Brothers Herb and Joe Graffis have been awarded the 1972 Green Section Award of the United States Golf Assn. for their "distinguished service to golf through work with turfgrass." They are the first dual recipients of the award since its inception in 1961, and the first recipients in the publishing field. Co-founders of GOLFDOM, Joe Graffis presently is associate publisher; Herb Graffis is senior editor.

The award was presented by Philip H. Strubing, USGA president, and Henry Russell, chairman of the USGA Green Section Committee, January 28 at the USGA's Conference on Golf Course Management at the Biltmore Hotel, New York.

"In 1927, Herb and Joe founded GOLFDOM, which they edited and published," the USGA said in an announcement. "Through their editorial policies they encouraged the trial of turf products in experimental plots throughout the country. They also campaigned for improved status and recognition of golf course superintendents, the use of proven turf chemicals, improved drainage, installation of fairway watering systems and automatic irrigation. They helped set guidelines for the use of pull carts, and later for automotive carts to avoid damage to turf."

In addition to their work in publishing, the Graffises founded the National Golf Foundation and helped establish the Golf Course Superintendents Assn. Turfgrass Conference and Show. For many years Herb Graffis has been president of the National Golf Fund, the sponsor of National Golf Day.
LOOK AT WHAT'S BEEN ADDED TO THE CUSHMAN TURF CARE SYSTEM.

NEW Top Dresser

For use with the Cushman wide-box Turf-Truckster. Installs in 3 to 4 minutes and uses power take-off. No separate engine or extra tires and wheels to buy and maintain. Moving bed spreads dry or moist material. Moving brush breaks material up, pushes it downward in an even 36” pattern. Easy to precisely calibrate flow because the Turf-Truckster has efficient engine and ground speed governor control. Spreads greens faster, more evenly...and saves big time between greens. There's no loading and unloading and you can zip from green to green 4 to 5 times faster than with other equipment.

NEW Greens Spiker

Spike a 57 inch swath at one pass, over twice the width of other units. Designed to be pulled by the Turf-Truckster, it spikes cleanly to a depth of 2½” on 1¼” centers. Cuts greens spiking time in half. Cuts total time even more for there's no loading or unloading and the spiker can be quickly towed between greens. A simple, positive mechanical lifting device allows operator to lower unit for spiking or raise it for towing, without leaving his seat. Special guards hold turf in place so it is left smooth, undamaged and ready for play. The Turf-Truckster ground speed governor and fat turf tires also protect greens. Up to 150 lbs. can be added easily for aerating hard packed soils.
The system that can save you 35% of your equipment purchase costs and 50% of your labor costs is now more complete than ever.

The Cushman Turf Care System is built around the highly successful 18 hp. Turf-Truckster and the Turf Minute-Miser, now with 8 horsepower. These vehicles provide your supervisor and crews with low cost transportation plus a highly efficient tow system for mowers, ball-pickers, and other equipment. And you get power to spare to operate Cushman accessories for top dressing, aerating, spraying, dumping and hauling.

The Cushman Turf Care System, a single-source package of vehicles and accessories that saves you time, work and money. Send us the coupon below and we'll prove it!

**NEW 8hp Turf Minute-Miser**

Low cost transportation vehicle for supervisors and workmen. Competitive in price with vehicles that have far fewer quality features. Easy riding, easy driving and easy on the turf with big 6.50 x 8 turf tires. Now available with a powerful 8hp gasoline engine. Power enough for fast personnel transportation plus power to spare for towing the new Cushman low-bed utility trailer, or even a 3-gang ball picker. And you can carry hand tools and another person with the optional covered cargo box and rear personnel seat.

**NEW Low-Bed Utility Trailer**

Economical but rugged low-bed trailer with big turf tires. **Bed size 35" wide by 66" long with a 250 lb. load capacity.** Easily holds several large trash containers, or 2 hand mowers, plus rakes and shovels or whatever equipment is needed at the work site. We'd like to send you information about these new products and the complete Cushman Turf Care System. Let us prove its performance and savings. Drop this coupon in the mail today.

