

Soil Must Be Built Right for the Permanent Golf Course

By W. F. THERKILDSON

FRRIENDS, GOLFERS and Greenkeepers, lend me your ears that I may pour into them some choice advice, supplied by Nature in her effort to make unheeding man understand her everyday gestures of friendliness.

I've used the Utopian title of "The Permanent Golf Course" as a sort of vision of a greenkeeper's heaven. If it were possible to establish a college where accurate advice and instructions on permanent golf course building were available, I'd bet that the attendance of green chairmen, greenkeepers and golf club treasurers would burst its walls. However, "The Permanent Golf Course"—insofar as nature's limitations allow—is entirely within the range of attainment.

This world of ours pays such marvelous dividends for the exercise of so-called "horse sense" in our attention to plant life, that I sometimes think it is regrettable that man does not possess "horse brains."

A soil, or any soil—obvious as this statement may be—is just as efficient in plant nourishment as the materials from which it is built. I use the term "built" advisedly, for soils are built rather than made. One builds a house from materials manufactured elsewhere and so it is with soils. Nature makes the materials with which the efficient soil craftsman builds.

I've heard about those contributions of Nature which built something called "virgin soil." This general and extensively used name has come to be the common term by which the crop producing capacity of soils has been inaccurately measured. It does stand, however, for that ultimate value which man has arbitrarily fixed for ideal soils.

Greenkeeping Is Fancy Farming.

There is nothing new upon this earth and that goes for the things that are applicable to plant growing. The production and maintenance of greens, fairways and grounds is just another form of specialized plant growing. The greenkeeper must have

a knowledge of soils in relation to his special crop of grass. He must know the requirements of the grass—with full recognition of just what Nature has prescribed for each kind.

Grass—nature's largest family—is found in hundreds of thousands of varieties. It has been said that "Grass is earth's carpet for the living and her blanket and benediction for the dead. Earth's scars are healed with grass and when man's highways and gathering places are abandoned, silently but surely, grass grows and returns to the throne that it may have temporarily abandoned, but never abdicated."

A beautiful thought, but how sincerely and fervently many greenkeepers pray for some of the desirable varieties to grow upon and thus cover the scars of the courses under their charge.

Well, friends, save yourself further worry and praying, for most of your troubles begin with the soil! "Sez who?" you shout. Believe it or not, Nature says so! Smart as you, or all of your technical and scientific friends may be, all of us are but kindergarten children when it comes to matching our knowledge against the fixed laws of nature.

A Grass for Each Condition.

In her great plan, she gave the earth thousands of varieties of grasses, each one as an answer to some particular condition of location, soil, or climate. For swamp conditions and wet places certain kinds were provided—I've seen hundreds of greens that were swamps as far as adequate drainage was concerned—but it is a curious fact that she gave us darn few kinds for brick yard and sand dune areas. Honestly, in trying to help some of my greenkeeper friends, I've wondered where or how they secured so much first class brick material to make their greens.

The sand conditions that I have observed, all presented an easily solved problem, as compared to these hundreds of sub-surface brick yards that baffle prac-

tically every effort, other than entire rebuilding.

Numerous times I have said and written and of course been disputed, that the all important factor in any soil is its content of organic matter (called humus). That statement is true, for without humus there is no bacterial activity and where there is no bacterial activity, soils are dead! Humus increases water-retaining capacity of sandy soils and establishes aeration and drainage in heavy soils. If used liberally, it improves the structure and fertility of all soils. Humus stimulates bacterial activity. It is constantly being decomposed, or digested, by soil organisms and such natural decay continuously liberates nutrients for plant development.

Five Keys to Good Turf.

In establishing a successful course—which applies to greens and fairways alike—the vital points are:

First—Permanency.

Second—Soils adapted to the grasses used, or vice versa.

Third—Avoiding over-stimulation in the desire to obtain a quick flash of green. This frequently occurs where the various ammonia agents are used as top dressing.

Fourth—Proper firming of soils. To be permanent, all turf areas must be made firm and kept so.

Fifth—Intelligent mowing and maintenance. These are the most common of fatal abuses. The way that these abuses occur are many and varied, but they arrive at the same general dissatisfaction and complaint.

