It is anticipated that approximately twenty persons can be accommodated per course. The students will be selected by International Cooperation Administration, World Health Organization and Pan American Sanitary Bureau. Employees engaged in antimalaria work of these organizations, as well as key personnel of national malaria programs are eligible to attend.

The amazing reduction in malaria in the past fifteen years in the Western Hemisphere and in many other countries such as Italy, India, and the Philippines, has raised hopes that this disease may be wiped out completely by a concerted campaign directed in each country by a team of well-trained supervisory personnel. The World Health Organization, International Cooperation Administration, Pan American Sanitary Bureau, United Nations Children's Fund, and cooperating agencies are aiming at total eradication of malaria throughout the world in five to ten years with the exception of residual foci in inaccessible areas such as portions of tropical Africa and the upper Amazon basin.

References Cited

RUSSELL, PAUL F. 1957. Malaria in the world today. Am. J. Pub. Health, 47(4):414–420.

SOPER, F. L. AND D. B. WILSON. 1943. *Anopheles gambiae* in Brazil. 1930 to 1940. Rockefeller Foundation, New York. I-XVIII, 262 pp.

TIME. 1958. The war on *Anopheles*. Time, Jan. 20, 1958. p. 66.

WORLD HEALTH ORGANIZATION. 1957. Expert Committee on Malaria. Sixth Report World Health Organiaztion Tech. Rept. Series No. 123: 1–84.

MAINTENANCE EQUIPMENT USED ON MARYLAND SALT MARSHES, INCLUDING A NEW DITCHER

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Within the tidewater region of Maryland there are around 300,000 acres of marsh, with a large percentage of this vast acreage capable of producing salt-marsh mosquitoes, whenever proper conditions prevail. In the early thirties two CCC companies were engaged in mosquito work in Worcester County, but during the interval of time they were engaged in this work only fifteen or twenty thousand acres of salt marsh were ditched. In the last twenty or so years, no maintenance work has been done to the ditches constructed by the CCC forces, nor has there been any mosquito work of importance accomplished elsewhere in the state during this interval of time.

In Maryland, a new mosquito program was made effective July 1, 1956 with funds available for both temporary and permanent work. The portion of the law relating to permanent work stipulates that work shall be undertaken only upon the condition that the municipality or special taxing area involved shall agree to defray at least 25 percent of the total cost of such work.

In order to set up an economical maintenance or ditching program for the various interested groups, it has been necessary to rely principally upon machine work, because the grade of labor obtainable for this purpose is generally poor, and if used at today's rates the cost would be prohibitive. In order for us to make any real progress in the next few years, on the vast acreage involved, we would have to rely largely on good, efficient machinery.

When our program was initiated in 1956 the backhoe and scavel combination on an Oliver tractor was a popular machine among New Jersey mosquito units. This type of equipment was developed both for digging new ditches and maintaining existing ditches.

After investigating many types and forms of machinery that could be converted to marsh usage, it was decided the backhoe and scavel unit was the most practical for our use considering cost and availability of such a unit. At the same time we had given considerable thought towards the purchase of a bucket type excavator such as the Oliver Universal Trencher, Model *3A-48;* but there were engineering problems involved that could not be solved at the moment, the main one being that the track centers were 48 inches apart instead of the customary 72 inches. With the bucket or chain type excavator the rate of work is more uniform than that of the backhoe; however, the bucket or chain type unit has its limitations in connection with mosquito work. Its use is limited almost entirely to small ditch maintenance and cutting new laterals, whereas the backhoe is capable of doing the same type of work, and in addition, the units in our possession are designed to dig either astride or off-side the ditch. This feature permits cleaning of wide ditches or natural streams up to twenty feet in width. They are also useful in construction work, and handy for building or repairing dykes.

