Consider

A New Management Program for Greens[1]

by JOHN H. MADISON, JACK L. PAUL, and WILLIAM B. DAVIS[2]

Since World War II, we have seen play on some nearby golf courses go from 20,000 rounds a year to over 100,000 rounds a year. The pattern has been the same throughout the country. This has required changed maintenance practices, principally an increased use of nitrogen fertilizer and water to grow more grass in order to keep up with wear. Because the resulting grass is more succulent and more attractive to insects and fungi, increased amounts of control chemicals have been used. Increased irrigation and increased play have aggravated compaction, which is relieved by use of coring machines. The coring operation provides a seedbed for annual grasses which become a continuous problem.

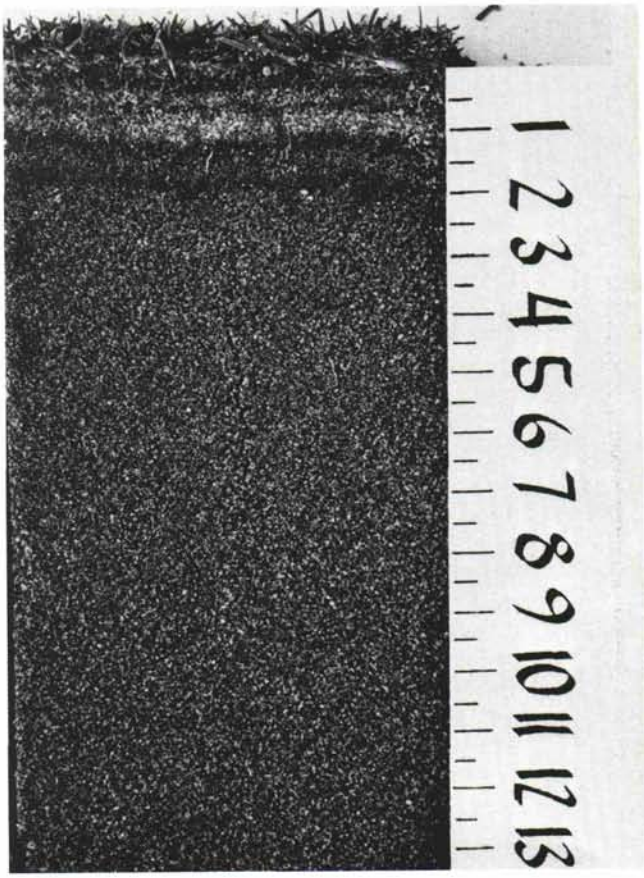
We now use maximum amounts of fertilizer on greens, but play continues to increase. What direction can we take now? In considering this question, we felt that a different approach to putting green maintenance was worth considering. With support from the USGA Green Section, an alternate program has been worked out. We present this for your consideration as a packaged program. We don't ask you to buy the package. We ask you to consider it. If it appeals to you, we suggest trying it experimentally on a limited test area. If your equipment can't handle the whole program as a total unit, break it down and apply the various materials separately.

What is the basis for the program?

Although great progress has been made in putting green management over the past 25 years, the major problems continue to include thatch and compaction. Thatch provides a reservoir for diseases and both thatch and compaction limit air, water and root movement in soil. Coring, to relieve the problem, creates a serious weed problem with *Poa annua*, goosegrass and crabbrass.

Our solution to these problems is to provide light and frequent top-dressing with

Figure 1. Two and a half years of conventional top-dressing practice has resulted in a typical layer cake of thatch and sand.



[1] A contribution of the Department of Environmental Horticulture, College of Agricultural and Environmental Sciences, University of California, Davis, California 95616.

