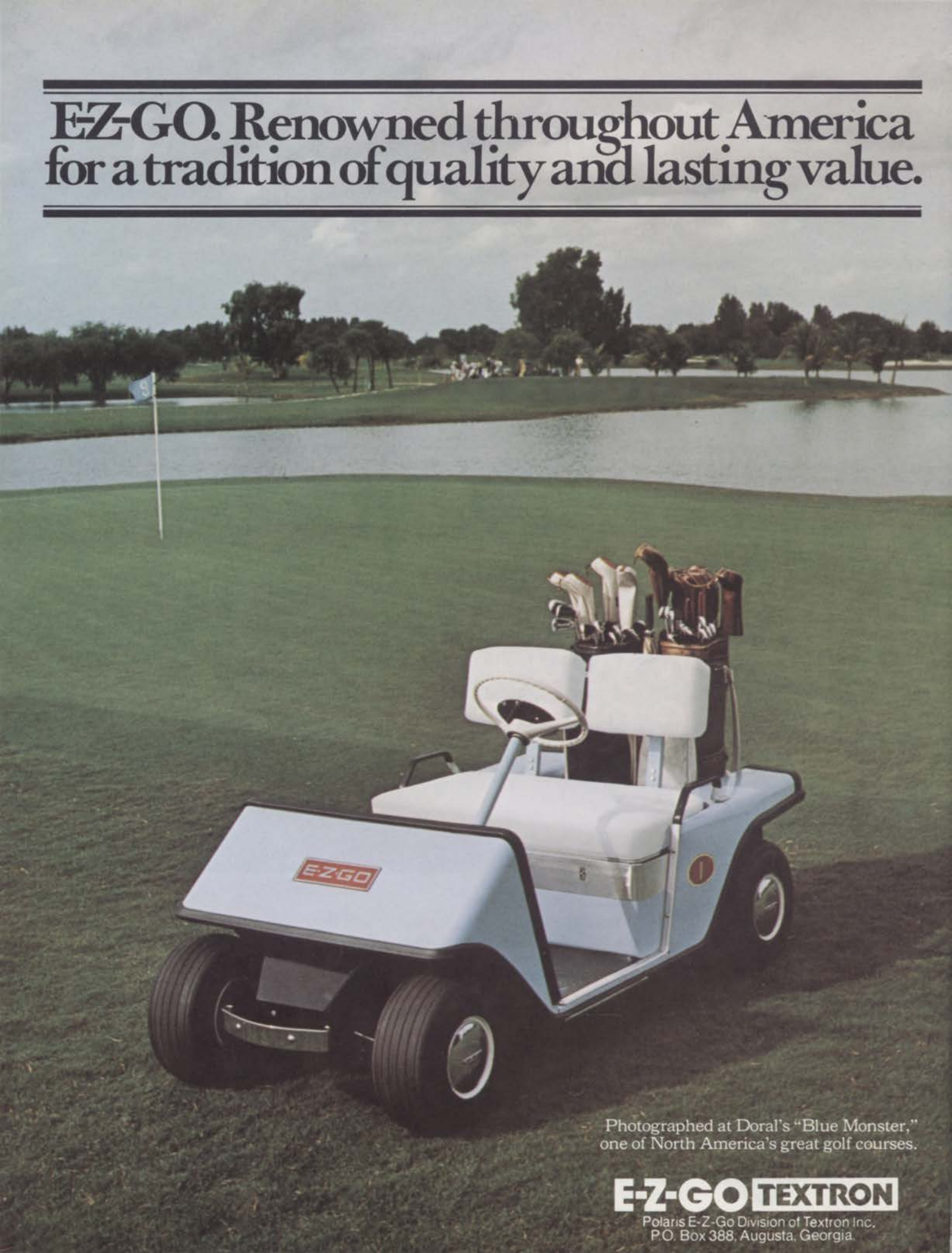

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