

composition and texture. A heavy clay or other impervious soil must be covered with a soil containing humus. The addition of a considerable quantity of sand and the incorporation of a fertilizer containing available nitrogen for plant growth to the surface of the green is imperative. The top-soil is put in final shape by hand raking and when finished should be very fine, relatively loose, free of all lumps, roots, etc.

Planting

The bent grass sod is cut into rather small pieces by running it through an ordinary farm root cutter. If any clover or other undesirable plants are present in the sod, these should be sorted out. The stolons should be distributed as evenly as possible and in sufficient quantity to cover the ground well, thus avoiding gaps which are so liable to form tufts later. To keep the roots from drying out, they must be distributed over a small area at a time and covered as soon as possible. Enough top-dressing is applied just to cover the stolons and the surface is rolled at once and sprinkled. Sprinkling should be done by hand, rather than with a sprinkler attachment, to avoid washing the fine top-dressing mixture into ridges. This statement also applies to established greens during the first two or three days after top-dressing.

Mowing

The lawnmowers are put into use as soon as the grass has reached a height of about two inches. The grass is mowed every day thereafter. Sundays excepted, throughout the season. Preferably the mower should be run one day at an angle to the direction it was run the previous day, keeping in mind the advisability of cutting in rotation in four directions. This tends to keep the grass growing upright and to make the surface uniformly even. The mowers must be kept sharp to avoid tufting the grass—the bane of the golfer.

Top-Dressing

This is done as required to maintain the growth and condition of the grass and is as important as daily mowing. Among the reasons for top-dressing may be mentioned the following: (a) to protect the new stolons that grow laterally from near the base of the parent plant; (b) to furnish nourishment; (c) to fill any unevenness in the surface of the green. The top-dressing mixture which we are using has given splendid results in the past. It is composed of two parts compost, one part sand, with which is mixed for general use one and one-half pounds ammonia sulphate per 1,000 square feet of green. The ammonia sulphate content is varied to suit conditions. It is increased for spring and fall use and reduced for use in the summer and on newly planted greens.

Watering

Water makes available the plant foods in the soil by putting them in solution. The quantity of water needed will depend upon the season of the year, the nature of the soil, and the rainfall. We believe the matter of judicious watering is one of the most essential steps in establishing and maintaining a perfect bent grass green. It requires constant supervision and good judgment to obtain the best results from watering. The surface of a newly planted green should be kept moist at all times. This is accomplished by sprinkling daily until the ground is thoroughly saturated, but never to the extent that streams are formed, as they uncover the stolons and also leave the sur-

face of the green rough. For all sprinkling we believe a nozzle should be used that throws a fine spray, as the surface of a green becomes disfigured by too heavy a stream of water, which beats holes in the top-dressing and is likely to make little ditches.

We have solved the watering problem by employing a night man. He starts work at 7:00 p. m. and finishes at 4 a. m. His last duty is to turn on the sprinklers used to water the tees. These are allowed to run until the day force commences work in the morning. The statement that water and more water—though not in excess—is the only hope of keeping the grass green and growing is particularly pertinent to this discussion. Next season we plan to water the approaches to the greens.

Weeding

While it is possible to control weeds to some extent by applying an acid-reacting top-dressing, every putting green requires hand-weeding at least once a season. Messrs. Oakley and Fitts, in the *Green Section Bulletin* for July, 1927, state that the chief weed to fight in the latitude of Washington, D. C., is crab grass. This is also true in Wisconsin. The time to eradicate crab grass is when it first becomes more evident. One man can then remove more crab grass plants than can three men after the plants have started to branch. Crab grass is the greenkeeper's worst enemy and does more damage to greens than all other weeds combined.

Sand Must Contain No Lime

The sand which we have been using in our top-dressing mixture has recently been analyzed and found to contain nearly 18 per cent carbonates. This surprised and disconcerted us, as we were working under the impression that our sand carried little or no lime. It is a well established fact that lime is contra-indicated on the golf course, as it facilitates the growth of clover and weeds, both of which the greenkeeper is continually fighting. On the other hand, an acid-reacting top-dressing mixture inhibits the growth of these plants, yet stimulates the growth of bent grasses. A supply of quartz sand containing practically

no carbonates has now been secured, so we anticipate better results in the future.

Acid-Reacting Top-Soil Important

The black top-soil used for composting purposes is also subjected to chemical tests to determine its inorganic and organic matter composition. By this method we have been able to secure a soil high in organic matter (humus) yet carrying no carbonates (lime). With this information to guide us and a contract for a load of horse manure every day of the year for composting, we feel that the putting and fairway greens at the Black Hawk Country club should soon be as good as any in the country, as nature has provided a wonderfully fertile, well drained soil which only needs intelligent management to produce an ideal stand of the desirable grasses.

So far we have been fortunate in experiencing no damage from brown patch or other fungus diseases. Earthworms are a pest at times, but an application of corrosive sublimate (mercuric bichloride) in solution has been an effective means of controlling them.

