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Dealing With Golf's Environmental Issues

BY JAMES T. SNOW
NATIONAL DIRECTOR, USGA GREEN SECTION

The 1990s might well be called *the decade of the environment* for golf in the United States. Officials at all levels in golf have been thrust together to deal with the attacks of people outside the game who contend that golf courses are harming our environment.

The cost of building and maintaining golf courses has risen dramatically, and many proposed golf courses have never gotten past the initial planning stages because of the objections raised about environmental concerns. Organizations in golf including the USGA and the Golf Course Superintendents Association of America are spending millions to investigate golf's environmental impacts and to educate golf course superintendents and others about the issues.

It seems hard to believe, given the high profile status of the environment in golf today, that just a decade ago no one in golf thought much about terms like Integrated Pest Management (IPM), underground storage tanks, surface and groundwater protection, pesticide impacts on wildlife, and many more.

What happened during that time to bring environmental issues to the forefront of golf? For one thing, environmental awareness became prevalent throughout society in the United States and the world. For another, golf enjoyed a worldwide boom, and the construction of many hundreds of golf courses caught the eye of environmentalists who are concerned about the effects of development on the environment.

Just what are environmentalists and regulatory agencies concerned about when it comes to the construction and maintenance of golf courses? In a nutshell:

- ◆ Potential for pesticide and nutrient pollution of our water resources
- ◆ Use of scarce water resources for irrigation of golf courses
- ◆ Loss of "natural" areas
- ◆ Potential impact of pesticides on people, wildlife and other organisms

The United States Golf Association is involved in a number of environmental-oriented programs that address these concerns. Let's take a closer look at each one.

Potential pollution of ground, surface waters

Given the importance of potable water resources to all facets of our lives, and that fresh water is scarce and expensive in many parts of the United States, it is understandable that people are concerned about activities that have the potential for polluting our precious water resources. Agricultural use of pesticides and fertilizers has caused problems for water supplies in the past, and people are naturally skeptical about claims that golf course activities don't pollute the streams that run through golf courses or the groundwater beneath the property. With groundwater, too, there is no second chance: once the aquifer is polluted, there usually is no way to clean it up.

A summary of peoples' concerns about the pollution effects of golf course activities on water resources follows:

Use of pesticides and other potential contaminants — Contamination of groundwater with pesticides or other materials (e.g.

gasoline) could render it unusable for drinking and other purposes. Contamination of surface waters could kill aquatic organisms and affect the biology of the waterways.

Fertilizer Use — Nitrate contamination of groundwater is a potential health hazard. Pollution of surface waters with phosphorus and nitrogen are associated with the process of eutrophication.

Erosion and sedimentation — Sedimentation caused by erosion is primarily a concern during construction, and can cause damage to streams and lakes. Pesticides, phosphorus and other nutrients can be carried to waterways by this process.

Thermal pollution — The removal of vegetation along stream banks and the discharge of warm water into streams from on-course ponds can change stream ecology to the detriment of desirable fish populations and other organisms.

For its part, the USGA is in the midst of a major research program to determine the effects of golf course activities on the environment and, where problems appear, to investigate alternatives to current practices.

As part of a three-year, \$3.2 million research program, the USGA is supporting 17 university research projects involved in the following topic categories:

- ◆ What happens to pesticides and fertilizers applied to golf courses;
- ◆ The development of alternative (non-chemical) methods of pest control;
- ◆ The effects of golf courses on people and wildlife.

In the first category, there are eight projects looking at the loss of pesticides and nutrients through leaching, runoff, volatilization, and other means. Our understanding of how these products move in turfgrass systems, and what effects they might have on our water supplies, should be much more clear at the conclusion of this study in 1993.

