A special section exclusively
for the southern superintendent.

Golf Business South

Why South? Conditions are different.

There is no animosity, but you hear Southern Superintendents saying, "We're completely different from the North. We don't have the winter-time to fix our equipment. We run all year-round." And in the general text of that statement, it is true that conditions in the South are much different than in the North. However, reversing that statement and saying conditions in the North are much different than in the South, puts the burden on the Northern Superintendent. They have to deal with such things as snow mold, aetenius beetle, etc. The Southern Superintendent has to deal with mole crickets and overseeding.

Perhaps Jim Bertoni, Superintendent at La Jolla CC in southern California, said it best. "An article written for conditions in the cool season growing climate might cover the majority of superintendents. An article written about my conditions would benefit only a few superintendents."

We have long been accused of ignoring the South and concentrating on the North. And it's true, we have. So now we're correcting the problem. We are directing a special bi-monthly supplement at the problems a Southern Superintendent faces and trying to help with the dissemination of the information that the university people are putting out. We want also to act as a forum for superintendents. There are many fine ideas that can be shared and benefit quite a few. However, the problem is a little more complex than it seems. "The South" cannot be an all encompassing term. The problems of a superintendent in northern Florida are much different than those in the southern part of the state.

Arizona superintendents have to deal with desert conditions. Freezing temperatures at night, heat in the day. Others have their problems. Some southern California soils are not meant for the rains. They get 2½ inches of rain in a day and it brings disasterous results. The soils are heavy clay and turn to jello. Trees uproot because of high winds and soils that just can't hold them in after rain. And then the rain creates lush vegetation that dries up and turns brown in August. Then fires are likely. The water sources in the West are often high in salt. Even with all the rain in southern California, there is still a water shortage. There are not enough reservoirs to hold enough for future use. Bertoni paid $45,000 for water last year.

Out of it all, the common sense of the superintendent prevails and he gets the job done. Clint Smallridge, at Royal Poinciana in Florida, is one who realizes the importance of communicating with the members of his club in terms that they can relate to. One idea, that of relating equipment use in miles traveled, rather than hours, almost doubled his equipment budget. Think about it. If you drive a fairway unit eight hours a day, five days a week, 52 weeks a year and keep it for 10 years, by rough figures it has about 600,000 miles on it. And the miles are hard ones, stopping, starting, turning. Anyone can relate to why it is worn out.

While some areas of the country are not growing right now, the Sunbelt is advancing rapidly. There are some 37 courses being built or added on to in Florida alone. Bob Sanderson doesn't think the recession is affecting the economy there. The company he works for went into summer with a backlog of 1200 homes to build.

The energy crisis is affecting the South. Superintendents are concerned with the most efficient equipment. Smallridge has converted to diesel and is using only one-third the fuel he was. Sanderson is thinking of conversion to LP gas. David Harmon, Superintendent at Golden Horseshoe in Virginia, went on gas rationing, altered his mowing heights and frequency and saved 300 gallons in one month. And the members didn't seem to notice that the course was a little different.

Harmon does feel that tourism has slowed down some in his area. Some superintendents in his area have been put on a bonus plan, where they get a percentage of what they save in the budget. It would make a superintendent think twice about providing extras. But that again depends on the course. A resort course has to provide the extras because a golfer is paying the premium and expects it.

He now puts his chemicals, fertilizer, and even oil filters and spark plugs out for bid. He was amazed at the variance in price between distributors on name brand chemicals.

So you see there are many ideas that relate to the South and for which a particular forum is needed. GOLF BUSINESS South intends to provide that forum. But a forum, by definition, requires an exchange of ideas and that doesn't come about unless someone speaks up. Many are ready and willing.

Jim Bertoni feels adamant about this. "We are losing our chemicals and what are we doing about it? What is our responsibility to our club? Just to continue to learn how to grow grass, or to advance with society and say this is going to hurt our club in the long run? It's time I tie in with my associates in my profession and we stand unified against the loss of these chemicals."