---

**CUSHMAN MOTORS**
Division of Outboard Marine Corporation
993 North 21st Street, Lincoln, Nebraska 68501

Name: ____________________________
Organization: ____________________
Title: _____________________________
Street: ____________________________
City: ___________________ State: __________ Zip: __________

For more information circle number 254 on card
RYEGRASS.
It's the One
You Don't
Need to
Baby.

That's one of the joys of both Annual & Perennial Ryegrass.
Both are very easy to establish and neither requires pampering or special attention.
When you sow it, you need only be sure the seed comes in contact with the ground and it will come on strong in a hurry. Normally this is in 6 to 14 days.
Sow it even under unfavorable dry conditions and it will take off as soon as there is moisture.
Both Gulf Annual or Annual are favorites in Southern regions for overseeding greens, tees and fairways.
Linn Perennial is popular in Northern regions for fairways because it stands up to heavy foot and vehicle traffic and responds rapidly to water and fertilization.

Write for free informational brochures.

OREGON RYEGRASS COMMISSION
Dept. 1, Rivergrove Building
2111 Front St., N.E.
Salem, Oregon 97303

Shakespeare introduces a graphite shaft

Shakespeare Company of Columbia, S.C., has announced the introduction of a graphite fiber golf club shaft in a driver for 1972.

According to Frank Thomas of Shakespeare's central engineering group, a shaft of Thornel graphite yarn has been developed using computer and space-age materials. Shakespeare, well-known for its fiberglass fishing and archery equipment, has also bolstered the strength of its fiberglass shaft, long considered by some manufacturers to be too whippy or weak. According to Thomas, a new method of constructing the glass fibers has enabled Shakespeare to challenge the dominance of aluminum, steel and lightweight steel shafts.

Shakespeare said that its Tor Fil Sigma driver with its graphite shaft will be available by early spring, but the retail price will probably not cause a mass buying movement by the public. A spokesman for Shakespeare estimated that the graphite shafted driver with an extremely stiff, but strong shaft, would retail for around $100. The marketing is currently being directed toward the big hitter and the professional golfer.

Bernie Lavins, Shakespeare's vice president for manufacturing, says, "The weight of the head can be slightly increased with the decrease in shaft weight. By lightening the shaft of the club," Lavins explains, "we have made it possible to increase clubhead speed without decreasing head mass." In addition to its lightweight and regular steel shafts, all-fiberglass and all-graphite shafts, Shakespeare is also preparing a combination graphite-fiberglass shaft. This shaft will be more in the buying range of golfers than the all-graphite shaft, says a company spokesman. Although Shakespeare has not found another golf equipment manufacturer to buy its Union Carbide-developed graphite shaft concept, the company is pursuing this avenue as well as attempting to find tour professionals willing to test the shaft. Professional Don January, under contract to Shakespeare, has worked with the company in testing and designing the graphite shaft.

According to Thomas, the over-all weight of the graphite shaft is 2.6 ounces as opposed 4.0 to 4.5 ounces for steel.

Chlevin resigns top GCSAA post

Ben Chlevin, for seven years executive director of the Golf Course Superintendents Assn. of America, resigned effective January 31. The announcement came prior to the GCSAA Conference and Turfgrass Show in Cincinnati, February 13 to 18, and was accepted "with regret" by the GCSAA Executive Committee, according to association President Richard Blake.

"I have no definite plans at this time," said Chlevin, "although I would like to go into public relations activity connected with the golf industry."

Chlevin served as public relations director of the National Golf Foundation from 1953 to 1960; assistant to the publisher, GOLFDOM Magazine from 1960 to 1964, and was named executive director of the GCSAA December 1, 1964.

During his tenure the GCSAA headquarters were relocated from Jacksonville, Fla., to Chicago. The association's membership increased from 2,000 to 3,000, and the annual budget doubled from $275,000 to over $550,000.

