

## Mosquito Extermination

Green committees and greenkeepers frequently think of June beetles, Japanese beetles, and ants as the chief insect pests of a golf course. Club members, however, often think otherwise. To the player a flock of mosquitoes is usually much more distracting than any number of turf insects.

In all too many cases the mosquitoes that bother the players are produced on the club property due to the oversight or neglect of those in charge of the course. Stagnant pools are an abomination in many ways. Good water hazards are an asset to any golf course, but there is a wide difference between good water hazards and the puddles



A bad breeding place for mosquitoes.



The same place filled in and converted to useful land.

of stagnant water that some clubs try to glorify with the name "water hazards." Stagnant water offers an ideal breeding place for mosquitoes, and a small, neglected pool may furnish a stock of mosquitoes sufficient to torment the club members during the greater part of the playing season and possibly bring disease. It is the duty of green committees and greenkeepers to do all in their power to protect the players from these small tormentors just as much as to provide them with good turf on which to enjoy their game.

National and State organizations have spent millions of dollars in recent years in an effort to reduce the mosquito nuisance by eliminating the breeding places of the pests. Golf clubs can help this pro-

gram of public welfare by providing proper drainage on their properties. It should be remembered that a campaign of this nature is successful only if all breeding places in a given area are eliminated. Stagnant water in some unused part of the club property is just as dangerous from the standpoint of mosquito infestation as is a pool in the middle of a fairway. Those in charge of a golf course are not fulfilling their obligations to their club members and their community if they fail to do their share in the nation-wide movement under way to reduce in every possible manner the mosquito nuisance and the diseases which the mosquito may transmit.



Swampy areas too extensive to permit filling in may be effectively rid of mosquitoes by means of properly constructed ditches. The main ditch for the area here shown is two miles long, draining at each end into a rocky beach.

Doubtless the most efficient plan for mosquito extermination is the Gorgas plan, being sponsored by the Gorgas Memorial Institute of Tropical and Preventive Medicine, which is perpetuating the sanitation work inaugurated years ago by the late Major General Gorgas. "More human lives were saved by General William Crawford Gorgas in controlling mosquitoes in Cuba and Panama than have been saved by the act of any other single man," writes Dr. Franklin Martin, chairman of the board of directors of the Institute. In a statement issued by the Institute it is said: "The work which Gorgas accomplished at Panama alone is conservatively estimated to have saved a total of 71,000 lives, and the United States Government a total of \$80,000,000. This record won for General Gorgas the title of 'the greatest and most famous sanitarian of the ages,' and in completing the Panama Canal, America won credit for doing what four hundred years of time and all the plans of other nations had failed to accomplish. What Gorgas did we can do in every home, every community, every golf course, every county, every State. We can clean the United States of mosquitoes if we will." In commenting on the Gorgas plan,

Rear Admiral Cary T. Grayson, president of the Institute, writes: "The Gorgas Memorial Institute stands for better health. In a variety of directions it is carrying on the activities of the great sanitarian General William Crawford Gorgas, to whom the Institute is a perpetual memorial. The splendid Gorgas Memorial Laboratory in Panama, made possible by an annual appropriation of \$50,000 from the United States Government and by the generous cooperation of the Republic of Panama and other Central and South American countries, is constantly engaged in the study of tropical diseases as they affect human and animal life; a wide educational program for better health is bringing new understanding of how to prevent disease to families and communities throughout our own country; and the Gorgas plan of permanent mosquito extermination is making every place in which it is used a better, healthier, more comfortable place in which to live."