Aubrey Roy, Superintendent at Sea Pines Plantation in Georgia, recognizes the problem as he looks for an alternative chemical for sting nematodes. Now that they have taken Fumazone off the market, and Nemacur costs $97 a bag, what do you use? He is looking to researchers for the information. He wants to know when crowfoot germinates in his area. When do you go on a preemergent program for it? And what about creeping charlie? He doesn't have a chemical registered for it.

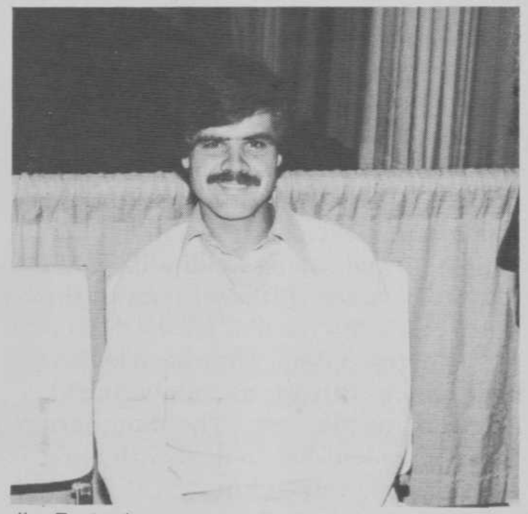
These are the kinds of things that make us excited about our new supplement. At the GCSAA show, when we talked to all the superintendents pictured on the next two pages, this excitement was great enough to make us go ahead with it. We plan to work hard to tailor our articles to the needs of the Southern Superintendent. And, as I say all to often, we can only do it if you tell us when we're on track or off track. It's kind of like the fellow you have mowing. He's not going to raise or lower the height of cut unless you tell him to. We have some good ideas and I know you do to. We're looking forward to passing all of them around. As I heard from one superintendent, "We tend to look upon a weed as a problem. The weed isn't really the problem. What's wrong that allows it to grow there is the problem." Same with us. You look at an article and say it isn't right for you. Tell us what is right for you. We'll look for some fertilizer for the idea. *Ron Morris.*

Southern Superintendents speak:

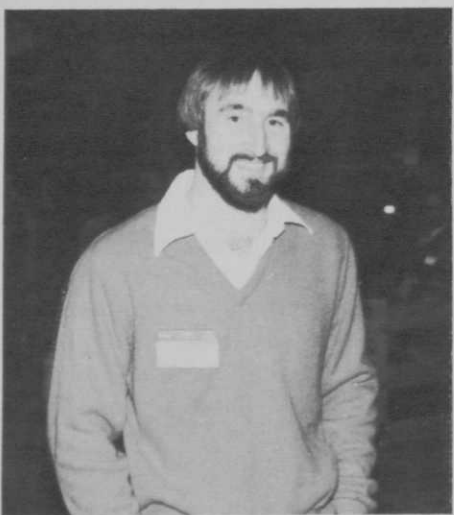
Aubrey Roy
Sea Pines Plantation

I've been irrigating with effluent water. I believe all the courses on Hilton Head will convert within the next ten years. We need to find out when crowfoot germinates in our area for a preemergent program and we need to know more about creeping charlie.

Traveling for an hour, I can go surfing, ride a dune buggie, or ski. You can see the tremendous variation that occurs in golf courses.



Jim Bertoni
La Jolla CC



Ken Mangum
Lagoon Park

We have problems with transition. Last year I had ryegrass in July. The bermuda just sits there. It varies, though. Three miles down the road it'll be perfect. The next year I'll have the right conditions.

Lindy L.S. Loo
State of Hawaii

We have to carefully watch humidity in Hawaii. Our temperatures don't vary much, 68-72 in the morning, getting up around 82-84 in the afternoon. Summer humidity might be 10-25 percent, but in winter it gets up to 70, 80 or 90 percent. Pythium can become a problem.

David Harmon
Golden Horseshoe GC

Some courses in our area are putting superintendents on a bonus program. Anything they can save, they get a percentage of. It makes you think cost efficiency. Some extras you have to do if you're a resort course. If you're going to charge the prices of a resort course, golfers expect the luxury.

Courses in Arizona have to put up with extreme temperature changes. The irrigation system might be frozen in the morning, by mid-day it's a 110. A lot of courses are going with fertilizer injection systems. $8,000 extra is not much when you're talking about $600,000.