GOLFDOM Senior Editor Herb Graffis, in commenting on Chlevin's resignation, said, "Solid progress and smooth operations in the superintendents' association have been achieved since Chlevin has been on the job."

Dr. Paul Alexander, director of education for the GCSAA, is acting as temporary executive director until a successor is found.
"PO-SAN" stops Poa annua!

Mallinckrodt CHEMICAL WORKS
ST. LOUIS
Jersey City • Los Angeles • Montreal

IF YOU DON'T BELIEVE IT, CALL ME COLLECT!"

"I'm Marv Scobee, superintendent at Highland Golf and Country Club, Indianapolis.

Last fall I PO-SAN-treated 18 fairways. Some had 85% Poa annua. A week after the PO-SAN application, I drill-seeded all fairways to Highland bentgrass.

Result? Astounding! The initial turf yellowing from the PO-SAN (which I had expected) left in about 10 days — and the bent, well fertilized, "came on like gang-busters" — filling in quickly as the Poa retreated. My fairways, shown here 5 weeks after the PO-SAN treatment (and 4 weeks after seeding) are the most beautiful we've ever had. The Poa is down to about 25% — and I'm rapidly approaching 100% bent fairways! A real PO-SAN bonus — it killed practically all the clover, knotweed, and other broadleaf weeds! Now I have beautiful fairways, far less Poa than ever before, and 350 mighty pleased club members and officials.

You bet I'll continue PO-SAN in 1972!

To share my enthusiasm for PO-SAN, give me a buzz. PO-SAN has to be "the way to go" in fairway Poa control."

Yours for Poa-free fairways

Marvin Scobee
Call me collect at (317) 255-6776

Growth Retardant lor Post Emergence Control of FAIRWAY POA ANNUA

ILLINOIS:
PO-SAN has dropped my fairway Poa annua at least 25% with a single year's application and with no harmful residues. I'm certain-ly going the PO-SAN route again in '72.
Bill Selg
Oak Park C. C., Chicago
Call me collect at (312) 722-7493

WISCONSIN:
"... pleasing to observe PO-SAN's results in Poa control. I'm hopeful all our fairways will be on the PO-SAN program in the near future.”
Bill Sell
Ridgeway C. C., Neenah
Call me collect at (414) 429-0848

NEW JERSEY:
"PO-SAN has done what you claim. We've reduced the Poa in our fairways quite considerably." Jack Montanelli
Woodcrest C. C., Cherry Hill
Call me collect at (609) 429-0848

NEBRASKA
"PO-SAN has dropped my Poa remarkably with no injury to my bluegrass fairways. It has also saved labor in reduced fairway mowings. I plan increased PO-SAN usage in 1972."
Jon Hardwick
C. C. of Lincoln, Lincoln
Call me collect at (402) 423-4415

OREGON
"PO-SAN has turned the tide in controlling Poa annua. It's way down from the 90%, we had in early 1976. We plan PO-SAN again on all fairways in '72 — and some PO-SAN tests on greens."
Tom Manning
Columbia-Edgewater C. C.
Portland
Call me collect at (503) 285-8111

For more information circle number 178 on card
Influences on water use rate of Penncross creeping bentgrass


The objective of this study was to determine the relative importance of selected cultural and environmental factors on the water use rate of a Penncross creeping bentgrass turf. Correlations were also made with the stomatal density of the leaves when grown under various environmental and cultural conditions. The stomatal density counts were made from clear-nitrocellulose replications of the leaf blade surface.