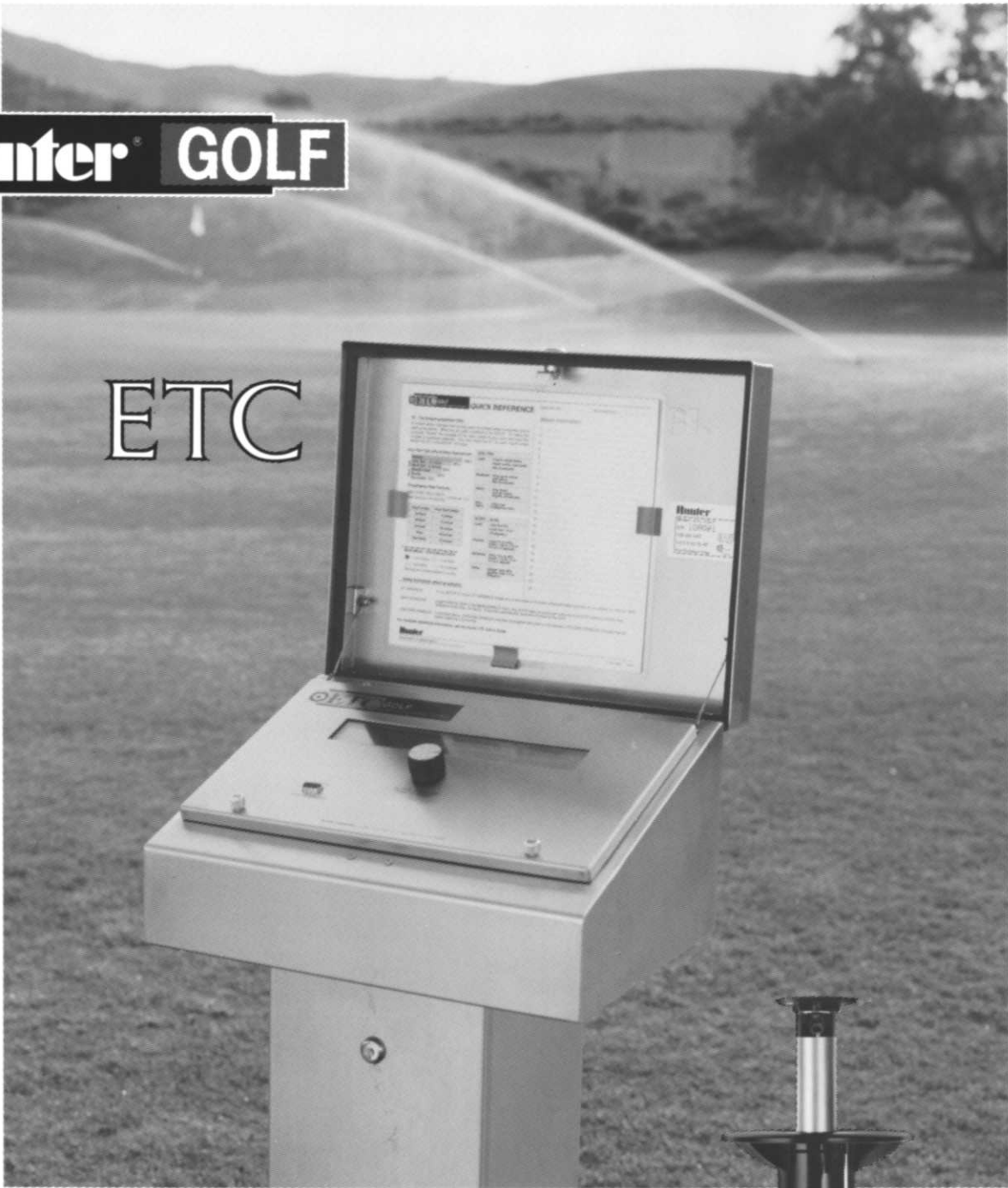
In a separate research program, the USGA has been and will continue to spend approximately \$750,000 per year on turfgrass improvement, including a series of turfgrass breeding projects to develop better grasses for golf. A major thrust has been to develop low-water-use grasses, but today much emphasis also is being placed on disease and insect resistance. Such grasses could significantly reduce pesticide use and help protect water supplies.