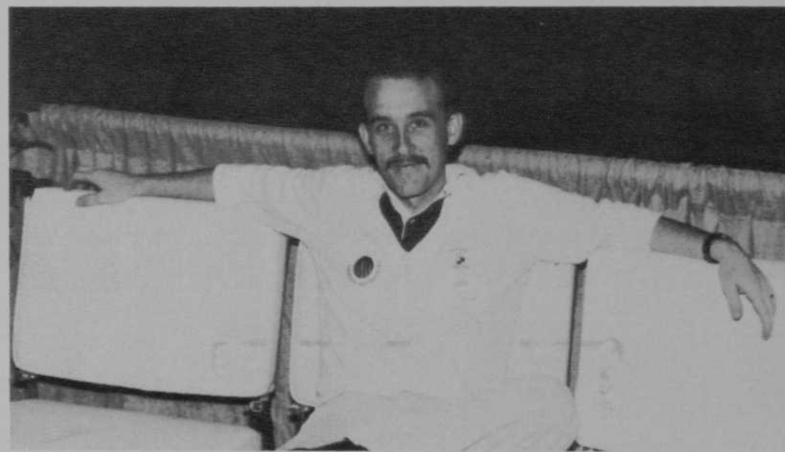
Bob Sanders
Antelope Hills GC

Larry Brooks
Oro Valley CC

Hunter Gammon
West Creek GC

The Carolinas are being recognized as a prime area for industry. Population is increasing. The Carolina's section of the PGA holds over 70 golfing events. Some of the biggest and most prestigious events are here.

Weather can shift the best plans. We had 18 inches of rain last September and had to aerify in October, right before winter. I didn't want to but would have had to put up with algae all year long.



Gary Morgan
Sherwood CC

Hilding Hanson
Sahara CC

I've found, at Royal Poinciana, that I can be more effective as a superintendent by relating my needs in terms the members can understand. For example, I relate my equipment needs in miles rather than hours. A member understands when you tell him a mower has 200,000 miles on it.

Clint Smallridge
Royal Poinciana GC

Tourism in Florida has gotten bigger, if anything. There are more people living here. Our main problem is going to be energy. We need to develop systems to create energy from our grass clippings. I've converted to diesel on all my equipment and am using only a third the gasoline of a year ago.

I went to the GCSAA show looking for answers about LP gas. I'm hoping to convert at least one greens mower, one fairway unit, and a run-about. I want to be ready in case the fuel situation gets critical. I'll still be able to get things done. Besides, it's much cleaner and more efficient.

Bob Sanderson
Port Charlotte GC

Paul McGinnis
Palmbrook CC

Ron Powell
Pinetop CC

You have to have an irrigation system in Arizona. Then you have to find the water for it. We do a lot of aquatic weed control, taking care of our water sources.

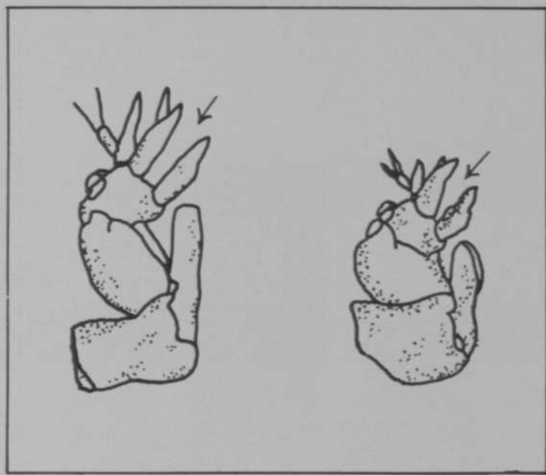
Mole crickets damage turf across the South

A mole cricket tunneling through the soil, feeding on turfgrass roots produces three types of damage. The first two are rather obvious. The ridges it leaves on the surface look as though a miniature mole has been at work. Rootfeeding can dangerously weaken the turf. The third type of damage is such that you might think it was caused by the crickets actually feeding on the plant. However, while the rootfeeding itself might not critically damage the plant, the tunneling creates an uprooting effect and subjects the plant to dessication. The loosening of the soil causes the plant to dry and turn brown.