The water use rates were determined in a specially devised wind tunnel. The environmental conditions maintained in the chamber included a temperature of 91 degrees F, 40 per cent relative humidity, a four mph constant wind velocity and a moderately low light intensity of 25,800 lux. The environmental and cultural conditions in the five experiments were as follows: experiment one included light intensity treatments of (a) 3,762 lux, (b) 25,800 lux and (c) full sunlight. The influence of the previous growing temperature was determined in experiment two. The treatments included (a) 50, (b) 68 and (c) 91 degree F soil temperatures for 2.5 months prior to determinations of the water use rate. In experiment three, there were three cutting heights: (a) 0.25, (b) 1 and (c) 5 inches applied on a weekly clipping schedule during the three-month growing period. In experiment four the water application rate effect was determined. The three treatments included: (a) 0.5, (b) 1 and (c) 4 inches of water applied weekly for three months prior to determination of the water use rate. In experiment five, three irrigation frequencies were evaluated. Included were (a) water applied only when visual wilt occurred, (b) watering three times a week to a saturated soil condition and (c) watering daily to a saturated soil condition. As in most of the previous studies, this experiment was conducted for a three-month period prior to placement in the wind tunnel for the evaluation of the water use rate as well as for the determination of the stomatal density.

An assessment of the stomatal density data indicated that there was a three-fold greater number of stomata on the upper surface of the Penncross creeping bentgrass leaf compared to the lower surface of the leaf blade. The actual stomatal density in this study ranged from 72 to 125 stomata per square millimeter.

(Continued on page 29)
In 24 minutes we can show you how to avoid the five major pitfalls of turf irrigation

Ask to see our new slide-sound film, "The True Pattern of Turf Irrigation."

In less than half an hour, you’ll get new insights—and some surprising facts—on sprinkler patterns, water penetration, pressure regulation and irrigation uniformity. Ways to avoid the pitfalls.

You’ll also see how your job can be done without wasting water or manpower. And without overspending.

To do it right, Buckner has the broadest line of sprinkler equipment in the business.

So you don’t have to “make do” with one or two sprinkler head designs. You can specify exactly the right one from fifteen different valve-in-head, cam, impact or gear driven Buckner heads. Plus almost infinite variations of popup or shrub heads. And your system is completed properly with the most advanced pressure-regulated electric or hydraulic valves, controllers and programmers—including our great money-saving simplifier, the CP-2 Dual Central Program System.

Send the coupon or call your Buckner professional to see this film. It’s a worthwhile 24 minutes.

For more information circle number 191 on card
It's about time!

IT'S ABOUT TIME for a different concept in nitrogen—IBDU. It can be used alone, or in combination with other nitrogens, for a complete range of nitrogen release rates.

IT'S ABOUT TIME because IBDU is slow release. IBDU is activated by hydrolysis (water), so it isn't affected by sudden changes in temperature or bacterial activity. Use IBDU and avoid the sudden flush of growth that occurs when temperature or humidity rise, and cut down on the chance of disease infestation. And it won't leach out when the spring rains come.

IT'S ABOUT TIME because IBDU will keep on feeding after the other products have stopped. IBDU releases twice the slow nitrogen of urea-formaldehydes, and will keep feeding at lower temperatures. IBDU will help keep your turf green longer in the fall—and green up sooner in the spring.

IT'S ABOUT TIME because you can safely apply IBDU at higher rates than normal with more even release—and that means fewer applications. Fewer applications mean time saved and time means money.

Patterns showing rates of mineralization of IBDU and urea-formaldehyde.
In experiment one the water use rate of Penncross creeping bentgrass increased as the light intensity was increased. There was also a corresponding increase in stomatal density with increased light intensities. Thus, the light conditions under which turfgrasses grow have a strong influence on the density of stomata formed on the leaf surface. This in turn affects the water use rate. Turfs growing in shade would have a lower water use rate compared to adjacent turfs of the same species growing in full sunlight.

In experiment two, it was found that suboptimal growing temperatures resulted in a reduction of both the water use rate and the stomatal density. A 30 per cent reduction in stomatal density occurred between 68 and 50 degrees F, while the water use rate declined by 20 per cent. There were no differences observed in the water use rate or stomatal density between the 68 and 91 degree F growing temperatures. In this regard, the soil temperature is more important than the air temperature. Turfs growing under cool conditions form a reduced number of stomata per unit area and therefore have a lower water use rate.

In experiment three the water use rate increased as the height of cut was raised. In raising the height of cut from 0.25 to one inch the water use rate increased 53 per cent. This results primarily from the greater leaf area exposed to the evaporative conditions of the atmosphere.