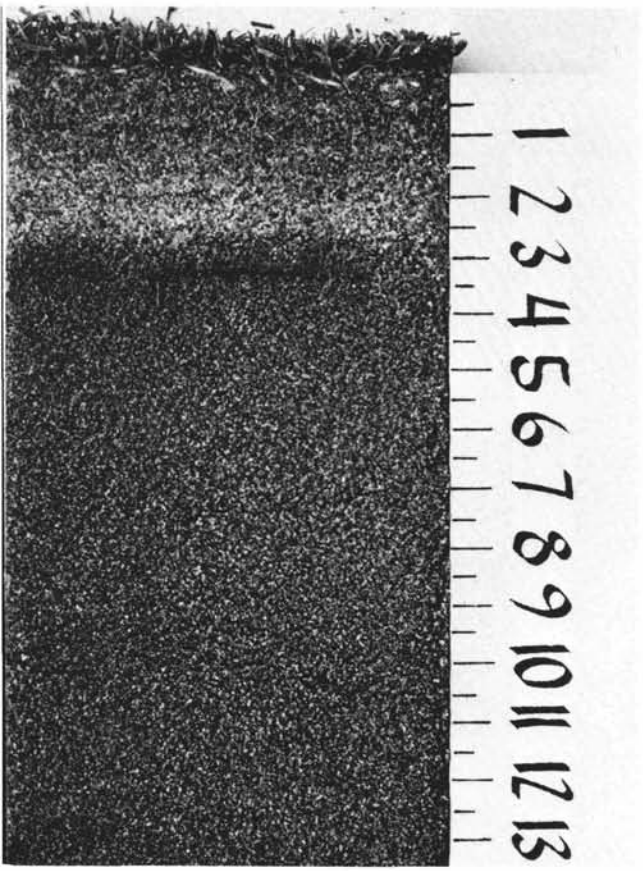
[2] Horticulturist and Associate Horticulturist in the California Agricultural Experiment Station and Extension Landscape Horticulturist, University of California, Davis, California, 95616.

sand in the 0.05 to 1.0 mm range. This sand will drop out of sight and the golfer will never know the green has been dressed. Just enough sand is applied to mingle with the stolons and prevent a thatch layer from forming. Coring is eliminated because compaction is reduced. Bentgrass seed is added to the top-dressing so there is continual crowding of weeds and rapid replacement of turf whenever bare areas occur. For the sake of economy, seed, herbicides, insecticides, and fertilizer are added to the top-dressing so all operations are combined.

Does the program work?

We have worked with the program into our third year. Preliminary research contributed much background information. We have found the program to work at Davis; it has been used successfully by co-operators; and we are confident that any superintendent who clearly understands his goals with the program will be able to make it work.

Figure 2. Two years of frequent top-dressing have resulted in a homogenous mixture of sand and stolons. The initial layer from one year's growth has been buried 1¼" deep but is still visible. It is slowly breaking down.



When the program is begun on an existing green, there may be some immediate response if the green is badly thatchbound. If the green is the ordinary layer cake of thatch and sand layers occasionally pierced by aerifier holes, no immediate results should be expected. However, by the end of the second growing season there should be noticeable weed suppression and good general vigor. Improved rooting should begin to result in a turf more tolerant of stress.

The program.

We top-dress every three weeks with the following materials for 1,000 square feet of green:

Material	per 1000 ft²	per 100 m²
Sand-0.05-1.0 mm (-#18 + #200 screen)	3 cu. ft.	90 liters
Nitrogen source to provide N at	3/4 lb.	350 grams
K_2SO_4	5-6 oz.	150-175 g
Dolomitic lime (acid soils) or dolomitic gypsum (soils above pH 6.5)	2½-3½ oz.	75-100 g
(If dolomites are not available add Epsom salts	1½ oz.	45 g)
Zinc chelate or mixed minor element chelates	1/2 oz.	10-15 g
Iron chelate	1/2 oz.	10-15 g
Phosphorus source to provide P at	1½ oz.	30-40 g
Bentgrass seed	1/2 oz.	30-75 g

When pesticides are used, we add them as wettable powders to give the recommended rate. We alternated between the insecticides Diazinon, a somewhat systemic phosphate, and Sevin, a carbamate. Depending on season and disease, we have used thiram, Dexon, captan, Koban, and Daconil 2728.®

How the program has worked so far.