The USGA also is trying to educate golf course superintendents and course officials about these concerns, so that proper measures can be taken during construction and maintenance to minimize pollution potential. Through the Green Section's Turf Advisory Service, USGA agronomists work with superintendents and officials to reduce pesticide use through the establishment of Integrated Pest Management programs and other means.

A major educational resource has recently been introduced by the USGA in the form of a 950-page book entitled *Golf Course Management and Construction: Environmental Issues*. The book contains more than 1,000 references from the scientific literature and takes a factual look at the issues and what can be done to minimize potential problems. A superintendent who spends time reading this book can develop a much clearer understanding of the principles behind golf's environmental issues and the practices that can mitigate golf's potentially negative effects on the environment. ➤

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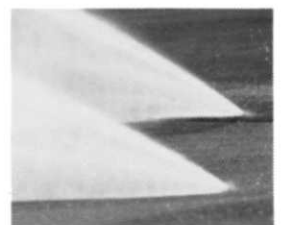
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USGA has provided a grant to the Audubon Society of New York State

Use of water resources irrigation

A growing population and an already limited water supply in many of the arid and semi-arid parts of the United States has made water use for golf course irrigation a sore subject for many residents of these areas. Even in the higher rainfall areas of the East and North, periodic droughts combined with large populations and high water demands have made golf course irrigation an issue in these areas from time to time. However, whereas an 18-hole golf course in the East might use 15 to 20 million gallons of water per year on average, golf facilities in the West can use 500 million gallons or more. With water and electricity (pumping) costs exceeding \$700,000 per year in some cases, it is not surprising then that golf courses in these areas are seeking ways to reduce their use of potable water.

In response, a growing number of golf courses are turning to the use of effluent (recycled water) for their irrigation needs. In some areas, new golf courses can't be built unless they agree to use effluent water for irrigation. Though effluent systems generally work very well, concerns about high salt levels, heavy metal contamination, disease organisms and other issues make this a controversial alternative in the eyes of some.

To take a closer look at the issues surrounding the use of effluent on golf courses, the USGA is spearheading a symposium on this topic in March 1993 from which a comprehensive proceedings will be published.

As mentioned earlier, a major effort of the USGA Turfgrass Research Program is the development of new grasses for golf that use less water. Improved salt tolerance also is a goal, since groundwater (and effluent water) in many of the more arid parts of the country tends to be quite salty.

There are several angles to this work:

1) Taking native, drought- or salt-tolerant rangeland grass species and attempting to improve (or improve further) their turf characteristics for golf course use (e.g. blue gramma - *Bouteloua gracilis*; fairway crested wheatgrass - *Agropyron cristatum*; alkaligrass - *Puccinellia spp*; curly mesquitegrass - *Hilaria belangeri*; buffalograss - *Buchloe dactyloides*); 2) Taking existing low-water-use turfgrasses and improving certain characteristics to expand their range of adaptation so they can be used to replace high-water-use cool season grasses (e.g. bermudagrass - increase cold hardiness; zoysiagrass - improve establishment rate and length of growing season); 3) Taking vegetatively propagated low-water-use warm season grasses and developing improved seeded types to obtain wider use (bermudagrass, zoysiagrass); 4) Taking existing turfgrasses and reducing their water use rates (bentgrass, zoysiagrass). The work is going quite well, and there will be a number of lower-water-use grasses on the market during the next few years.

Finally, water conservation is being achieved by encouraging golf courses to take advantage of existing irrigation technology. Savings of up to 50% or more could be realized at many courses if they upgraded their systems and educated themselves about how to use these systems effectively.

Loss of "natural" areas

It is estimated that there are about 14,000 golf courses in the United States, representing approximately 1.3 million acres (533,000 hectares) in golf course turf and a total of up to 2.3 million acres (940,000 hectares) dedicated to golf course facilities, including

clubhouses, parking lots and other areas. New golf course facilities today can easily require 150 to 250 acres of land, and much more if located in or near wetland areas or other properties with difficult terrain or environmentally sensitive areas. Housing developments featuring a golf course can mean the development of thousands of acres, of course.