Dr. James Reinert, University of Florida at the Agricultural Research Center in Ft. Lauderdale, has been studying the mole cricket and its habits for between three and four years. There are now eight people in the state of Florida working with the mole cricket. It was determined that, over the two year period of 1976-1978, in the state of Florida alone, mole crickets caused $100 million in damage. The damage is not solely to turf, but involves pasture grasses, truck and field crops. Turf is an important crop as any in Florida because the state depends to a great extent on the tourist trade that is drawn by the golf courses.

The mole cricket and its damage is not confined only to Florida, either. While Dr. Reinert has been gathering data for northern Florida, he is not sure whether it holds true for the mole crickets that damage turf throughout the South. Mole crickets have created severe problems along the coast of southern Georgia. Many exclusive courses there are on an intensive mole cricket program just to try to keep their grass. Dr. Reinert noted one superintendent from that area who was planning to spend two-thirds of his pesticide budget against mole crickets.

But while research to date has not moved at the pace the scientists would like, there are promising developments on the horizon. Imagine if you can, a forlorn scientist in the middle of a golf course playing old records of the mole cricket's mating call. It really doesn't come off that romantic, does it? However, Dr. Tom Walker with the University of Florida in Gainesville has recorded the mole crickets mating call and can, during the mole cricket's mating flight, attract large numbers. This will allow scientists to study the crickets in large numbers in their controlled experiments and determine new and/or more efficient ways of combatting them.



The tibial dactyls (arrows) of the Southern mole cricket (left) are separated by a space almost as great as the width of one of them, while the space is much less than that width in the Puerto Rican mole cricket. The space is U-shaped in the Southern and V-shaped in the Puerto Rican.

Mole crickets fly predominantly two times a year. In the Gainesville area, Dr. Reinert says that they fly some in February with the main flight coming in late May or early June. Coinciding, naturally, with the mating flights, egg production begins in the latter part of March with the peak egg-laying period coming in late May through mid-June. Temperature determines the time period before the eggs begin to hatch. Those laid in March typically require about 35 days to hatch while those deposited in May or June require only about 20 days.

The eggs are deposited in hollow "chambers" tunneled in the soil. The chambers are typically in the upper five inches of the soil profile, but may vary from one to twelve inches. Low temperatures and dry soil will cause the mole cricket to dig deeper.

The mole cricket goes through a typical incomplete metamorphosis. It goes from egg to nymph with eight instars, to adult. As indicated, nymphs will begin to hatch in the latter part of April. When it first comes out, the nymph is completely white, but quickly turns brownish-black. The quarter-inch long, first instar will tunnel to the surface approximately nine days after hatching. As the cricket enjoys his turfgrass diet, he grows bigger, finally reaching 1½ to 1¾-inches as an adult by about mid-September.

Dr. Reinert has found that the crickets feed severely in bermudagrass and bahiagrass, both of which are used in turf culture. Zoysia does not seem to be affected, although, relatively speaking, there is little of it around. St. Augustine is damaged, but due to its mat type of growth, is not affected so much. Dr. Reinert notes that loose knit grasses, such as bahia, are more subject to dessication when the soil is loosened under it. Bermudagrass is usually cut very short, leaving it without protection and mole cricket damage shows up right away.

Dr. Reinert suggests that we may see switches to new varieties as they are developed. He is doing work looking for host plant resistance to insects. One that proves promising is an experimental variety of bermudagrass that is also 100 percent resistant to the bermudagrass mite. While not resistant to mole crickets, because they do feed on it, the variety is tolerant of the feeding activity. In a controlled experiment, Dr. Reinert set up tests of the grass with and without the mole crickets. The grass with the crickets actually had more root and top growth than the grass without the crickets. "The natural assumption," Dr. Reinert says, "would be that we're actually stimulating more growth by the cricket activity. The bermuda was actually spreading out over the damaged area." The grass hasn't been tested in field plots yet and still has only an experimental number. It will be a year, maybe two before enough data is accumulated to release it to the industry.