When one undertakes course building, he must know that he is laying a soil foundation which will have to endure hard wear for a very long time. He must, therefore, establish not only the correct mechanical condition, but fill the soil areas with slowly available, basic naturals that the usually slow-feeding grasses can use. It is then obvious that he must be sure of his soils, mechanically and physically. He must know that unless the native soil is eroded and sterile (subsoil) there are natural grasses indigenous to that native soil which will grow, and that combating such grasses will be one of his chores. He must know that all grasses thrive only where the soils are firmed enough to give immediate and close contact with the many fibrous roots that are necessary to provide constant support to the above-ground parts. He must prepare his soil

area so that the young roots may quickly penetrate, deeply. Most grasses are heavy, though slow, feeders upon the soil constituency that is peculiar to the support of the particular grass. To illustrate: Bluegrass—the bulk of most fairway mixtures is bluegrass and redtop—is a grass indigenous to natural (not manufactured) limestone soils. Consequently it draws heavily upon the available lime content of all soils upon which it is sown. Bluegrass rarely does well in soils deficient in natural lime. A minor quantity of hydrated lime and a major quantity of ground lime rock thus become imperative in building a turf soil, where bluegrass is used. Redtop—as are all of the *Agrostis* group (which includes the numerous bent grasses)—is tolerant of and thrives better upon soils that run from slightly acid to markedly acid.

Nature took millions of years to build her natural, or virgin, soils and many course builders seek to equal that record in overnight soil preparation, by the use of chemicals. Such practices—particularly in the case of turf grasses, start every greenkeeper in the endless circle of more plant stimulation . . . which demands more watering . . . which develops fast soft growth . . . which must be cut more frequently . . . which requires more stimulation to equalize removed grass and to avoid susceptibility to disease . . . which demands spraying and treatment, and so on ad infinitum.

Sandy soils (untreated) rarely produce good turf. Heavy clay soils are so compact that drainage and aeration are inadequate and crusts form; resultant turfs are undesirable on such untreated soils. Silt loams are, as a rule, the most satisfactory untreated soils for turf.

Disease Unlikely in Right Soils.

These natural types of soils should be thoroughly considered in building the long lived, or permanent green and the extensive fairways. If you have a certain type of soil and desire to grow a particular kind of grass, either give consideration—if you are familiar with its native heath—to the kind of soil in which it grows naturally, or learn from some authority what to do to make your soil as nearly natural a soil as possible, for that particular grass. When you have done that, you have started right. You will obtain a uniformly good growth and you will find your problems of disease will be few or none at all.

Some varieties of grass are more susceptible to the ravages of disease than others, but if conditions are natural, for each variety, then their susceptibility is but relative and they rarely become diseased.

No preparation of a permanent soil is of value if the final compost contains less than 10 per cent—by bulk—of organic matter. That is reduced to understandable figures by this illustration: Preparing to a depth of ten inches—which should be minimum—a layer of cultivated humus one inch thick should be thoroughly and evenly worked into the nine inches of top soil directly beneath it. If the soil is very heavy or clayey, or of sandy character, two inches of humus would be better—or 20 per cent.

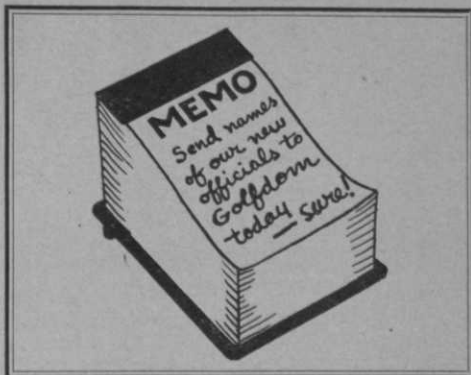
Hydrated lime should be worked into clay soils at the rate of not less than 140 to 150 lbs. to each 1,000 sq. ft. On silt soils, from 110 to 125 lbs. per 1,000 sq. ft. On medium sandy soils, not less than 85 lbs. and on sandy soils from 50 to 60 lbs. to each 1,000 sq. ft. Lime always moves downward in the soil, consequently even distribution is essential and deep working of lime is not efficient.

When the soil is of loose, or open texture, apply 600 lbs. of a good grade of raw ground bone per acre. Spread evenly and thoroughly incorporate it with the soil compost. If native soils are naturally tight, as are clay soils, 500 lbs. will be enough. 100 lbs. of muriate of potash will pay for its use, but in most turf areas it is not so important as bone phosphate.

Ammonia, in any chemical form, is a speed stimulant producing a quick, soft, unenduring flash of green. If used it should be mixed with cultivated humus—2 lbs. of ammonia to 8 lbs. of cultivated humus—and applied thinly and evenly as a top-dressing and immediately watered in.

Most golfers get the grass urge in spring. That is natural but, curiously, spring is not the best time for seeding because of advancing temperatures and unfavorable rain fall. In all localities, eight weeks, figured back from the date of the first kill-frost, will be found to be the best for successful seeding. Spring seeding always suffers with the competition of crab grass, knot weed, foxtail, goose grass and other annual weeds, while late summer seeding misses these summer weeds. All desirable turf grasses grow slowly, so don't expect the impossible.

If these directions are followed, you will



get a permanent course, providing good, high germinating seed is sown.

