

hazards at which birds can drink and bathe; but where these are absent or are far apart, bird fountains could easily be attached to hydrant supply pipes. These not only would be a boon to birds on hot summer days, but if placed in view of rest benches would be a source of interest and entertainment to members and visitors.

Protection, food, water—these are the things that usually are present in some degree and which may very easily be supplemented; but nesting sites, especially for some of the most useful birds, are scarce or lacking on most golf courses. The trees and shrubbery (the latter best if in tangled masses) will accommodate many birds; but the birds that nest in cavities can hardly find a home on improved lands, especially where tree surgeons have been employed. Fortunately these birds will occupy artificial cavities or nest-boxes. In most cases nest-boxes must be supplied if we would enliven and benefit our golf course with such beautiful and useful birds as the purple martin, bluebird, house wren, tree swallow, flicker, white-breasted nuthatch, and chickadee. At least twice as many other kinds of small birds have been known to occupy nest-boxes. These bird homes are manufactured by a large number of dealers in the United States and may be put up without much trouble. Placing nest-boxes is work which can well be done in winter, a season during which, at least on northern courses, employees are but little occupied, and members might welcome something to do out of doors. Names of dealers in bird boxes, bird baths and the like, and bulletins treating all phases of bird attraction methods, as well as advice in special cases, may be obtained by application to the Biological Survey, U. S. Department of Agriculture, Washington, D. C.

---

## Fighting the White Grub at Merion

ALAN D. WILSON

In September, 1920, we noticed large brown patches appearing on several of our fairways, notably the 12th and 16th on the east course. Investigation showed that the turf was not only dead, but was loose and could be pulled away from the ground. On digging down to find the cause, we discovered large numbers of white grubs about three-quarters of an inch in length. These were not the grubs of the green beetle, the ones which throw up small mounds of earth, with which we were familiar, but smaller and of a totally different species. They had very thoroughly eaten away all the roots of the grass. We tried the various common poisons, but had no success in killing the grubs, and we finally dug up large areas of both fairways, picked the grubs out by hand, and re-sodded.

The matter was reported to the Department of Agriculture, and on October 6 the department was kind enough to send an investigator, Mr. R. H. van Zwaluwenburg, of the Bureau of Entomology, who spent two weeks with us trying all sorts of poisons in an effort to find something which would kill the grubs without killing the grass. In all, he used 36 test plots of 2 feet square each, and tried, among other things, Bordeaux mixture, Paris green, nicotine, kerosene emulsion, lime, bichloride of mercury, and the arsenical solutions (such as arsenate of lead and arsenate of soda), but without effect; that is to say, with no killing amount-

ing to 50 per cent. He then tried to get them with poison gas by the use of carbon bisulphide, which was entirely successful so far as the grubs were concerned, but it also killed the grass. He finally struck the successful poison, sodium cyanide, which, in solution of 10 ounces to 50 gallons of water, gave about a 96 per cent kill of grubs with only a slight injury to the grass. Other areas which were later infested were treated with this solution, using 50 gallons, applied by hand with watering pots, to an area of 200 square feet. The grass turned quite yellow shortly after the application, but a month later was green and healthy again; the areas treated last year have shown no ill effects since.

One interesting fact we noticed was that in the treated ground all angle-worms were killed, and this, too, before they could even reach the surface. In the badly affected areas there were on the average about 28 grubs to a square foot, and this amount of grubs were apparently able to eat away practically all the roots of the grass.

The grub was identified as the grub of the May beetle (or June bug), which has a three-year cycle of life; so that the grub which was bothering us in 1920 was the product of eggs which were laid in the ground in May or June, 1919.