The grass itself is coarse and looks similar to common bermuda. It requires low fertility however, and would probably make a good grass for roughs, fairways and tees, but definitely not for greens, Dr. Reinert suggests. He points out, though, that by eliminating the roughs, fairways, and tees you have eliminated most of the acreage you would have to treat.

That is one of the main problems, he adds, in treating for mole crickets. The amount of acreage in treating the entire course and the price of insecticides make it prohibitive to those who can't buy it just because they need it.

Dr. Reinert has noted extensive damage from areas with mole cricket densities of four per square foot. Their nature is something that is going to take more study before it is fully understood. On the course, mole crickets often start in the lip around traps and zero in on the greens. Dr. Reinert did some tests in which he gave mole crickets a choice between St. Augustine, bermudagrass, cypress mulch and bare sand. He counted the most crickets in the bare sand.

There are several chemicals that are labeled for mole crickets. Dr. Reinert reports good results with dursban, Baygon, Scotts Nematicide / Insecticide (ethoprop), and malathion. Dr. Reinert likes to encourage superintendents to use chemicals in bait form.

The crickets come to the surface at night and will readily feed on the baits. The cricket nymphs do not seem to want to feed however, if the soil is dry or cold. Once the baits are out, heat and moisture will act to break down the active ingredients. Timing the bait application in June or July, right after the rains end and are not expected for some days again would be just about right. There is also the fact that irrigation after putting the baits out will destroy their effectiveness. Good baits include 0.5 percent Dursban, 2.0 percent Baygon and 2.0 percent malathion.

Others in the industry have pointed out that there will probably be no new pesticide developments at all in the decade to come. However, some pesticides on the market that are not labeled for mole crickets show a pronounced activity on mole crickets as they are sprayed for other intended targets.

The effects of these chemicals on non-target wildlife could lead to loss of their use entirely, however. Extreme care should be taken in using any of these chemicals, not only for your own safety, but for the continued use of the pesticides we have that have proven so effective against the pests that they are labeled for.

Sampling technique for mole crickets

Infestations of mole crickets, *Scapteriscus acletus* Rehn and Hebard and the changa, *S. vicinus* Scudder, are sporadic, unpredictable, and difficult to detect in early summer, at the optiets were counted for 3 min. following applied. Most nymphs are 1st to 3rd instars at this time and too small to cause noticeable tunnelling on the soil surface (Hayslip 1943, Fla. Ent. 26(3): 33-46). Usually infestations are not noticed until tunnelling activity is visible. When visible tunnels are present, damage has already occurred; the nymphs are approaching maturity and are more difficult to control.

During August 1978, 5 materials were applied to Bermudagrass, *Cynodon dactylon* (L.), and evaluated for their ability to flush mole crickets to the soil surface. The following materials and amounts were used per 4 liters of water: Fifteen ml of synergized pyrethrins (1.2% pyrethrins and 9.6% peperonyl butoxide), 15 ml Ivory® dishwashing soap, 118 ml 4% apple cider vinegar, 30 ml Lysol®, 60 ml Parson's Sudsy Ammonia®, and 118 ml 4% apple cider vinegar plus 15 ml Ivory® dishwashing soap. Water was used as a check. The treatments were randomly assigned in an infested area and 4 liters of mixture were applied with a 7.5 liter sprinkling can to 0.6 m/2 soil surface. Emerging mole crickets were counted for 3 min. following application. Each treatment was replicated 26 times.

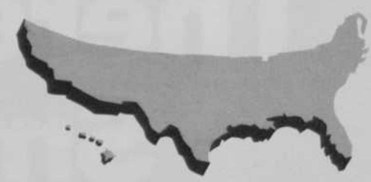
Pyrethrins were the most effective material, flushing a mean of 11.46 mole crickets/0.6m/2. Mole crickets irritated with pyrethrins usually emerged on the soil surface within 30 sec after application. Dishwashing soap (Ivory Liquid® Flushed ca. 30% fewer mole crickets than pyrethrins but the flushing action was just as rapid. The addition of vinegar did not enhance the activity. Sudsy ammonia, Lysol® and vinegar flushed significantly fewer than pyrethrins or soap. No phytoxicity was noted with any of the materials.

