# MALARIA MOSQUITO CONTROL AT THE JOHN H. KEER RESERVOIR

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## INTRODUCTION

The John H. Kerr Reservoir lies between South Hill, Virginia, South Boston, Virginia, and Henderson, North Carolina. U. S. Route No. 1 passes within 6 miles of the dam. The reservoir is 39 miles long with a total shoreline of 800 miles. At average pool level the reservoir covers 48,900 acres. This Corps of Engineers project is a multipurpose development for the control of floods, hydroelectric power, low river flow regulation, and recreation.

The 1952 malaria mosquito control program at John H. Kerr was conducted by an entomologist, 3 control aids, a labor foreman and 6 laborers.

## CONTROL PROGRAM IN 1952

AERIAL SPRAYING. Aerial spraying was the principal method of control and the work was done on a contract basis. The contractor's equipment consisted of a Piper Cub, specially fitted with Art Whittaker attachments, which included a 47 gallon belly tank suspended between the landing gear, a wind driven pump, and a spray boom beneath each wing.

Spraying Systems Tee-Jet nozzles were installed at each wingtip and on one wing inboard. All other apertures in the booms were sealed. Pressure was varied according to the nozzle size and the exact amount of insecticide to be applied.

A 20% solution of DDT in Sovacide 544B was applied at the rate of one tenth to five hundredths of a pound of DDT per acre when used as a larvicide, and two to three tenths of a pound per acre when used as an adulticide.

Glass slides, coated with General Electric SC 87 Dri-Film, a water repellent silicone fluid, were used in the determination of particle size. Droplets of from 100 to 150 microns were used in larvicidal work, and droplets of around 50 microns were used while spraying for adults. The plane was flown at 80 m.p.h. approximately 35 feet above the surface, giving it a swath width of 70 feet.

Aerial spraying, conducted 3 to 4 days per week, was confined to the early hours of the morning and early evening hours. Limited adult spraying was done in areas of high human inhabitance when adult mosquito collections indicated the need. This was always done in the evening. At the end of the season we had used 15,263 pounds of DDT, 7,155 gal. solvent and had flown 236 hours.

LARVICIDING BY BOAT. Because of incomplete inundation last year, boat application of larvicide was limited to a few deep water areas. Two flat bottomed inboard motor boats were equipped with pumps to discharge water and 5% DDT in solvent. The rate of application was about one tenth of a pound DDT per acre.

HAND LARVICIDING. Wherever the labor foreman discovered mosquito breeding while performing other work, larvicide was applied by hand from portable compressed air sprayers. This also was applied at the rate of about one tenth of a pound of DDT per acre.

SHORELINE MAINTENANCE. The labor foreman and six laborers spent most of their time last season on marginal drainage and growth removal. Because of this limited manpower, work was carried on primarily in populated areas.

## RESULTS OF CONTROL PROGRAM

The 1952 season was one of greatly increased mosquito production in the reservoir area, even though there were then only 250 to 300 miles of shoreline. This was due largely to two main factors. First, the reservoir basin of 48,900 acres had been cleared by heavy equipment which left

countless depressions in the soft, flat bottom land. In these, both pest and *Anopheles* species reproduced prolifically. (*A. quadrimaculatus, A. punctipennis,* and *A. crucians* are the predominant *Anopheles* species in the reservoir area.) Second, partial inundation was taking place during August and September—the peak mosquito months.

The greatest problem last year, however, was in trying to keep informed as to where mosquitoes were breeding or being controlled as well as carry on other phases of the work, with only a few men.

In appraising our program we relied upon larval dipping to determine the immediate effectiveness of larviciding, adult counts from collection stations to determine general adult population trends, and a comparison of adult population records of previous years to determine overall control results.

The appraisal of last year's mosquito totals as compared with mosquito incidence of previous years was most difficult as the ecology of the reservoir was markedly different. A few adult counts the previous year in 1951, ran as high as two and three thousand *A. quadrimaculatus* per station, per visit, while last year the same stations yielded less than a half dozen per visit. A few other stations, particularly where late summer inundation took place, gave counts of 1 to 40 *A. quadrimaculatus* where none had been taken the year before. Station totals such as these increased or decreased depending upon the amount of attention given their respective areas. However, the majority of 92 adult stations showed less than 10 *A. quadrimaculatus* per visit during the season.

There were no reported cases of malaria, nor complaints of annoyance filed with the Virginia or North Carolina State Boards of Health nor with the Corps of Engineers Office in 1952. We were therefore not displeased with the year's work.