All plant life must have phosphorus, because phosphorus increases root development, particularly lateral and fibrous roots, thus increasing resistance to disease. It is also essential to normal cell development.

Nitrogen promotes vegetative or above-ground growth, of grass, but at the same time weakens and softens that growth and makes such stimulated growth susceptible to drought and frost and decreases disease resistance. It does, however, give a quick flash of green, which always fools the amateur.

Potash has local effect upon grass in that it helps in starch formation, also as a necessary component of chlorophyll, the agent that gives color to grass.

If your soils have been properly built, these chemical stimulants are of lesser importance in the start of the area than later. It follows, in older courses, that as mowings are made and clippings are removed, the soil becomes depleted. Don't get into the endless circle of plant stimulation, more cutting, more stimulation, more cutting, and so on.

The greenkeeper must be the judge as to grass starvation. If convinced of the need of nutrition, first try light, even top-dressing of cultivated humus mixed with a good complete fertilizer, say 6-8-4, which is 6% nitrogen, 8% phosphoric acid and 4% potash. Mix 3 lbs. of this chemical formula with each 10 lbs. of humus. Carefully spike the area at least 4 ins. deep. Apply the compost evenly to cover about $\frac{1}{4}$ in. thick. Water in evenly and see for yourself how efficiently and at what low cost a permanently built course can be maintained!

Subsequent waterings must be deep and thorough. Allow the grass to completely make use of the water before watering again. Know that light, frequent watering does more harm than good.

Mowing Height Varies.

Where mixtures of several kinds of seed are used, as in most fairways, the grass should not be mowed closer than 1 in. and preferably $1\frac{1}{4}$ ins. Shorter mowing with most grasses, has a tendency to restrict root development, thereby limiting the grass plant's power to resist drought. Where pure bent grasses are used, as on greens, the mower may be adjusted to cut to a height of $\frac{5}{8}$ to $\frac{3}{4}$ in. on the first cuttings. Later cuttings may be made at heights in keeping with the greenkeeper's ideas and the players' demands.

These rather detailed instructions may seem primary in character to the experienced course builder or greenkeeper but, notwithstanding, it has been my experiences in talking with many of them that they give little consideration to the basic foundation of soil and more attention to the immediate problem or need. This sort of action is uneconomic and is, in a measure, comparable to a man continuously patching his roof—which should be completely torn off and reshingled—and then finding, after the patching, that the roof still leaks.

Plan New Jersey Short Course for Mid-February

ANUAL SHORT COURSE in greenkeeping at Rutgers university, college of agriculture, New Brunswick, N. J., will be held February 18-23, 1935. Details of the course and its cost may be had on request from Prof. Frank G. Helyar, director of resident instruction.

Dr. Kellerman, Greens Expert, Dies at Washington, D. C.

DR. KARL FREDERIC KELLERMAN, chief of the division of plant disease eradication of the Dept. of Agriculture and one of the world's great plant pathologists, died following a brief illness, at Garfield hospital, Washington, D. C., August 30.

Dr. Kellerman was born in Gottingen, Germany, the son of Dr. W. A. Kellerman, late professor of botany at Ohio State university. He graduated from Cornell and after serving on Cornell's faculty a year

after graduation, entered government service.

He was a sound and interested counselor in USGA Green Section affairs from its inception and, for his interested service as chairman of the Section's research committee, the Section's active factors acknowledge a great debt to him.

Henry W. T. Dutton Takes Forest Hills at Augusta

HENRY W. T. DUTTON, famous operator of resort hotels in the north and south, and father of Henry Dutton, former secretary of the Club Managers Assn., has taken over operation of the Forest Hills hotel at Augusta, Ga. Dutton operates the Greylock hotel at Williamstown, Mass., during the summer season.

The Forest Hills will open for the season January 1. With Dutton at the helm, it probably will be headquarters for the pros during the Jones Tournament of the Masters.

Government Figures Show Big Slump in Sports Goods

BUREAU OF THE CENSUS, Department of Commerce recently released data on the government's biennial census of manufacturers taken in 1934 which shows that the total value of products made by establishments in the sporting goods field slumped from \$49,257,447 in 1931 to \$25,267,452 in 1933. Figures given are f.o.b. factory prices. These figures do not include firearms and ammunition or sporting clothing or footwear.

If golf maintained the 40 per cent share of total sporting goods business that it held when figures on the previous census were made public, the f.o.b. factory prices of golf goods in 1933 summed up to \$10,106,960. Figuring that the retail selling price of this merchandise in 1933 was slightly over \$20,000,000 and that pro retail sales in 1933 were approximately \$12,000,000 you have the picture of the pros' importance in the sporting goods retailing picture.

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