Some people believe that the construction of a golf course and the development of surrounding lands represents the loss of a significant amount of natural lands, habitat for important wildlife, plant species and other organisms. This is particularly a concern to them when the course is located in or near wetlands, forests, and other environmentally sensitive areas, where course activities could also affect remaining natural areas. It is true that the land developed as a golf course is often severely disrupted during construction from the standpoint of its value as wildlife habitat. But it is also true that many existing golf courses are outstanding examples of wildlife sanctuaries, particularly in urban and suburban areas. Nevertheless, many courses could do a much better job of managing their property for the benefit of wildlife, and it wouldn't have to cost much to accomplish or affect the playability of the course to a great degree.

To assist golf courses in enhancing their properties for the benefit of wildlife and other natural resources, the USGA has provided a grant to the Audubon Society of New York State to expand a program called the Audubon Cooperative Sanctuary Program for Golf Courses.

The program is an attempt to involve golf course superintendents, course officials and golfers in habitat enhancement projects and other resource conservation measures. The environment benefits from the programs carried out by golf courses, and golf benefits from receiving recognition for its conservation efforts. After just a year since its official start, more than 460 golf courses are participating in the program. As a further sign of its commitment to the environment, the USGA has sponsored the writing of a book tentatively titled *On Course With Nature*. It will be several hundred pages long and all contain information about how to protect or restore natural ecological communities on golf courses and other managed properties. Specifically, it will encourage superintendents, course officials and architects to consider naturalization as an alternative to our more traditionally manicured landscapes on golf courses. The book should be available by early to mid-1993.

Potential effects on people and wildlife

In many instances, wildlife benefits from the presence of golf courses in urban and suburban communities, where green space often is limited. But sometimes wildlife falls victim to golf course activities as well, particularly when certain pesticides are used. Bird-kills and fish-kills are the most visible forms of pesticide impacts, but many other types of wildlife can be lethally and sublethally affected when pesticides are used. Reproduction, behavior, physiology and overall health can be compromised, eventually causing death, susceptibility to predation, or other problems.

Most golf course superintendents enjoy the many forms of wildlife on their courses and would do nothing intentionally to hurt them. However, most sublethal effects of pesticides on wildlife are not at all apparent, and it's fair to say that most people simply would be unaware of the negative effects of their pest control activities. Also, very little

“Best overseeded grasses on the putting green were Sabre and Cypress cultivars of *Poa trivialis*”

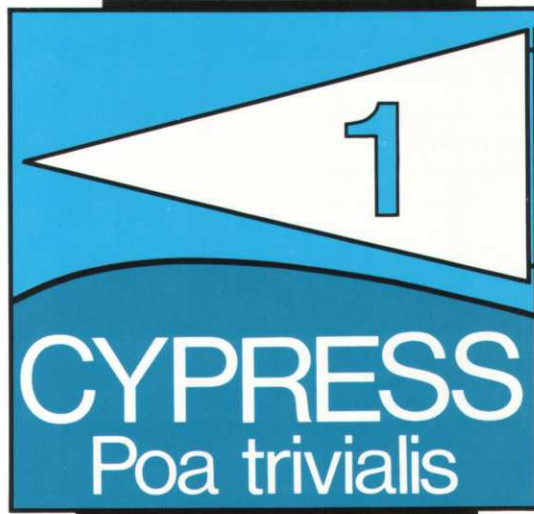
1992 University of Florida Dormant Bermudagrass Overseeding Trial - Gainesville, FL.

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Table 2. Monthly and seasonal months for turf quality of winter overseeded grasses 'Tidwarf' bermudagrass putting green from December 1991 to April 1992 at Gainesville, FL.