In treated plots, we observed that other species of arthropods were rapidly flushed by pyrethrins or soap, including armyworm larvae, *Spodoptera* sp.; sod webworm, *Crambus* sp.; earwigs, *Euborellia* sp.; crickets, *Gryllus* sp.; and centipedes.

The soap mixtures was also evaluated on St. Augustine grass. Chinch bugs, *Blissus* sp.; and bigeyed bugs, *Geocoris* sp. were readily flushed to the surface of the grass. This technique was determined to be much easier simpler than the recommended coffee can technique for flushing chinch bugs (Brogdon and Kerr 1961, Agri. Ext. Serv., Univ. of Fla., Gainesville, Circ. 213).

Preliminary tests with Dove®, Joy®, Palmolive®, and Lux® liquid dishwashing soap indicated they were equally effective as Ivory® in flushing activity. The results of this test indicate that the use of dishwashing soap is a simple, effective and readily available surveillance material. — D. E. SHORT AND P. G. KOEHLER, Dept. of Ent. and Nema., University of Florida, Gainesville, 32611, from *The Florida Entomologist*, Sept. 1979.

The related functions of water and turfgrasses



By William R. Kneebone, Dept. of Plant Sciences, University of Arizona

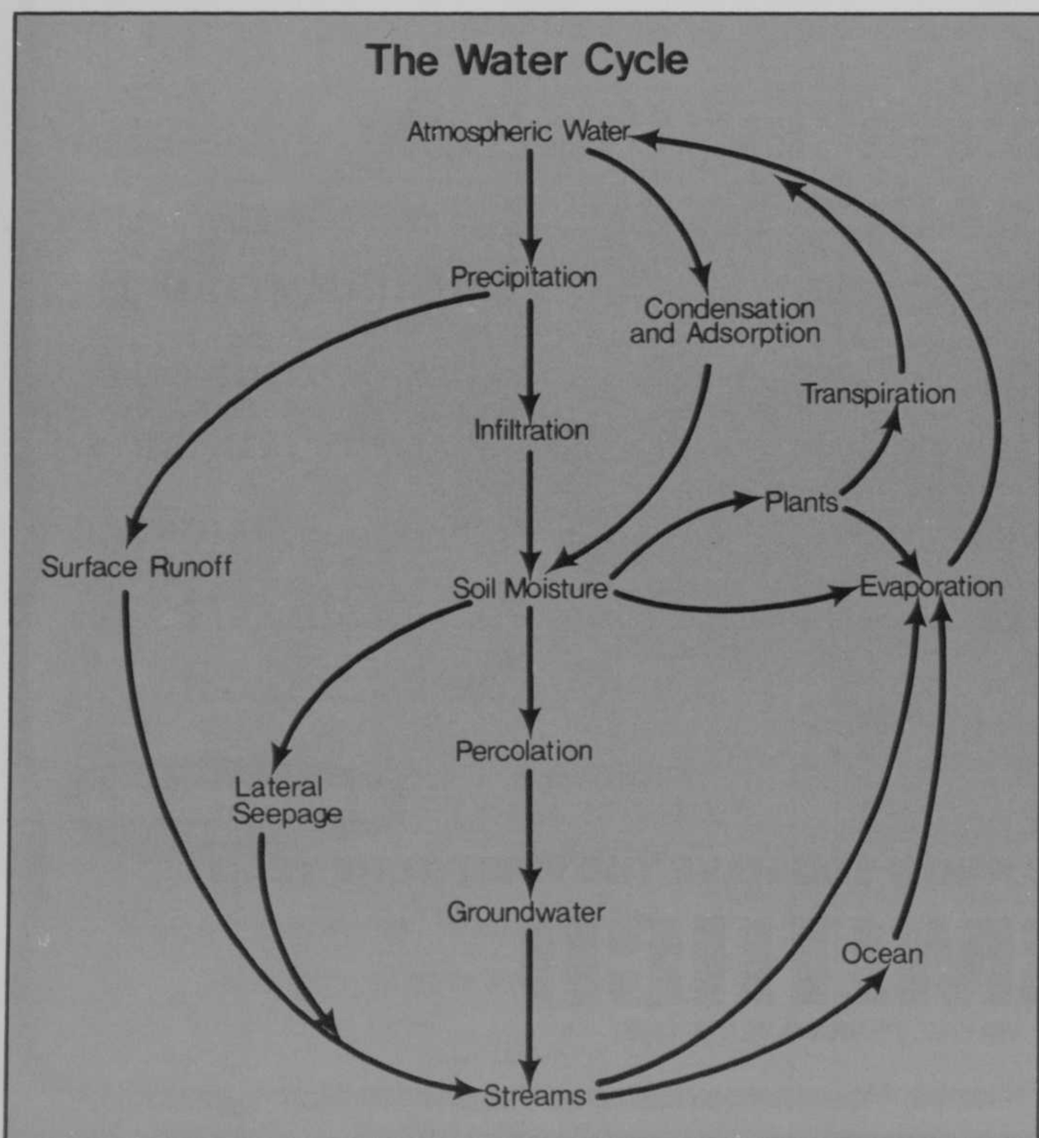
Water performs four basic functions to the grass plant: it cools, carries nutrients, provides structural support, and is essential to biochemical aspects of plant metabolism.

