

# Sources and Uses of Soil Modifiers in Turf

by HOLMAN M. GRIFFIN, Director, USGA Green Section, Mid-Atlantic Region.

The popular term for a soil modifier is a soil amendment. I feel either term is adequately descriptive. An amendment is something which is added to anything to modify it. A soil is any substance or medium in which something can take root and grow. Since few natural soils are suitable for good turf growth when subjected to compaction, we use amendments to make them more acceptable.

The sources of soil modifiers are limited only by the imagination, and they may be either natural or manufactured. Some of the basic categories of soil modifiers are: other soils, organic materials, plastics, ion exchange resins, and rubber. The types of organic modifiers alone would fill a small book, and hydroponic farms are evidence of the fact that plants can be grown with a minimum of soil solids.

Turf managers have long sought methods of evaluating soil materials for use in growing turf under special conditions. Either a practically priced "mail order" mix, or a formula for making suitable soils from the materials available to them would be acceptable. Modern technology has offered some of both. Individuals may have their component materials analyzed by special laboratories and mix their own,

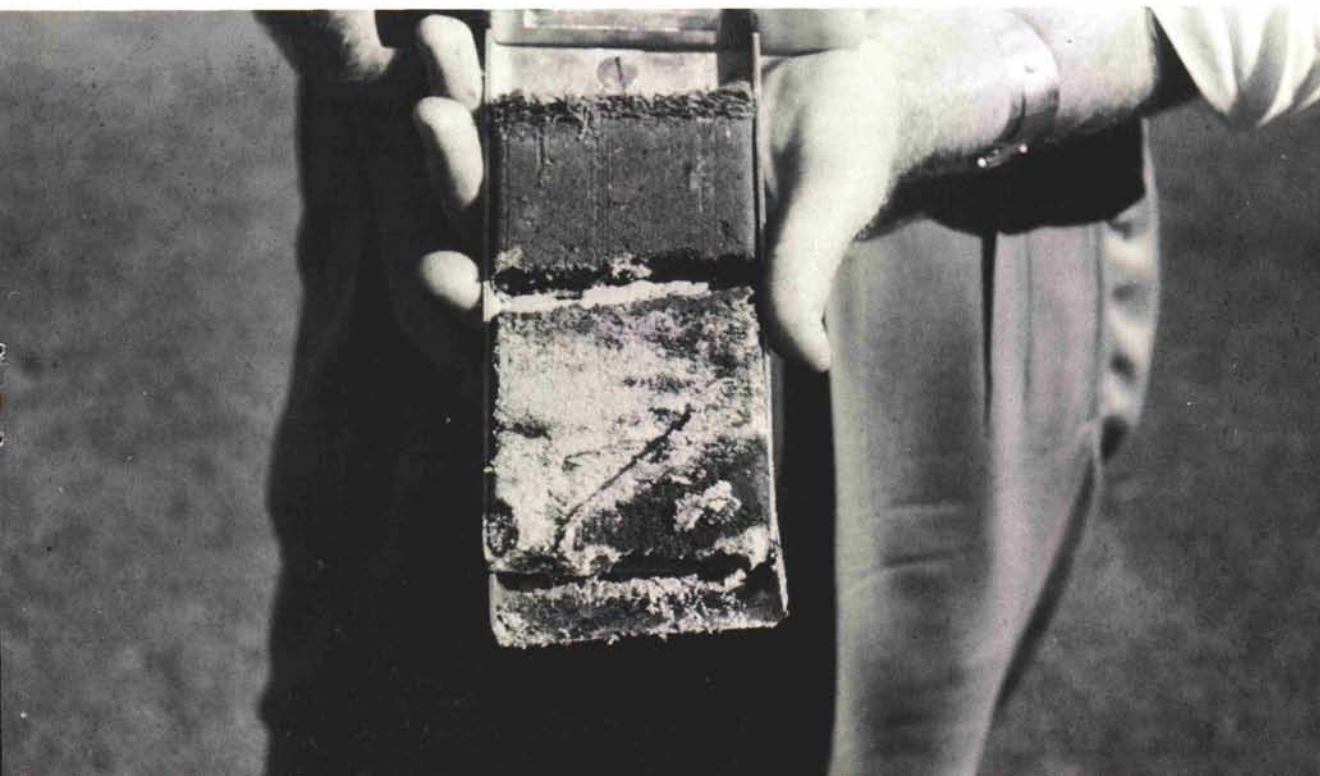
or they may purchase mixed soils which have been properly analyzed from several relatively new companies.

Soils may be modified for a number of reasons with some of the most basic being to provide the right kind and amount of pore space for the retention and movement of air and water, to reduce compaction tendencies, to give resiliency and to improve the capacity for storing and exchanging nutrients. A good soil amendment may do all these things or a specific amendment may be selected for a single purpose.

A few years ago, many turf managers were concerned about the trend toward too much sand in greens. As a result of experimentation at Purdue University, pure sand of a selected particle size has been shown to be satisfactory for good turf production, and when modified in the top few inches, it will produce a satisfactory golf green, tee, football field, bowling green, or other sports turf area. Of course this isn't quite as simple as I have made it sound, and you should know all the details before you attempt to use this method.

Pure sand with a particle size range of 0.2 mm to 1.0 mm resists compaction and will

*Poor soil mix to begin with (bottom) was only made worse by a thick layer of muck (top) adhering to sod.*



provide adequate pore space for water and air movement. Pore size is considered to be one-third of the diameter of the solid particles in a uniform mix, therefore a uniform material with the particle size just described would have many pores ranging from .06 mm to .3 mm.