Planting Greens in Spring

We are convinced that the best time of the year to start work is in the late summer and early fall, the idea, of course, being to secure a good stand of bent before winter sets in. However, as every green chairman and greenkeeper knows, it is usually impossible to accomplish before snow flies all the work planned, so some of it must of necessity be postponed until spring. In southern Wisconsin excellent results have been secured with bent grass stolons planted in the spring. We tried this method on one green last season and another one this season. The 1926 work resulted in a green that was suitable for use just sixty days after the stolons were planted. This green now probably has the best putting surface and the most ideal stand of fine bent grass in this section. The green that was planted this spring was ready for play in practically the same length of time.

One of the big problems in connection with spring planted greens is fighting the weeds of all kinds which grow so rapidly under the ideal conditions for plant growth which must be maintained for the grass. This necessitates several hand weeding, but final results amply justify the expense.

MAINTENANCE POLICIES that make GOOD at Blackhawk

BY JOHN S. BONE

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AS every greenkeeper has learned, it is impossible to follow entirely any hard and fast rules, for I can think of no business that is so governed by weather conditions as is ours. Each morning, we might say, presents its particular problems of adjusting plans to conditions.

To go into every detail of Blackhawk's methods of maintenance would not prove profitable, as we follow in a general way the accepted methods of present day practice.

Labor management we all recognize at once as one essential that if properly handled will go a long way in the solution of many of our other problems. We recognize that the quality and quantity of available workmen varies somewhat in different sections, and we find ourselves particularly fortunate at Blackhawk Country Club in being able to secure exceptionally good, reliable men, most of whom have been with us four, five, and six years. Each man has his own work for which he is trained and held responsible. In order to stay on our force a man must do

his work as directed, in a workmanly fashion, in a reasonable length of time, and show an interest in his work.

Report System Employed

Each man understands that he is expected to report to me anything that he may see on the course that is out of order or calls for my special attention. All our men are hired by the hour and receive pay for overtime whenever it is necessary to call on them for special work. Our rule is to treat our workmen as we would wish to be treated if we were in their places, and we have the respect and friendship of the entire force. One faultfinder can spoil a whole crew and the sooner we get rid of him the better.

Assaying Purchasing

Every greenkeeper should keep himself informed as to labor-saving machinery. The test of whether a club should purchase such machinery

is: will it do the work as well or better than we are able to do it by any other method at a real saving of time and labor, and: do we require the services of such a machine for a sufficient number of hours each year to justify the investment. If it meets these requirements we should purchase it by all means.

It is poor economy to try to make the old tractors or mowers or any other machine do after they have reached the stage when they are sure to give trouble instead of service. We believe it pays to give men good tools to work with and insist that they take proper care of them, which they are much more likely to do than if they are given poor ones.

Watering very properly suggests itself to us as of major importance, and I believe the only rule to govern this is the condition of the green itself. All greens on the same course do not require the same amount of water. Experience should teach us to tell immediately by the feel of the turf under our feet just what the water requirements of each green are.

As the edges of greens always dry out the most, especially on raised or banked greens, we make it a rule to sprinkle well outside the green itself.

Compost Practice

In regard to fertilizing greens I expect to be accused of being old-fashioned. We still believe in the good old compost pile and when I say old, I mean at least three years old, and right here is, in my opinion, why it has been so condemned lately. We might well expect to get all kinds of weeds and disease from compost only a year or less old. We make a pile each year, with the top wide and sloping to the center to hold water better, sufficiently large to meet the requirements of a year. This is made of horse manure and good top-soil in layers about a foot thick each, to a height of about six feet. If we expect to have good compost we must put good material into it. This is allowed to lie for a year, then turned under and mixed, taking care to leave the top wide and sloping toward the center each time it is turned, until the last before using when it is left with a crowning top to shed water. When we are ready to use this material it is screened and mixed in a common cement mixer ten parts compost with five of sand and from two to four pounds ammonium sulphate per 1,000 square feet of surface varied according to the season of the year. The screen and mixed are so placed that they run at the same time from one engine, and the compost is shoveled from the screen directly into the mixer. In this way we think we have reduced the labor cost about to the minimum. The first top-dressing is applied just as soon as it is fit in the spring, then again in from four to six weeks and so on according to the requirements of the greens.

I like to give the greens a late top-dressing which is rather heavy, as I think it sends them into the cold weather with lots of vitality and also makes a covering or mulch for the roots. For these same reasons and also because it has a decided tendency to produce that erectness of blade which is every greenkeeper's aim, I am strong for this system of fertilization.

Mowing Methods

Poor methods in mowing have been the very point where otherwise good work has brought disappointment to many a greenkeeper. After the first few cuttings in the spring, or just as soon as the grass begins to grow well, we set the mowers to cut three-sixteenths of an inch in height and keep them there until late fall. If one does not start cutting short early, the greens get grainy and matted or, in other words, the blades do not stand erect. When once we have this condition it is very hard to overcome it.