In experiment four the water use rate decreased as the water application rate was increased. In experiment five frequently irrigated turfs had an increased water use rate. The author concluded that, of the factors studied, the light intensity, cutting height and frequency of irrigation had the greatest influence on the water use rate.

Comments: The water use rate is defined as the total amount of water required for turfgrass growth plus the quantity lost by transpiration and evaporation from the soil and plant surfaces. The rate of water use of most turfgrasses under normal conditions usually ranges from 0.1 to 0.3 inch per day. Water use rates as high (Continued on page 30)
Ryan aerators help rolling hills...

and level land to breathe better.

Relieving compacted turf on playgrounds, parks, golf courses means getting more air to turf roots. Turf breathes easier, grows healthier. Ryan aerators core, slice, and renovate turf to keep it breathing better all season.

The Ryan Renovaire (1) is designed to contour aerate compacted turf on hilly and undulating areas. Its tine wheels are mounted in pairs to operate independently and follow "the lay of the land." High and low spots get equal penetration.

On large level turf areas (football fields, fairways and other level ground) the Ryan Tracaire (2) does great. With either unit, a dragmat breaks up cores so you top dress and aerate in one operation.

Interchangeable tines convert both the Renovaire and Tracaire to core, slice, or renovate, depending upon the season and condition of the turf. In early spring and fall the coring tines are used to aerate compacted turf, allowing air, water and fertilizer to penetrate. During hot weather the slicing tines gently keep the turf open and cushion-soft. The renovating tines are ideal for late fall conditioning of "problem" turf areas. Renovating does a thorough rebuilding job for seeding and fertilizing.

Both machines cover a 6-ft. swath and can aerate at speeds up to 10 mph. The Tracaire is available in two models: 9-wheel and 12-wheel which attach to a standard 3-pt. tractor hitch. The Renovaire has 12 aerating wheels and attaches to a tractor drawbar. Keep your turf free from compaction and breathing all season with a Ryan aerator.

Write for a FREE Ryan catalog.

RYAN EQUIPMENT COMPANY
2055 White Bear Avenue
St. Paul, Minnesota 55109
Telephone 612-777-7461

SUBSIDIARY OF OUTBOARD MARINE CORP.
SEE US AT THE GCSAA SHOW—CINCINNATI

For more information circle number 207 on card

as 0.45 inch may occur under conditions of high evapotranspiration. This situation usually exists only in early to midsummer when peak water use rates are more common.

A knowledge of the water use rate of turfgrasses is important in designing and utilizing irrigation systems. It is also important to obtain information on the relative importance of various environmental and cultural factors on the water use rate. In this way it may be possible to modify certain environmental conditions or to alter certain turfgrass cultural practices so that the water use rate of a specific turf can be reduced. This probably will become more important as water availability becomes limited in the future.

The stomata are extremely important structures because they are the primary avenues or openings through which gas and water exchange with the external atmosphere. Although the stomata compose only 2 to 3 percent of the turfgrass leaf area, they are responsible for as much as 90 percent or more of the total water loss from the turfgrass plant to the atmosphere. Stomata may occur on the stem tissue but in a substantially reduced density compared to the leaf blades. The rate of water loss by stomatal transpiration is a function of the water vapor gradient between the leaf tissue and the external atmosphere. It increases with (a) a decrease in the atmospheric water vapor content adjacent to the leaf, (b) an increase in the wind velocity adjacent to the leaf, (c) a high leaf moisture content and (d) an increase in the leaf and atmospheric temperature.

As demonstrated in this paper, the density of stomata varies with the environmental and cultural conditions under which the stomata develop. The stomata density will also vary with the turfgrass species. The stomata on turfgrass leaves are usually arranged in longitudinal rows interspersed with other epidermal cells. The opening of stomata for water loss is stimulated by exposure to light. Generally, the stomata are closed during dark periods. Thus, the water loss by evapotranspiration is less at night.

Of the environmental factors in-