## REBRUSHING

A rebrushing program was conducted in 1952 through 1953 by an Entomologist in charge, supervisor, 3 labor foreman, and 65 laborers. The removal of secondary growth in certain areas of the reservoir was planned primarily for mosquito control. Flat and sheltered bights and embayments lying within the top 8 feet of the fluctuation zone were therefore earmarked for rebrushing. As *Anopheles* mosquito production is directly proportional to the amount of intersection of the water surface, stiff-stemmed annual growth in the upper zone of fluctuation, which was not expected to deteriorate with partial inundation, was therefore cut along with perennial growth.

Work was done by hand tools and mechanized equipment. It was found that tractor work was faster and not unduly expensive when the equipment worked; however, keeping it in good repair was difficult. Experienced tractor operators were unobtainable, stumps and rough terrain caused breakage, and the vast marshy areas could not be negotiated by the tractors. A set of "half tracks" would have helped considerably in marshy bottom land had they arrived in time for use. Rains and the rising reservoir maintained wet areas which consequently resisted "area burning." Cutting, piling, and burning by hand was very slow, but dependable and least expensive.

In March, when the rising reservoir ended the work, 1,813 acres had been rebrushed.

## PROGRAM CHANGES AND ADDITIONS FOR 1953

PERMANENT MEASURES. Changes in program for the 1953 season will be directed toward permanent control measures wherever possible. Dynamite will be used to blast large permanent ditches thru hundreds of acres of marshy bottom land in order that those areas may be drained upon recession of the lake. Ditches will also be dynamited to eliminate marginal pools and swamps where hand ditching is impractical.

The Island Creek subimpoundment will be closely studied this season to determine the feasibility of "deepening and filling"

certain shallow water areas. In this method, the lower part, or that portion of a marshy area toward the lake, is deepened and the earth obtained is spread upon the upper half of the marsh. Such displacement of earth creates a steep bank of 2 to 4 feet, and is a permanent method of eliminating trouble areas. Unfortunately, this would not be practical on the main reservoir as the 8 foot seasonal recession would pull the water below the bank and the deepened area before the end of the breeding season.

GROWTH INVASION STUDIES. In order to observe the extent of marginal growth invasion, lines of stakes at about 6 inch contour intervals will be set in typical areas around the reservoir. Mosquito production and larvicidal expenditures may later be correlated with this growth invasion index.

AERIAL SPRAYING. A 30% DDT solution will replace the 20% solution used last year. By doing this a saving is anticipated in both flying time and solvent. In the way of deterring mosquito resistance to DDT, greater effort will be made to apply only minimum dosages to larvae this season. A large scale experimental adulticiding program will be done by airplane in the evening and the results determined by biting counts and light traps.

# NOTES ON THE ACTIVITIES OF *AEDES* LARVAE

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INTRODUCTION: Animals which feed by the filtration of a stream of water are commonly sedentary or sessile. This is apparently partly because they can bring food to themselves instead of having to go and fetch it, but more because this method of feeding rarely permits the accumulation of sufficient energy reserves for extensive or violent movement (e.g. Jørgensen, 1952). If the characteristic wriggling of mosquito larvae is their normal activity state, as many writers apparently believe (e.g. Matheson, 1944, pp. 31 & 32) they represent a striking exception to this in that they are left with sufficient energy reserves to permit an unusual degree of activity in the pupal stage also.

These observations were made in an attempt to elucidate this riddle, and as a preliminary to more extensive studies of the energetics of the mosquito adult (Hocking, *in press*).

Diurnal movements: Most observations were made on a large population of larvae of *Aedes communis* De Geer in a single pool (fig. 1) near Churchill, Manitoba.

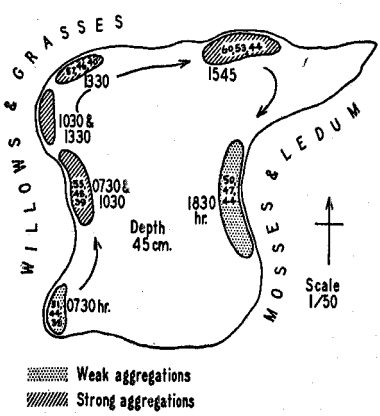


FIG. 1. Changes in the position of aggregations of the larvae of *Aedes communis* through the day. 5 June, 1951. Figures within the aggregations are fahrenheit temperatures at the top, middle depth, and bottom.