1. Amount and Frequency of Top-dressing: This is critical. The goal is to apply just enough sand just often enough so thatch is mixed with sand but a good cushion or mat is left above the sand. If not enough is applied or if sand is not added frequently enough, alternate layers of sand and thatch occur. When sand is too coarse or is added too frequently or in too great a quantity, the cushion is buried; ball marks kill grass; traffic abrades the grass; little wear is tolerated.

We apply 3 cubic feet of sand per 1,000 square feet at three-week intervals, 15 times a year. This is a little over ½ inch of sand per year. In the Davis, California area, we continue to add the fertilizer amendments throughout the

winter months. During the active growing season we could easily go four weeks between top-dressing without getting into a soil layering problem, but with our nitrogen source, the 3-week interval seems necessary to maintain uniform growth. At the peak of the growing season, 5-week intervals between top-dressings is apparently a bit too long and traces of soil layering start to appear. In northern tier states where thatch is being formed in quantity only from May through August, six annual top-dressings may be enough. In Florida, 20 may not be sufficient. This still needs to be explored. However, increasing N will require increasing sand.

2. Top-dressing Sand: Sand, as specified (—#18 + #200), will drop from sight as soon as it dries, or it may be washed in by turning on the irrigation system for a minute or two. If the application is not even, one may need to drag or broom it in. The golfer should never know the green was top-dressed. Keep looking for a good sand. If the finest sand you can get is as coarse as plaster sand, forget the program until you can find a suited sand. Keep asking, though, and you are apt to find it.

3. Top-dressing Practice: We find that top-dressing machines apply material evenly at low rates. We figure on adding 1/28" of sand at each treatment. The machine which rolls material out on a belt can handle both damp and dry sand. The vibrating type of machine handles damp sand only if it is going fast and vibrating rapidly. With dry, mixed top-dressing in a vibrating machine, materials tend to segregate and you may get an overdose of fertilizer near the last of the hopperfull. Dry sand goes on well with a fertilizer spreader. We have found only one spreader equipped to handle damp sand and it has a special agitator to feed the sand.

If mixing top-dressing requires buying special equipment, the sand and fertility programs can be separated during the initial 2-4 year test period. For good mixing, the sand should be slightly damp. Pesticides, if used, should be added last and only after the operator puts on gloves and a dust mask. Sand containing pesticides should be used, or controlled so no children play in it.

4. Coring: A coring machine can be well used to break the interface at the first top-dressing. After that the coring machine should be prohibited. It is no longer needed and its use spoils the benefit of weed control.

5. Weed Control: Most weed seeds require light to germinate. Top-dressing buries them and replaces them with grass seed. In two years our *Poa annua* and other weed problems have virtually disappeared though they continue outside of the test area. (Don't dig up buried seed!)

6. Disease Control: Top-dressing should reduce inoculum by burying it. We have had Pythium on our aprons that failed to enter the experimental area. Top-dressed areas, in shade, continue to get Fusarium patch during long periods of cold, wet overcast. Our studies regarding disease control are still inadequate.

7. Insect Control: Without thatch, it is more difficult for caterpillars to burrow and easier for birds to find them, but control is still necessary. Insecticides in the top-dressing are effective and should be used as needed.

8. Mineral Nutrition: Different sands are more or less mineral rich. The minerals added are for assurance—actual need may be less. When more nitrogen is used, other minerals should be increased in proportion. Adding iron salts or chelates to the top-dressing is not effective in providing iron as a colorant. Foliar sprays are still needed for a deep green iron color.

9. Organic Matter: No organic matter is used in the top-dressing. This program is to control excess organic matter—thatch. Grass creates its own organic matter which adds to the cation exchange capacity of the soil. As old layers of thatch become buried, they slowly decay unless they remain saturated with water.

10. Infiltration Rate: Infiltration into the new surface is good, but if the old buried surface was impermeable, it may limit per-

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ABOUT THE AUTHOR:

Dr. John H. Madison was born in the Midwest, raised in New England and received his Ph.D. in plant physiology at Cornell University, New York. He came to the University of California, Davis campus in 1953 where he has worked continuously with turfgrasses. He is the author of two major texts; "Principles of Turfgrass Culture" and "Practical Turfgrass Management" as well as many other publications.