This year (1921) we were on the lookout for the grubs and first discovered them in the second fairway of the east course late in August. We at once treated them with cyanide, disked up the ground with a Velvet lawn seeder, reseeded, and rolled heavily, our theory being (1) that wherever they showed up this year we would escape with the least possible damage if we poisoned them before they had eaten off a large percentage of the grass roots, and (2) that by heavy rolling while the turf was still alive, even though some of the roots had been eaten, we would press the mutilated roots back into the soil in the hope that some of them would continue to live. Another advantage of early treatment was that we could disk and reseed in time for the seed to germinate well so the young grass could get a good growth before the winter set in. There was no other sign of grub damage for three weeks, and we thought we had escaped, when suddenly they appeared all over the fairways on both the east and the west courses. The areas were so large and there were so many of them that it was obvious that we would never get over the ground with the hand outfit we were then using. We accordingly purchased a two-horse sprinkling cart, holding 600 gallons, and a one-horse cart holding 200 gallons. To the first of these we attached three hose with spray-nozzles, and to the second, two hose, and we also continued the use of our barrel on wheels, from which we applied the solution with watering cans. We took on 14 extra men, bought large quantities of cyanide, and started in on a wholesale scale.

In all, we have had 11 fairways affected on the east course and 9 on the west, a total of 20. We completed our poisoning on October 20. Being still fearful of the possible injurious effect of the cyanide to the turf, and finding that earlier in the year the grubs were much nearer the surface than they were last year in the colder weather of November, we have used this year a weaker solution. The results seem to show that with 10 ounces to 50 gallons of water we get better than a 95 per cent kill; but it burns the grass temporarily. With 8 ounces to 50 gallons we get about an 80 per cent kill; the grass turns yellow in spots, but

there is no permanent injury. A 6-ounce solution does not affect the grass at all, but gives only a 50 per cent kill. Our experience would seem to show that 8 ounces to 50 gallons is the best practical solution for use early in the season when the grubs are close to the surface.

Great care must be taken in the handling of sodium cyanide, because (1) it is a deadly poison, (2) it eats away and ruins all brass or copper fittings, and (3) if it is not evenly distributed it either kills the grass if put on too heavily or fails to kill the grubs if not put on heavily enough. We find that the only way in which we can distribute it reasonably even is to stake out areas 10 feet wide and 20 feet long and try to distribute 50 gallons over that area. Signs are put up notifying the members of the danger, and the men are constantly cautioned to use the utmost care.

One curious fact is that only 2 of our 36 putting-greens have been at all affected—a small portion of the 2d green and about 40 per cent of the 10th on the east course. In both cases the area affected was on the edge, not the center, of the green. In treating the greens, which are composed of German creeping bent with quite a large percentage of the velvet-bent strain (*Agrostis canina*) we realized that we were dealing with delicate material, and reduced our solution to 6 ounces to 50 gallons of water. Even this solution turned the grass completely brown, and at first sight it looked as if all had been killed. After top-dressing with mushroom soil, and watering frequently, we can report, at the end of three weeks, that both strains of the creeping bent have entirely recovered, but the small patches of velvet bent have been killed; which shows the extreme delicacy of this most beautiful of all turf grasses.

A theory has been expressed that the reason for the prevalence of these grubs at Merion is the fact that we have creeping-bent fairways throughout, and that to get and maintain them we have tremendously overfertilized the course. This hardly seems to be borne out by the facts, for we find just as many grubs in the rough, which we have never fertilized, and we find fewer grubs on the greens, which we have fertilized much more heavily even than the fairways, and, more conclusively still, we find that another golf course in the vicinity, as well as one in New Jersey, have had just as many grubs this year as have we—in fact, we think more—and, to the best of our knowledge and belief, their fairways have had no fertilization of any kind for the past twenty years. We are, therefore, entirely in the dark as to why these grubs should appear, and, by the same token, as to what steps we should take to prevent their reappearance. Most of the golf clubs around Philadelphia have them this year to a greater or less extent, and we are led to believe that it is probably due to weather conditions at the hatching periods and is a Providential dispensation for the probable good of our souls.