Turfgrass	Month				Mean
	Dec.	Jan.	Feb.	Apr.	
Sabre	7.8	8.2	8.4	8.0	7.8
Cypress	7.2	7.4	7.3	6.8	7.1
Pinnacle	7.5	7.8	7.4	6.8	7.1
Premier	7.8	7.7	7.5	6.8	7.1
Blend #1	7.4	7.4	7.3	6.8	7.1
Mix #2	7.2	7.8	7.3	6.8	7.1
GR-89	7.1	7.7	7.3	6.8	7.1
Southern Select	7.4	7.4	7.3	6.8	7.1
Leader Board	7.8	7.6	7.3	6.8	7.1
Medalist	7.5	7.7	7.3	6.8	7.1
Repell II	7.4	7.4	7.3	6.8	7.1
Essence	7.2	7.2	7.3	6.8	7.1
Cowboy II	7.2	7.2	7.3	6.8	7.1
Evening Shade	7.2	7.2	7.3	6.8	7.1
CBS II	7.2	7.2	7.3	6.8	7.1
Pennant	7.2	7.2	7.3	6.8	7.1
Mulligan	7.2	7.2	7.3	6.8	7.1
PhD	7.2	7.2	7.3	6.8	7.1
Pebble Beach	7.2	7.2	7.3	6.8	7.1
Sunrise Primo	7.2	7.2	7.3	6.8	7.1
Prelude II	7.2	7.2	7.3	6.8	7.1
Alliance	7.2	7.2	7.3	6.8	7.1
Patriot II	7.2	7.2	7.3	6.8	7.1
Turf Seed Blend #1	7.2	7.2	7.3	6.8	7.1
Competitor	7.2	7.2	7.3	6.8	7.1
WYS-1	7.2	7.2	7.3	6.8	7.1
WX9-115	7.2	7.2	7.3	6.8	7.1
WYP-83	7.2	7.2	7.3	6.8	7.1
Turf Seed Blend #2	7.2	7.2	7.3	6.8	7.1
Palmer II	7.2	7.2	7.3	6.8	7.1
Essence	7.2	7.2	7.3	6.8	7.1
Enneagle	7.2	7.2	7.3	6.8	7.1
Blend	7.2	7.2	7.3	6.8	7.1

Development of new golf courses threatened

research has been done to document these effects on golf courses.

In response to the need for research, the USGA is funding a three-year study at The Institute of Wildlife and Environmental Toxicology at Clemson University concerning the effects of golf course activities on wildlife. An attempt will be made to identify the products and management practices which reduce non-target wildlife exposure to pesticides. The investigation is focusing on two areas: 1) developing a thorough water sampling program to measure the quantity of pesticides reaching adjacent marshes, and 2) assessing the potential for exposure of wildlife to pesticides on the golf course and adjacent areas.

Some people claim that golf courses are of interest or value only to people who play golf and that use of recreational land for golf course development serves the needs of a limited segment of the population. This argument may sound plausible on the surface, yet it is clear that many non-golfers chose to pay a premium to live adjacent to golf courses, for example. To gain a better understanding of the human benefits of golf course views, the USGA is funding a study at Texas A&M University to identify and measure the physiological and emotional effects of off-site views of golf courses, and compare these effects with those resulting from viewing other common types of urban land uses.

Also, the study will identify and measure the effects of viewing golf courses (from a workplace window, for example) on the performance of cognitive tasks relevant to the productivity of administrators and other employees. If positive benefits of golf courses can be scientifically validated for off-site users, this information can be put in the hands of people involved in land use decisions, to the benefit of golf.