Every greenkeeper rejoices in the marked improvement in greens mowers that have come in recent years. I have no doubt that there are a

number of makes of nearly equal merit now on the market. The same applies to power green mowers, also. What I have said in regard to cutting greens refers entirely to creeping bent greens with which I am concerned.

Making a Complete Job

Ask any greenkeeper what his chief concern is and I suppose he would say his greens, and yet in order to make the thing complete and keep everyone happy we must maintain the same standards for fairways, tees, traps, bunkers, and rough. Just as a slight blemish may destroy an otherwise beautiful picture so to neglect anyone of these may have the same effect.

All greenkeepers are still looking for some modern Moses to lead them out of the wilderness in which they find themselves in dealing with brown-patch.

We have had no trouble in controlling brown-patch by using ten pounds of bichloride of mercury and three pounds of ammonium chloride dissolved in 50 gallons of water. Mix one-half gallons of this stock solution with 50 gallons of water. Fifty gallons to 500 square feet may be safely applied. This has not failed to stop each attack, although we had to use it two and in a few cases, three times on the same green during the season.

We hope some of our scientific men to whom

we owe so much may soon discover a real cure for this menace in our pet greens.

Make Changes Deliberately

No doubt Mr. Noer is correct in his suggestion that there is need for a revision of methods in greenkeeping, and the same thing is true in many other lines of business. I have sufficient confidence in the alertness and ability of the men engaged in this line to believe that every exigency will be met and each problem solved in time, and I prefer to make changes deliberately rather than rush from methods that are giving reasonably good results to new and untried methods, but I am always trying to maintain an open mind toward forward movements.

Our program for the coming season will follow much the same lines as that of the previous season except that, in view of the reports that are coming to us relative to the use of arsenate of lead, we plan to give it a thorough test on some of our greens. We also plan to do some experimental work in forestalling attacks of brown-patch by using light applications of the solution mentioned in this article.

In closing I would like to stress the importance of tidiness, a place for everything and everything in its place, each detail attended to just when it should be, always just a little ahead of our work instead of the work ahead of us.

THE DIVOT A CONTRIBUTION FROM MR. BONE

There are two items concerning golf course maintenance practices about which we feel our membership should be better informed in order to understand the reasons for and the justification of the program we have planned. We refer to height of cut for fairways, and fairway watering and watering in general.

First, in regard to height of cut for fairways. Unfortunately, the conditions that golfers find most to their liking are exactly the opposite to the conditions under which grasses thrive best. There have been many experiments conducted that prove conclusively that the root system is in direct proportion to the height of cut. Where the grass is kept real short the root system is poor and inadequate, and improves in proportion as we increase the height of cut. Primarily the fairways are to play golf on, but in order to add to the pleasure of playing we have to give some consideration to the welfare of the grass. It would seem to be foolish to spend money for fertilizer and watering and then nullify the results by too-close cutting. We do not intend to create the impression that we are changing to a more radical program in this matter, but to justify our present system of which there has been some criticism.

Another reason for using our present plan is that we leave sufficient grass to protect the roots from the sun's rays and to retard evaporation so as to conserve the moisture in the ground. Poor lies are caused by poor sod, the ball coming to rest in a spot not filled by grass but having grass all around it, making what we call "cuppy lies." We expect by carrying out our present program of fertilization, watering, and cutting, to overcome this condition and crowd out most of the dandelions, as well as to make the course attractive to look at.

Now some information about watering. According to rainfall statistics, a variation of

from two or three inches, and as high as 11 inches in 1930 between Madison and Milwaukee, occur in the growing season, that is, May, June, July, August and September; and very often what may seem to be a good shower in Madison may be only a few drops on the golf course and when we realize that a one-inch rainfall only wets loam soil to a depth of six inches and is equivalent to 27,154 gallons to one acre, and that grass uses from 500 to 700 tons of water in a growing season (equivalent to five to seven inches per acre), we may better realize that watering is a large subject. From this you can see that a 10- to 20-minute shower doesn't accomplish much as far as penetrating the soil is concerned, but prepares the surface to receive water artificially applied; so after a shower is the most logical time to sprinkle, as deep penetration is the important goal and we save in sprinkling costs what the shower has already accomplished.

Continual surface watering is bad practice as the grass roots stay at the surface where the moisture is and become shallow rooted and spindling. The ideal at which we aim is not to allow a dry area to form between the surface and the under soil.

It is just as harmful to overwater as to not water sufficiently. By overwatering we may so fill the soil with water as to exclude air, in which case grass will become yellow and sickly, and eventually die if such a condition is allowed to go on.

There is no end to this discussion of watering practices among men concerned with grass culture for the simple reason that there are so many different factors involved, such as kind of soil, amount of drainage, temperature, etc. As I see it, it's all a matter of good judgement, with constant watching of all indications to be able to decide from them what the requirements are.

(Signed) John S. Bone.