We were in some doubt as to whether the treatment we adopted was practical and would give us results which would be worth the money expended. It has been a large operation, involving the use of 1,300 pounds of sodium cyanide, the application of about 2,800 barrels of solution, and roughly it has cost about \$4,000, as follows:

14 men for 40 days, at \$3.25.....	\$1,820
Hire and board of 3 horses for 30 days.....	165
1,300 pounds sodium cyanide, at 34 cents.....	442
1,200 pounds grass seed (redtop), at 30 cents.....	360
Heavy rolling, about.....	300
Cost of disking with lawn seeder, about.....	150
Equipment, such as watering carts, watering pots, etc., about.....	700
Total .....	<u>\$3,937</u>

While it is too early as yet to say definitely just how valuable this treatment has been, it now looks as if it were well worth the money spent. Where we have not killed the grubs, as in certain parts of the rough, the roots of the grass have been entirely eaten away and solid mats of turf 5 and 6 feet in diameter may be lifted from the ground like a rug. If, therefore, we had allowed the grubs to continue their work uninterrupted, it seems fair to presume that we would have lost most of the turf on the affected areas on 20 fairways and that these fairways would not have been fit for play for the balance of this year and would have had to be reseeded this fall, too late to get a proper germination, and probably would have to be reseeded again next spring. On the other hand, as a result of the work, the fairways which were first treated in the first half of September are now almost as good as before the attack. About 70 per cent of the old grass rerooted and looks strong and healthy, while most of the bare places are filling with new grass, and we think that by next May we will again have a solid heavy mat of turf. The fairways which have been treated in the last three weeks have not progressed so far, but they are all in a promising condition, although we have been seriously handicapped this fall by a lack of rain; we feel that we have reason to believe they will be substantially as good as ever in the late spring.

We have noticed one curious effect of cyanide on certain areas which we have treated, notably a portion of the 14th fairway and the 10th green, east course. While the grass seemed to be burned immediately after the treatment, now a month later it is of a distinctly deeper, richer, more vigorous color than the grass on the surrounding untreated ground, and this leads us to believe that possibly the cyanide, in its secondary effect, has some stimulating or fertilizing quality.

What we want to emphasize most strongly is that this work is not at all practical unless it is done early and before the grubs have had an opportunity to eat off a large proportion of the grass roots. If treatment of the turf is begun at the first sign of injury to the grass, we believe the labor and expense is well worth while, provided the turf is immediately rolled heavily with a view to reattaching the severed grass roots to the soil, and then disked and seeded promptly, watering, if possible, so that the new grass may have a chance to germinate and root before cold weather arrives. Our advice would therefore be, at the first sign of brown patches and dying grass late in August or early in September, to lift the grass with the hand or push with the toe; and if you find the turf is loose and comes away from the soil, investigate and see if this white grub is the cause of the trouble, and, if so, get after him at once in every area where he appears. Of course, the real answer would be to destroy the beetles in May or June, before they

have had a chance to lay their eggs; we thought this might be done by spraying the trees in the neighborhood of the course; but this, we are told, is impracticable, as their egg-laying flight has been known to exceed a mile.

The next best plan would be to use some treatment which would make the course unattractive as a breeding-ground for beetles or as a living place for grubs. We do not know of any such treatment, however, and are in the hope that some of our readers may be able to give us useful information.

We are also in the dark as to why the grubs are not on our greens. It has been suggested that this may be because the greens have been heavily sanded for the past five years and that this character of soil may not be attractive. It has also been suggested that as our greens are watered quite frequently, and this at night, and as the May beetle is a night-flying insect, this practice may have kept them away from the greens and sent them to the unwatered fairways. If any one has experience which will throw light on these questions the data certainly ought to possess practical value in the problem of combating this destructive insect.

**The Green Committee of the U. S. Golf Association is always glad to publish items showing how work around courses can best be done.**

#### CONSTANT REMINDERS

One of the Washington golf clubs has recently espoused a scheme, perhaps not new, that deserves wide adoption. At every tee there is a neat sign with an appropriate reminder such as nearly every golfer needs. Some of the messages are:

**Study Rules and Etiquette.**

**Let 'em Through.**

**Replace Loose Pieces of Turf.**

**Don't Linger on the Putting Greens.**

This scheme ought to be helpful on every golf course and is commended to the attention of green committees.

---

#### **The St. Louis District Green Section Organized**

Announcement has just been made of the organization of the St. Louis District Green Section. The marked success that has attended the District Green Sections which have been organized at New York, Philadelphia, and Detroit will doubtless lead to the organization of similar district sections in the other large golf centers of the country; indeed, movements in this direction are already under way at other points.