Most authorities seem to agree that a soil which contains a minimum of 12 to 18 per cent non-capillary or air-filled pore space will support good turf growth. The previously described mixture meets those requirements but needs some means of moisture retention to be managed easily. Moisture retention in the proper amount as well as nutrient storage and exchange capacity can be added with soil amendments.

A clay soil or a silty soil on the other hand will never have enough pore space of the right size to work well in a golf green, but it has a terrific capacity for moisture retention and nutrient storage. A heavy clay soil is penetrated by air and water only with great difficulty, and once admitted, these elements along with the transported nutrients may be held so tenaciously as to be unavailable to the turf.

The ideal solution to our problems would seem to be to mix the two materials just described, but clay, silt and fine sand only tend to clog up the pore space in a good mix and they are unnecessary.

In this age of modern technology we have to leave behind the old wives' tale about a black soil being the most productive. This is especially true of heavily trafficked turf areas. My thinking is that no silt, clay, or fine sand, commonly referred to as "soil" is needed in a turf bed at all. It is added simply because heretofore we have thought it necessary and because we had no other amendment as readily available, or as cheap.

The best time to incorporate soil modifiers

into a soil is during construction when all materials may be mixed uniformly; however, soil modifiers may be introduced into a turf bed at any time with good results. On a golf green, these materials are placed in holes made by aeration machines or other hole-punching tools, such as a soil probe. Soil modification to the working depth of most aerifiers, which is some three or four inches, can certainly help, but the modification is more effective if it is accomplished to a depth of 12 to 16 inches, or at least deep enough to penetrate into the drainage system, if one exists.

Although some soil amendments alone may support turf growth, we should keep in mind that most amendments are just that and not complete soils in themselves. For this reason, only soils modified with amendments and not straight amendments should be incorporated into holes made in an established turf bed.

If the material introduced into holes in a green is not capable of supporting good turf growth by itself, then we are simply filling holes with a different material which may be almost as undesirable as the original. Although some immediate improvement may occur in the turf when aeration holes are filled with pure amendment, continued modification will cause a different set of problems and the immediate benefits will be short-lived.

We all know the problems associated with soil layering, and vertical layering is exactly what we are doing when we introduce pure soil amendments into aerifier holes. Layering also occurs when a modified soil is introduced, but to a lesser extent. Also, with repeated hole-punching-hole-filling operations using properly modified soils rather than pure amendments, the long range picture gives us more assurance of lasting success.

Taking into consideration the maintenance

*Standing water on the green surface can cause real problems. Even in heavy rains, a well built green is free of ponded water in about 15 minutes.*



level to be employed and an accurate estimate of use, a turf bed can be constructed by using modern laboratory analysis as a basis for mixing materials. This bed should never have to be rebuilt because of soil failure, and it will require a minimum of subsequent mechanical aeration. Essentially, these are stabilized soils which can only be compacted so far and no further under normal use and maintenance.

For conservative turf managers who are more interested in facts and sound investments than they are in risking their employer's money and their own reputation just so they can claim to be soil experts in their own right, the days of "by guess and by golly" are almost over. I say

almost over because there is still a tremendous amount of misinformation and a gapping lack of any information at all on **what** is wanted in a soil mix as well as **where** and **how** the necessary analysis should be made.

We now have a considerable amount of information on soil physical analysis and a good technician can measure the physical properties of soil materials and positively determine the proportions needed for an acceptable putting green soil. This is a monumental achievement which was not accomplished overnight and will be of lasting value, but it is only a good point from which to start further investigations into the nature and properties of soils for turf.

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## Oakland Hills

### *Prepares for a Major Championship*

by TED WOHRLE, Superintendent, Oakland Hills Country Club, Birmingham, Michigan

**O**akland Hills Country Club, of Birmingham, Mich., was the site of the 1972 PGA Championship in August. After the membership agreed to host this major event, the services of a well-known golf course architect were sought to make suggested changes. Based on his recommendations, four new bunkers were built in the fall of 1971, and one modification to an existing bunker was made.

When the general condition of the playing turf was under control, we concentrated our efforts on installing the many utility wires required to make the Championship a success. Some of the utilities included underground telephone wires (some 30,000 feet) installed by our own crew to prevent the possibility of damage to the existing water lines, tile lines, and electrical control wires for our automatic irrigation system. Other utility installations included a multitude of electrical wires and television cables. Scoreboards, leaderboards and television towers were installed two weeks before tournament time. Additional towers for still photography, movie cameras and general radio and press coverage were also installed. Over 30 tents and trailers were placed around the course just one week before the Championship. These structures were used by the concession people and other public facilities.

As the Championship drew closer, we had to take into consideration the various heights of cut on the grass. Greens were to be 3/16-inch,

fairways 5/8-inch, tees 1/2-inch, intermediate rough about 10 feet wide cut at 2½-inches, and the deep rough as tall as nature would permit. Fairways were narrowed to 30 yards in the landing areas. A collar of 30 inches was mowed around each green, followed by 5 feet of short rough. The remainder of the turf surrounding the green is considered deep rough. All of these features place a premium on accurate shot placement.

Throughout the entire tournament the gallery was of prime concern to the club, especially the safety of the spectator. The placement of gallery ropes helped to control the crowd, as well as affording them safety. The ropes are placed in such a manner as to give greatest visibility for the gallery. We also cut low-hanging branches on our trees to give an unobstructed view of play and at the same time protect the crowd from accidental eye injuries.

Traffic control on the course during the week of the Championship is perhaps the biggest headache encountered. Strict schedules for delivery trucks which service the concession tents must be enforced. An employee of the grounds crew must accompany each truck. This includes the truck servicing the comfort stations at night. The collection and removal of trash from the premises is a monumental task. The local Boy Scouts gather up loose trash and place it in receptacles. The waste is then bagged for pick-up by the grounds crew and brought to