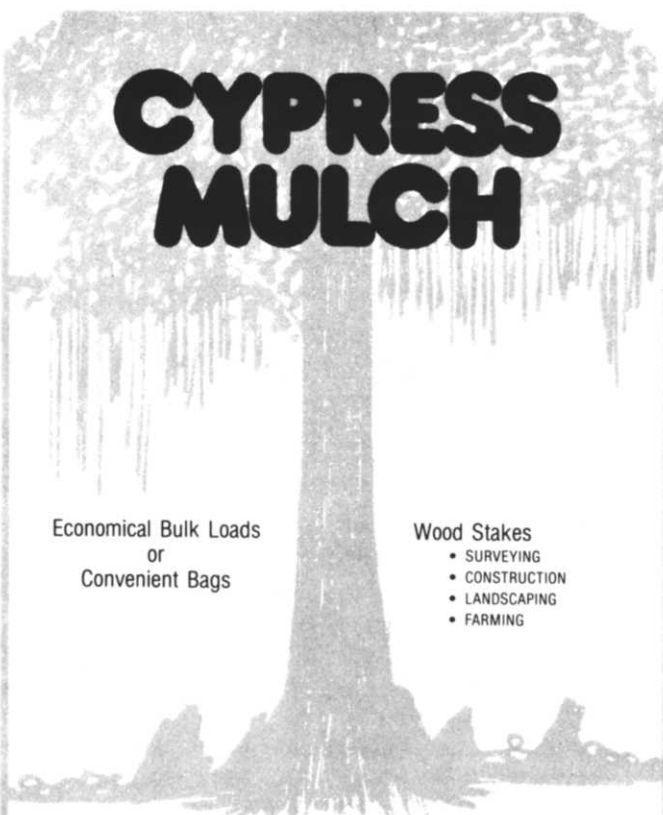
Summary

Current maintenance standards and the development of new golf courses in the United States is threatened today by concerns about the detrimental effects of golf courses on the environment. The task facing the game of golf involves the following:

- ◆ Develop a greater scientific understanding of the impact of golf courses on the environment.
- ◆ Where potential problems exist, develop alternative practices or programs that minimize the negative effects of golf courses.
- ◆ Educate golf course superintendents, course officials and golfers about golf's environmental issues and what they must do to help protect the environment and the game of golf.

◆ Educate regulatory officials, environmentalists and the public about the environmental benefits of golf courses and what is being done within the game to protect the environment.

The United States Golf Association is spending millions for research and educational programs to address golf's environmental issues. As information becomes available through these programs, it will be shared with interested parties throughout the world for the benefit of golf and the environment.



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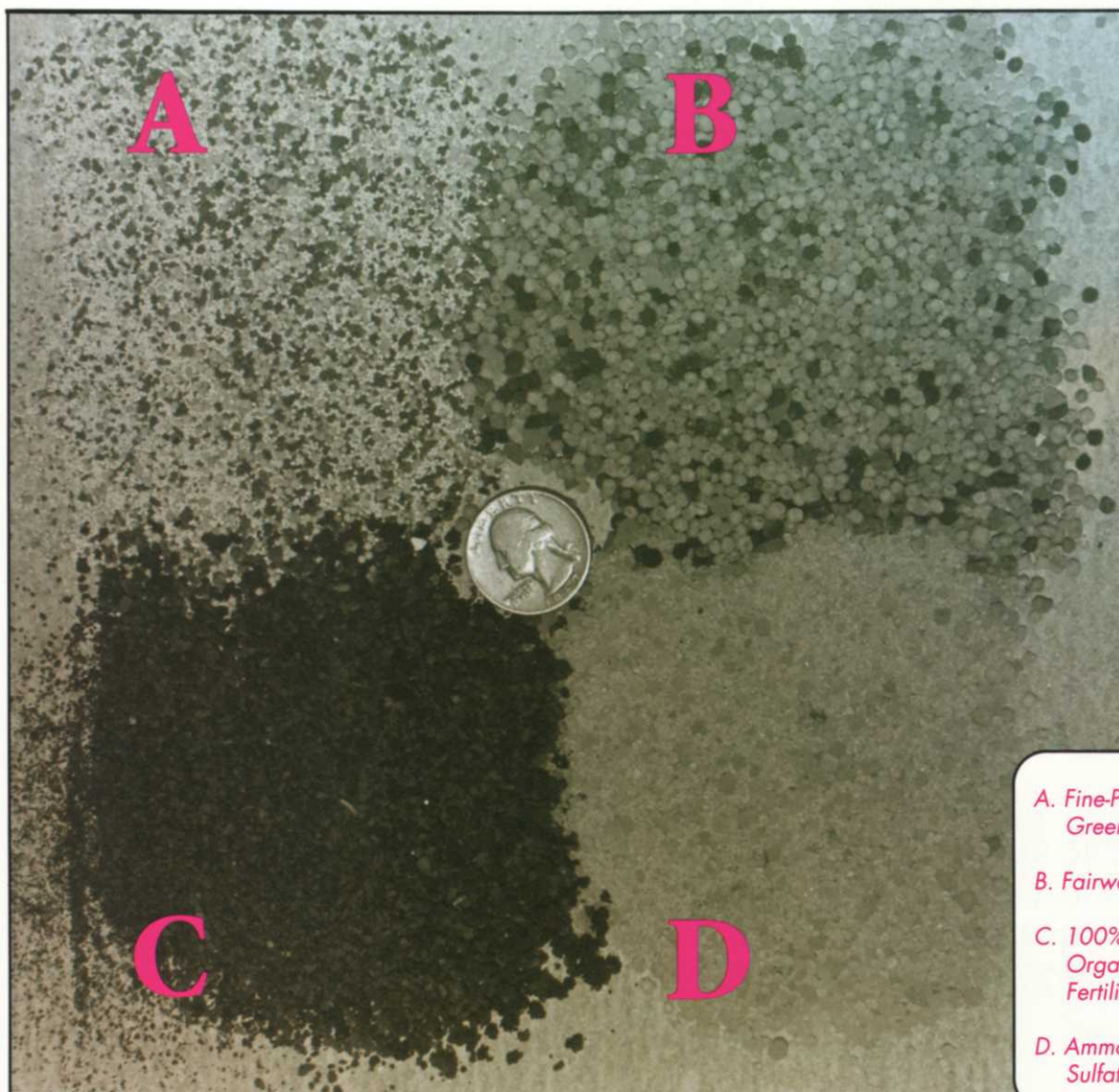
HANDS ON