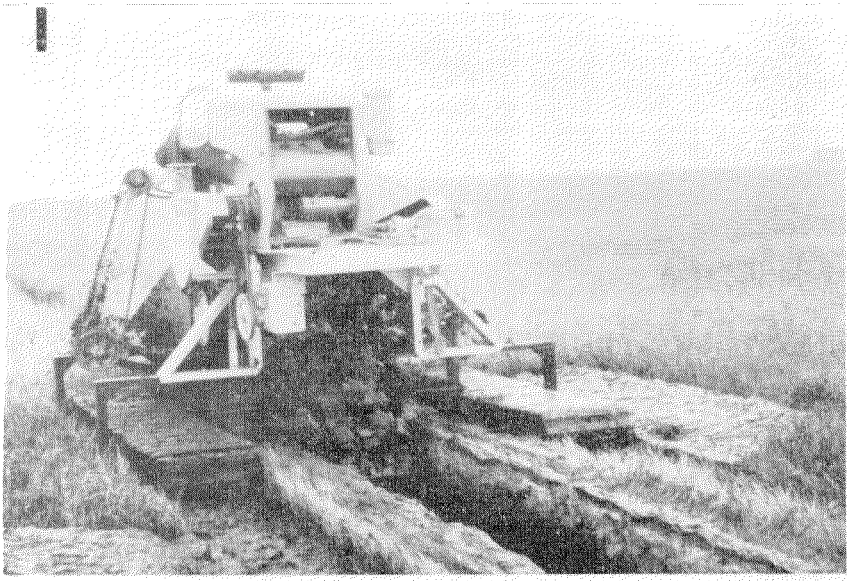
The backhoe usually does a good job under normal conditions requiring very little labor for follow-up work. It is not as efficient as a bucket or chain excavator on narrow ditches, because so many movements of the lever system are necessary before a digging cycle can be completed. The average operator can clean or dig up to 1500 feet of 14" to 24" width ditch in an eight-hour day.

We now have two backhoe-scavel units on Oliver OC-3 tractors. Each unit is equipped with a Henry C-10 H hydraulic backhoe on the rear and a Ware Loader mechanism on the front to carry the scavel unit. We specified the Henry backhoe because it had many features which permitted conversion to marsh usage. The backhoe-scavel unit has some improvements over those which we investigated. These units are so designed that the parts and accessories are interchangeable from one tractor to the other. The backhoe stabilizer unit with hydraulic extension pads has a clearance of approximately 18" from the marsh, this being very important in traveling across marsh terrain, stumps, etc. This clearance is also important because it prevents the tractor from being bogged down in many cases. To cope with the extra load on the knee action system, a transverse spring was installed to carry the overload. The tracks are on a 72" center rather than on a 68" center to permit the use of 36" gum wood grouser extensions.

Since the tractor is equipped with a backhoe attachment for the rear and a scavel unit for the front, both implements require the use of a counterweight. This counterweight is interchangeable from front to rear by having fittings common to both usages. It is held in place by three pins. In either case the operator can mount it without any assistance by using a special hydraulic cylinder to lift it in position at the rear of the tractor, while the front arms lower sufficiently for attaching it at the front. The counterweight is a compact unit weighing about 600 lbs. so that when mounted it does not obstruct the operator's view.

The backhoe unit is designed with the parallel circuit control valve, with free flow to permit simultaneous operation of any two or more hydraulic cylinders at the same time. The hydraulic pump has sufficient capacity to cope with this design. This feature adds considerably to the efficiency of its digging operation.

These tractors are equipped with Trasco reduction gears permitting 10 forward speeds and 6 reverse. This feature adds approximately $200 to the cost of the unit, but with this installation it has so many



