

MOSQUITO CONTROL IN SLUDGE LAGOONS

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This paper describes the physical structure, history and present condition of the sludge lagoons operated by the Metropolitan Sanitary District of Greater Chicago. Although the sanitary district has an enviable record for operation and efficiency, these lagoons have defied efforts of both the sanitary district and mosquito abatement district to control mosquito breeding. This type of mosquito breeding area may be a problem peculiar only to our mosquito abatement district.

These thirty open air sludge lagoons are located between the Desplaines River and the Ship and Sanitary Canal, not far from the geographical center of our district and are used primarily for storage of activated sludge that cannot be treated by regular plant facilities, badly overloaded at the present time. Approximately 150 to 300 tons of sludge are pumped into these lagoons daily.

They consist of 230 acres of partly digested sludge, open water, and areas covered with various types of vegetation such as marsh grass and algae. The size varies from 100 by 200 feet to 300 by 600 feet, with an original depth of 20 feet. At the present, top of sludge is about four feet from top of beds with a few inches of water covering sludge. The banks have a 1 to 1 slope and are covered with dense growths of vegetation. These lagoons support prolific breeding of *Culex pipiens* from mid-June to late September. The hordes of mosquitoes produced here have caused serious annoyance to residents of communities within flight range, particularly to the north and east, because of prevailing southwesterly winds.

The first lagoons were constructed about twelve years ago and more have been added from time to time. Although no new ones are contemplated, the possibility of increasing the area still exists, and it is certain they will be with us for many years to come.

At the moment this is written, Chicago newspapers report that the sanitary district has authorized its engineers to draw up specifications for construction of three additional treatment plants to dispose of the sludge. When these will be in operation no one can say, but until that time and possibly even beyond, we will have the problem of mosquito control on any lagoons that continue to exist.

Cooperation between the two districts has resulted in a substantial improvement in mosquito control since the severe annoyance of 1955. The mosquito abatement district has provided routine inspection service and also technical assistance when desired, while the sanitary district has provided personnel and equipment and has done the actual spraying of lagoons.

Reasonably good control was attained during the first few years when the method was to flood as few beds as necessary, about 10 or 12, allowing a crust to form on the others, which would inhibit mosquito breeding.

Then, in 1955, the sanitary district evolved a new theory: to introduce fresh sludge into all thirty beds at once in the belief that this would stop breeding for as much as six weeks. This wholesale flooding prevented formation of a crust on any of these beds, and close inspection by our men revealed a new brood two to four days after flooding.

The ensuing flights of *Culex pipiens* resulted in widespread annoyance reminiscent of days before the organization of the Desplaines Valley District; people reported killing as many as 70 mosquitoes in one night in their bedrooms.

In this particular emergency we were compelled to help the sanitary district spray these lagoons at weekly intervals, although other parts of our control program had to be neglected. The sanitary district's equipment and personnel were inadequate to handle the emergency.

The sanitary district has, during the course of years, used anything available for larviciding, such as old, discarded crankcase oil, transformer oil, cutting oil, etc., and many different chemicals, such as DDT, chlordane, Lethane, dieldrin, etc. in varying mixtures and percentages.

This, together with untrained personnel, made it difficult to determine the proper or most effective treatment. For this reason it was agreed between the two districts that, in the future, regular, semi-weekly inspections would be made and technical assistance provided whenever requested by the sanitary district. The sanitary district agreed to spray within twenty-four hours after inspection any lagoons that were breeding. Each district pays the cost of labor, material and equipment for its part of the work.

This procedure has been followed since 1955 with a marked improvement in control of mosquito breeding. The cooperation between the two districts has been good and much has been accomplished.

Desplaines Valley District made an experiment with granular dieldrin on one lagoon in April 1958 with such encouraging results that the sanitary district decided to treat all lagoons with dieldrin emulsion. This application was made the first week in August when seventeen lagoons were breeding. Breeding was immediately reduced to only five lagoons, but by the following week had jumped to an all-time high of twenty-four. Fifteen were very high, twenty-five or more per dip, producing an estimated 10 million *Culex pipiens* per brood. The failure of the dieldrin may be attributed to the fact that our good experimental results were obtained in cool weather, while hot weather in August when all lagoons were treated may have destroyed effectiveness of this chemical. The change from granular to emulsion may also have been a contributing factor. The mosquito abatement district had similar experience in spraying of polluted ditches, etc.

To facilitate daily coverage of lagoons, we had agreed that anything less than 25

per dip would be considered acceptable, certainly not up to our standards elsewhere of only one per dip.

The sanitary district then decided without our knowledge to use a 25 percent mixture of DDT, chlordane and dieldrin at an unknown rate. Inspection by our general foreman and inspector a few hours after treatment indicated breeding of as much as 500 per dip in beds just sprayed with above mixture.

In a desperate attempt to regain control, the mosquito abatement district again had to enter the picture with additional equipment and personnel and made two applications of 8 percent DDT in fuel oil at rate of 1 lb. per acre. This treatment resulted in an immediate reduction of 70 percent in number of lagoons and 90 percent reduction in intensity of breeding that lasted until the end of the season on September 26.

Looking back at inspection and larviciding records for the past three years, no clearcut pattern of behavior of certain lagoons or certain calendar periods could be determined. However, missing of a single semi-weekly routine spraying was reflected by increase in breeding. An increase was nearly always present on Monday; apparently the days lost by weekends were an important factor. No apparent relation in breeding could be detected between absence or presence of vegetation or between different types of vegetation.

Our technical staff noted that in two instances, one in each of two different years, use of insecticide containing fuel oil appeared to obtain a better and longer lasting effect than the use of emulsions or granular preparations. This is somewhat confirmed by experiences and/or suspicions of mosquito control workers elsewhere. Possibly just as good results may be obtained by use of fuel oil alone as no residual effect can be expected. This conclusion has also been advanced by other mosquito control workers. These approaches will be explored more thoroughly in 1959.

As the vast part of mosquito larvae tend to be concentrated along the banks of these lagoons, often in heavy vegetation, it seems that our present method of application with mist blowers leaves much to be desired.

A long boom with numerous jets such as is used in agricultural spraying might be satisfactory. This boom could be extended from a truck on the bank over the lagoon's edges only three or four feet above the water's surface. This would tend to concentrate the larvicide where most

needed and also prevent excessive loss by wind drift, as high winds are prevalent in this area.

The problem of control of these lagoons will be with us for many years to come. Any further control measures must also be undertaken with the realization that mosquito resistance to DDT or other chemicals could develop. In fact, some suggestion of such a condition has been noted during the past two years, although good control is still obtained when proper techniques of spraying are observed.