The more important features of the Gorgas plan of mosquito control, together with a statement of what the plan has already accomplished in the United States, are contained in a pamphlet recently issued by the Gorgas Memorial Institute, entitled "Get Rid of Mosquitoes." For the benefit of readers of the Bulletin, there is quoted below a portion of the pamphlet dealing directly on the problem of mosquito extermination. The pamphlet also contains information on the life history of the mosquito and descriptions of the different species and their habits, in terms of the layman. It presents in a popular way the thrilling story of the triumph of sanitation in combating some of the most disastrous human diseases with which medical science has had to contend. The Panama Canal, it will be recalled, could not be completed until the mosquito problem had been solved by General Gorgas. The pamphlet is profusely illustrated, and may be obtained by writing to the Gorgas Memorial Institute, 1331 G Street Northwest, Washington, D. C. We read:

"It is the consensus of opinion of our foremost observers that in localities where mosquitoes are prevalent and no control measures have been undertaken, their numbers are increasing considerably from year to year. New areas are being infested due to increased population and changing conditions. This is particularly noticeable in what Le Prince calls the 'man-made species' of mosquitoes bred in polluted streams. In populous sections there are very few swimming holes remaining fit for bathing.

"It is common for people to think that the larger the body of water or swampy area, the more mosquitoes it can produce. As a matter of fact, in many instances the places which look as if they might produce large numbers of them actually are the source of very few. Oftentimes it is because the natural enemies of mosquito larvæ control the situation. On the other hand it is astonishing how many families leave out in the open, around the yard, many home objects which will catch and retain rain water. Inspections of numerous towns show that it is common for three out of five families to produce a supply of mosquitoes close to their homes.

"Last year, Boy Scouts, volunteering as mosquito inspectors, found that 42 per cent of 3,000 homes in a wealthy metropolitan suburb were breeding their own. A few visits of the Three-Minute Squad of three scouts put an end to mosquitoes from this source. The Three-

Minute Squad uses a sponge to absorb water standing in house drains and keeps a record of work done.

"The practical extermination of all mosquitoes throughout the United States would not be an impossible task and there is nothing that would give greater return for the effort and money expended. The Gorgas plan of permanent mosquito extermination calls not only for present eradication of mosquito breeding, but for the exhaustion of all mosquito breeding possibilities that may be caused by abnormally wet weather conditions. The most important type of the engineering work called for consists of especially designed drainage of a permanent nature. Small pools and potholes are filled to grade, if filling material is available at reasonable cost. Mid-channelling serves in many cases to give added flow and perfect drainage to sluggish streams. Chemical repellants are valuable in manholes of storm sewer catch-basins. Spraying of oil and other larvacides is a temporary measure which sometimes must be resorted to, but it is expensive and does not effect total extermination or permanent control.

"Any city, town, or countryside that is infested with mosquitoes, or even has relatively few, can be freed of them under the Gorgas plan at very reasonable cost. All that is required is the plan and some organized concerted effort. If you have no outlying swamp areas and no polluted streams you have just a local problem that you can handle yourselves. The Gorgas Memorial Institute will show you how, and you probably have engineers fully capable of doing the outlying work if a specially trained mosquito engineer makes a survey and outlines exactly the necessary procedure under the Gorgas plan. The Gorgas plan has been bonded numerous times, guaranteeing the total permanent extermination of all mosquito breeding in a given area and maintenance in a mosquito-proof condition.

"As soon as boys and girls, and men and women, have learned what mosquito larvæ look like, it is not difficult to find and examine all the breeding places within a three- or four-mile radius of any community. Boy and Girl Scouts, Campfire Girls, Rangers, and other organized youth groups can render invaluable service in helping to rid their communities of the mosquito pest; and the value of this important service will endure twofold in the next generation, for it is certain that those who participate in this work now will not tolerate mosquitoes on their premises when they are the home-owners of tomorrow."

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The water-holding capacity of soils, likewise their capacity to retain soluble plant food, depends on the aggregate extent of surface area exposed by their component soil particles. The smaller the component particles, the greater is their number and the greater the aggregate extent of surface area exposed. It is for this reason that fine clay soil has a greater water-holding capacity than sandy soil. These smaller particles contained in soil are called "soil colloids." Potters' clay is highly colloidal. The size of soil colloids is astonishingly small and the aggregate surface area which they present is as astonishingly great. It has been estimated that in the average soil about 30 per cent of its component particles are as small as  $1/250,000$  inch in diameter. A single cubic inch of such a soil would contain about 3,720,000,000,000,000 such small particles, presenting an aggregate surface area of about 1,100 square feet.