By Steve Kuhn,
Golf Course Superintendent,
Doral Country Club

Fertilizer

Trends, blends, and programs



Of all the concerns of turf management, South Florida superintendents are overwhelmingly most confident in their decision-making about fertilization. Yet, in compiling results of shop talk discussions, I found a wide disparity in fertilizer ratios, nutrient sources, application rates and frequencies.

While insecticides and fungicides are applied according to label rates, we are usually not as confident in the selection or the expected results as we are with fertilizer decisions. Call it ironic, a paradox, whatever, but these are the traits of our profession that keep us focused to the job at hand and make every new day a challenge. ➔

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FERTILIZER RATIOS

When the results were tabulated, an overall Nitrogen(N)-Phosphorus(P)-Potassium(K) ratio of (7-1-7) was found to be the average used in South Florida on greens and tees. Superintendents with newer USGA-type spec greens tend to use higher P and K ratios in their fertilizers, while those with specific phosphorus deficiencies are having additional phosphorus blended directly into their top-dressing mix. Supers with older, slower draining greens are using lower P ratios. Higher K analysis fertilizers are a definite trend.

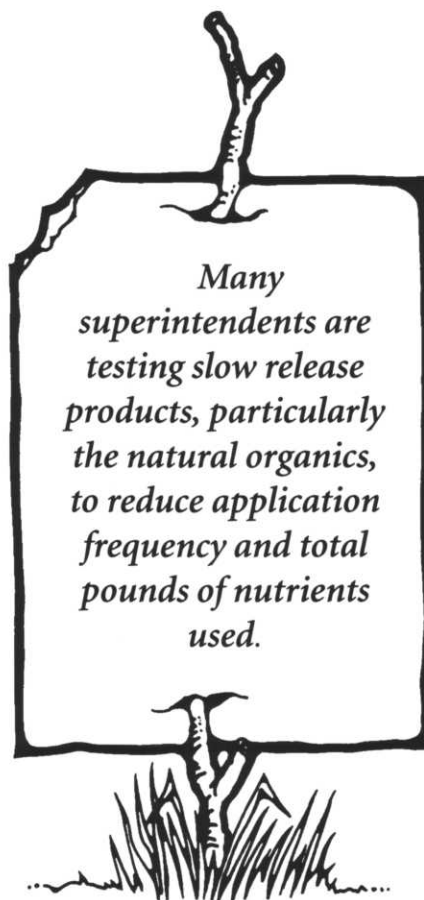
The average fairway ratio was found to be (5-1-5). When compared to the greens blends, most supers felt that less N and K are needed due to less leaching, higher heights of cut, and the return of grass clippings to the soil.