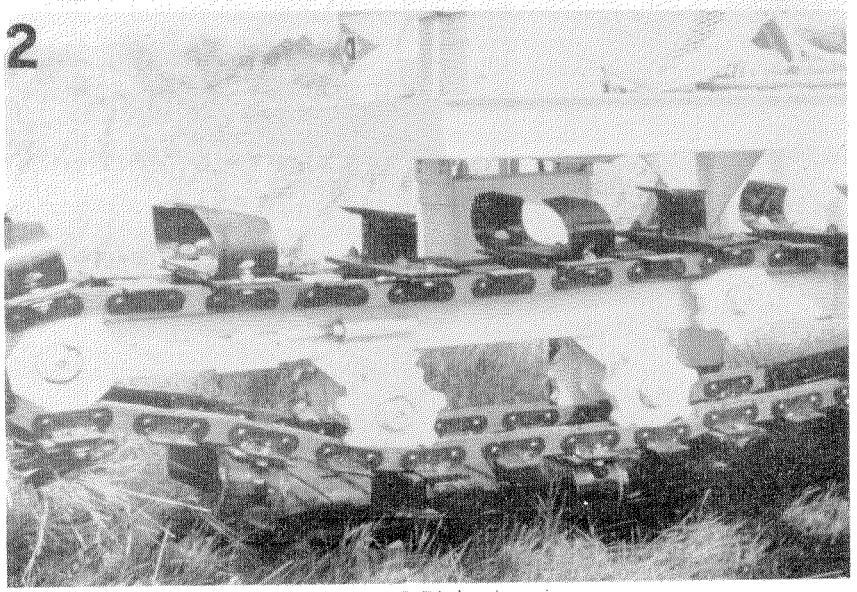


FIG. 1.—Pow-R-Ditcher in action.
FIG. 2.—View of Pow-R-Ditcher buckets.

advantages over the standard gear system that the extra cost is not prohibitive. It gives the tractor more power when needed, operates the unit smoothly under almost any condition, and prevents it from being bogged down in many instances, due to its steady power. The motor does not stall easily when working at peak performance under boggy conditions, affording it an easy out process which is important. This gear reduction system saves clutches, axles, and gears. In many instances we have been able to creep out of boggy areas where the regular gears would probably have caused the engine to stall out, thereby permitting the machine to sink each time the engine failed.

This unit, fully equipped with counterweight and backhoe, weighs approximately 8300 pounds. When equipped with 36" wooden pads 4½" wide the ground pressure is around 2.3 pounds per square inch. On the basis of our specifications this unit was developed, equipped, and supplied by the Paving Supply & Equipment Company in Washington, D. C.

Last summer our State Entomologist, Dr. George Langford, while attending a conference, came in contact with a representative of the Vermeer Company, Pella, Iowa, who thought their self-propelled Pow-R-Ditcher 524-T might be useful in our ditching and maintenance operations. As a result of this contact the company sent their engineers to study our marshes. Subsequently, they assembled a special self-propelled ditcher which they thought would meet our requirements. (Fig. 1). Upon testing it under normal marsh conditions, it demonstrated its usefulness in constructing new 14" ditches at the rate of around 300 to 600 feet per hour. It also, to our amazement, cleans out old ditches under average conditions.

This machine has no buckets to clog up. It is a chain digging type excavator with side cutters which have automatic cleaning devices at the top of the excavator frame (Fig. 2). This cleaning device removes trash, or roots as the case may be, allowing undisturbed operation under normal conditions. The tracks were widened to 18" to reduce the ground pressure. It weighs approximately 6200 pounds with seven feet of track on the ground on each side giving resulting ground pressure of approximately 2.1 pounds per square inch. To meet our specifications the track gauge (center to center track) was increased to 72". This permitted the unit to go astride the ditch giving full traction for the 18" width track. We also requested the conveyor belt be geared so that the sod could be discharged from one side of the ditch to the other. This alternate sod breaking allows side drainage into the ditches, and permits shifting of the sod when crossing another ditch, or wherever sod breaking is necessary to facilitate side drainage.

The ditcher has a VG4D-V36 H.P. Wisconsin Air-Cooled Engine, 6 volt electric system, electric starter, hydraulic track clutch and brake control, two way conveyor, double digging chain with two sets of idle sprockets on top and bottom of boom, and maximum digging depth of 4'–6". It cuts 14" to 24" width ditches but is presently equipped only with 14" cutters. The digging range is 1 to 18 feet per minute and the transport speed is three miles per hour. The total width of the unit is eight feet allowing transportation over the highway without special permit. It has a five speed dual transmission for digging and transport purposes including one reverse speed. The cost delivered to us in December, 1957 was $6,750.00.

It is quite evident there may be some changes necessary, as time goes on, and we cannot fully recommend it for all salt marsh uses. Possibly at a later date, when we have had more time to discover its limitations, we can specify the conditions under which it can be utilized. When we compare the ditching rate of 300 to 600 ft. per hour against possibly that of the backhoe at 100 to 175 ft. per hour, or that by hand from 15 to 25 per man hour then we can appreciate its value under certain conditions when the cost is only $6,750.00.