Most water used by grass passes from soil through the plant and into the air by evaporation from the leaves, cooling them because water vapor carries a lot of heat with it. If that heat stayed with the leaf it would reach lethal levels under full sun in summer. Under a full turf cover only a small fraction of total water applied evaporates from soil or leaf surfaces. The remainder runs off or enters the soil.

Four factors interact to determine water use by grasses. These are: 1) The microclimatic conditions under which the grass is growing; 2) The grass itself; 3) The soil in which the grass grows; and 4) The eagerness and aims of the grower. Maximum potential water use by turfgrass is about that from a weather bureau evaporative pan with a shallow depth-free water surface. Pan losses are related to three things: heat, humidity and wind. The hotter and drier the air above the wet surface, obviously the more moisture the air can take up. The warmer the water the easier for the molecules to jump out as water vapor carrying heat energy as they go. Wind takes away air partly filled with water and brings in drier air, like mopping with dry towels. In absolutely still air, a layer of moist air builds up at the water surface. Moisture and heat loss is less because it is moving by slow diffusion further and further away from the source — a little like using a damp towel to wipe up a spill.

The leaf surface is a water source just like the pan surface. Moisture and heat loss will depend on the same outside factors. However, most of the moisture is lost from only special portions of the leaf. In a turf this can be from cut ends right after mowing before they seal off. In all plants it is primarily from the stomata or breathing pores. Open pores will obviously lose more water than closed ones. They close when plants wilt and they close at night. Size and number can affect moisture loss, but the biggest resistance to water vapor leaving the leaf (and carrying heat with it) is the boundary layer of moist air next to it. Even with air movement there is always some resistance near the surface. It's no accident that problem bentgrass golf greens that get sick a lot tend also to be ones with lots of low shrubbery or trees around them and poor air movement. The air is more humid and the grass gets hotter with the same sun. Disease organisms like moist conditions and weak grass.

Moisture leaves the leaf until outside humidity is the same as the leaf surface or until moisture becomes unavailable in the leaf itself. The bigger the difference between moisture inside an open stomate and moisture outside, the faster the loss. We can cut this difference by making the outside wetter or the inside drier and by so doing, reduce water use by the plant. Wetting the outside costs water and drying the inside reduces growth. Some form of compromise between maximum growth with no water stress and no growth with too much water stress is what we need with turf. Our growth should be enough to look good, replace wear, or restore puttability but with a minimum of mowing required. We are fortunate that with turf we really don't need maximum production. (On a golf course groomed properly for a major tournament, for example, grass is on the dry side.) This means less than optimum water and less water use, but how much less for each is largely art so far. With proper data we should be able to calculate and use the right watering scheme for any given level of growth. To do this, we need uniform and precisley controllable irrigation — not always presently available to many courses. Systems capable of uniformity and precision can be designed and installed and water costs may well be the factor for getting them. Never skimp on initial design. You lose more



than you gain every time.