Mark Richard of Greynolds Golf Course, a public facility which plays over 100,000 rounds per year, likes to apply higher N and K ratio fertilizers during the winter when play is heavy to get as much growth as possible and to harden the turf off to wear and cold spells. In the summer, he will totally back off the nitrogen.

SOURCES OF NITROGEN

On both greens and fairway mixes, sulfur-coated urea was the leading source of nitrogen. SCU was found to be used by 30% of the superintendents on greens and by 55% on fairways. IBDU was preferred by 25% on greens and 20% on fairways respectively. A popular choice in fairway mixes by 20% of the supers was ammonium sulfate, due mainly to low prices and quick availability to the plant.

Although most superintendents on high pH soils using SCU or ammonium sulfate agreed that these sources failed to lower soil pH, they felt that using sulfur-coated or sulfate forms of nitrogen was effective in their overall programs. **Bill McKee at Oak Tree Country Club** says he uses the sulfate form of nutrients whenever possible on his pH 7.8 soils. He believes it allows him to get the fullest availability of all the elements, especially



Many superintendents are testing slow release products, particularly the natural organics, to reduce application frequency and total pounds of nutrients used.

iron and manganese.

Nutrient leaching, particularly N and K is of major concern in selecting the source. While SCU and IBDU are the slow release leaders, natural organics and resin-coated fertilizers are quickly gaining popularity. Homogenous blends with slow-release coatings are seen by many to be the environmentally sound approach to nutrition for the future.

The importance placed in choosing a greens mix is evident when an overwhelming number of supers agreed that, "if budget was not an overriding factor in purchasing a fertilizer product for greens," they would not change their current source of N. In terms of pricing, quality, and results, they were already using what they felt was the best greens mix available.

APPLICATION METHODS

Walking rotary spreaders are used on greens by 70% of the supers in South

Florida, while 25% have their fairway mixes applied by contract services. Citing quick, accurate, and trouble-free applications, superintendents are increasingly choosing contractors to apply bulk loads. Many courses close the first tee at noon and the operator follows the last group of golfers so as to not disturb play. In season, to avoid any loss of revenue, some courses have resorted to night applications.

APPLICATION RATES

Most superintendents apply their greens fertilizers at 1.0 pound of nitrogen biweekly. However, 35% apply at .75 pound of N rate on a slightly more frequent basis in order to avoid growth spurts. Nearly all superintendents indicated a 1.0 pound of N per month rate on tees. Fairways were evenly divided between 1.0 pound of N 4-6 times per year or 1.5 pounds of N 3-5 times per year. The average yearly rates of nitrogen were 21 pounds on greens, 12 pounds on tees and 6 pounds on fairways.

Many superintendents are testing slow release products, particularly the natural organics, to reduce application frequency and total pounds of nutrients used. USGA spec greens are causing many area superintendents to rethink their approach to greens fertilization. They are backing off from rigid application schedules of the past and are instead monitoring the color and clipping yields to determine when to fertilize — a much more objective approach. They believe they can reduce overall fertilizer usage, have more consistent color, reduce growth spurts, and adapt to changing conditions by using this approach.

SUMMARY

South Florida superintendents believe their goal of producing the best product for the dollar has always remained the same. It is the latest challenges of new fertilizer technology, a shift towards USGA spec greens and golfers demanding higher levels of quality which keeps them searching for that ideal program.