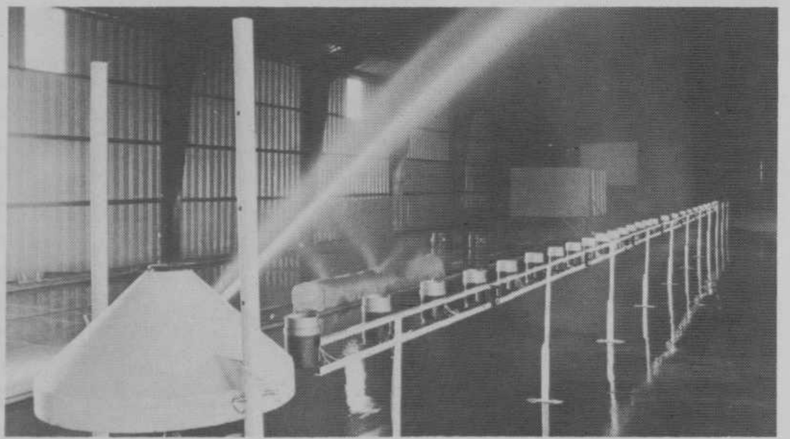
To get back to factors affecting water use, water at the stomate comes through the plant from the roots and into the roots from the soil. Roots vary in extent and efficiency. The most effective portion of a root is near the tip where active growth takes place and where thin-walled root hairs provide extra absorptive capacity. Old roots are covered with corky tissue and absorb water much more slowly. This means that, assuming soil mositure is available, plants with actively growing roots can take water up better than those whose roots are old and stalled. Grass roots are not perennial. They not only get old, but they die, usually in a matter of months, and must be replaced with new ones. Plants with large, young, actively growing root systems can draw from a bigger soil reservoir than those with short roots and they can take up water at higher moisture tensions.

Various research studies with crop plants have shown that root growth is affected less by water stress than top growth. This is logical because the roots are closer to supplies and also cooler. Less than optimum water rates for tops may still be all right for roots and encourage deeper rooting. This is one of the solid facts behind recommendations for less frequent, deeper waterings.

The luxury apparent in this scene is deceiving. It doesn't last long enough, nor happen often enough.

Even though water is an excellent management tool and we can manipulate plant growth with it, when we talk water use, we're really interested in saving water costs. How can we do this now and what hopes are there for the future?

As a breeder I am confident that varieties can be developed in every turfgrass species that will require less water for the same quality. We haven't been able to show differences between Santa Ana, Tifgreen and seeded bermudagrass in our water use studies, but an earlier study showed that long-time stress affected different bermudas differently. Seeded bermuda comes back after drought that knocks out Tifgreen, but Tifgreen looks better on the way down.



The distribution efficiency of sprinkler heads is important in determining the amount of water an area will get.

We have shown that there are significant differences in root depth in bentgrasses. Penncross (and I suspect Penneagle) show up well this way. Common bermuda roots seem less infested by ground pearl than Tifgreen roots. This makes common a better bet in Phoenix when things get really dry.

Until we get the miracle grasses that don't need to be watered, we need to consider ways to use less on the ones we have. When California went dry they learned that roughs didn't need watering, fairways needed good lies only in landing areas and approaching the greens, and when the pinch really came, golf could be played with only greens and tees watered. A talk by A. C. Sarsfield at the 1978 Turf and Landscape Institute in California pointed out a lot of things we could do, and they learned to do. As he said, they learned that water really does run downhill, too fast, too long, does puddle and run off, and shaded areas and ground covers really don't need as much water as turf in full sun.

What did these discoveries initiate? They rezoned irrigation systems to water areas with different requirements differently. They put check valves in lines so water didn't drain out in puddles around low heads. They relocated heads for more efficient distribution. Programming was adjusted daily as needed instead of a standard repeat that provided extra to avoid trouble. Mowing was raised and fertilizer reduced to cut down grass demand (and save money, too.) Aeration and verticutting were done when it was cool. Ornamentals and ground covers were put on drip systems.

All this allowed "surprisingly successful turfgrass landscape maintenance" with 50-60% of previous water use. I don't think it's surprising. Extra care makes things better and the time to arrange it is before the crunch. We can learn and we can save. Northern California is reaping the benefit in water savings now from a panic crisis situation then. If we're smart, we won't wait for a crisis.