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U.S. ARMY, ENGINEER CORPS ISSUES A PERMIT FOR SALT MARSH MOSQUITO SOURCE REDUCTION IN GLYNN COUNTY, GEORGIA

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The most significant pest mosquitoes in Glynn County, GA are the salt marsh species *Aedes sollicitans* (Walker) and *Ae. taeniorhynchus* (Wiedemann). These mosquitoes commonly breed in hummock sloughs, sand dune swales, dredge spoil sites, high marsh meadows and barrens, and other areas above the mean water line in the salt marsh. In addition to the copious production of mosquitoes, these areas share the common feature of being extremely unsuitable for the efficient operation of standard earth moving equipment. Consequently salt marsh source reduction projects in many mosquito abatement districts along the east coast during the years before 1975 have been very expensive. Some observers concluded that source reduction could be 1.4 to 3.5 times as expensive as temporary controls and therefore might not always be economically feasible (DeBord et al. 1975). New equipment innovations, especially mounting rotary ditchers on amphibious carriers, have drastically reduced the costs of excavation and construction in salt marsh habitats (Shisler et al. 1978). Furthermore, the rotary ditcher's ability to scatter the excavated material along the side of the ditch is even more important because it greatly reduces the spoil impact on the ecosystem. The reduction in cost and the minimal ecological impact combined to allow the staff of Glynn County Mosquito Control Department to begin the implementation of a safe and effective Salt Marsh Mosquito Source Reduction Program during January of 1980.

The initial permit application was submitted to the U.S. Army Engineer Corps' Environmental Assessment Division on April 18, 1979 and was finally granted on January 15, 1980. The major event which affected the outcome of the application was the public hearing of October 10, 1979. Many separate meetings and much work with local environmental groups, particularly the local chapter of the Audubon Society, preceded the official public meeting. The staff of the Mosquito Control Department determined that local environmentalists needed to be thoroughly and honestly familiarized with the nature, scope, and (most importantly) the objectives of the proposed source reduction program. Almost all of the various groups and individuals targeted by the Department for this awareness campaign were in complete agreement that any risks to the estuarine environment from this type of abatement program were by far outweighed by the potential benefits in the reduction of pesticide pressures on the ecosystem. The conserving of petroleum products in the form of fuels, lubricants, and pesticides that would result from the reduction of the mechanized application of chemical controls also appealed to many of the concerned citizens who were briefed by the Department's staff. Many of these individuals, including a delegation from the local Audubon Society, were in attendance during the public meeting and helped the Department personnel successfully argue the merits of this type of mosquito abatement with representatives of various federal agencies.

The Savannah District of the U.S. Army Corps of Engineers finally granted the permit on January 15, 1980. The permit specifically allows the Glynn County Mosquito Control Department to perform "general surface draining: routine construction, repair and

maintenance incidental to specific activities associated with mosquito abatement work. The abatement work will be accomplished in areas formerly used as disposal sites which are adjacent to waters of the United States as well as navigable waters of the United States within the geographical limits of Glynn County, Georgia. The activities encompassed within the scope of this general permit include the new construction of structures used for drainage and/or tidal irrigation, the routine clearance or retrenching of small drainage and/or tidal irrigation ditches, the necessary ditching to tidal or streambeds that may be necessary to connect isolated potholes or temporary pools known to breed mosquitoes and the construction of small pools to act as minnow and other predator reservoirs where ditching for drainage or tidal irrigation is impossible." (Creel 1980)

Specifically, this permit allows the Glynn County Mosquito Control Department to permanently alter salt marsh mosquito breeding habitats by constructing either minnow ponds or ditches for drainage or tidal irrigation. Maximum depths of ponds may not exceed four ft and maximum ditch dimensions shall not exceed 36 in. wide by 24 in. deep. All material excavated during construction is to be disposed of in such a manner as to permit the free exchange of water with surrounding areas. The maximum quantity of new work authorized under this permit will not exceed 3.5 million linear feet of ditch and the excavation will not exceed one million cubic yards of material for the 3-year duration of the permit. (Creel 1980)

Rarely in these times of environmental concern and inflationary pressure can a single project satisfy both environmental regulations and anti-inflation measures at the same moment. The environmental impact of many salt marsh source reduction programs throughout the eastern, southeastern, and gulf coastal zones is well documented. The great majority of this evidence clearly demonstrates that the direct environmental impact of source reduction over the years has been either extremely minimal, or significantly beneficial to the individual ecosystems. Almost every adverse ecological effect has been described in areas where projects were poorly planned or should never have been undertaken (Provost 1980). Moreover, if Glynn County's program is as effective in reducing breeding as at least one other mosquito control source reduction program has been (Fultz 1978) then the taxpayers should realize a potential savings over the 3-year duration of the permit of at least $250,000, assuming the annual inflation rate is 10%. (See Table 1)

Table 1. Projected savings in either aerial, larviciding or ground adulticiding costs during the 3 years of the Source Reduction Program as outlined in the Glynn County Permit.

Years	Breeding area remaining	Aerial larviciding costs*	Ground Adulticiding costs**
1980	2740.00	$115,080.00	$184,950.00
1981	1826.67	84,392.15	135,630.25
1982	913.33	46,415.43	74,596.23
1983	0	0	0
Totals		$245,887.58	$395,176.48

* These costs reflect the 1980 cost of $7.00 per acre and a treatment frequency of 6 per season.

** These costs reflect the 1980 cost of $0.15 per acre, a target area 50 times larger than the original breeding acreage, and 9 treatments per season.

The above figures represent *potential* costs. For an average month during the 3 seasons of 1978, 1979, and 1980; 542 acres were larvicided by helicopter and 92,783 acres were treated by ground ULV. Seventy to 80% of these treatments were in direct response to the mosquito problem associated with the targeted acreage of the permit. The real expenditures reflect a future 3-year projected cost of $272,799.64.

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A SUBSTRATE MODIFICATION FOR THE OVIPOSITION TRAP USED FOR DETECTING THE PRESENCE OF *AEDES TRISERIATUS*[1]

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The artificial oviposition trap developed by Loor and DeFoliart (1969) provided a means to determine the presence or absence of *Aedes triseriatus* (Say), the vector of LaCrosse encephalitis virus. Prior to their report, the only reliable method available to investigators was by sampling adult female populations by landing-biting rates with human volunteers or estimating the larval population by tree-hole sampling.

The oviposition trap of Loor and DeFoliart (1969) consists of a 12-ounce aluminum can painted black, lined inside with a strip of black muslin cloth, which provided the substrate for ovipositing females. The can was filled with a mixture of organic debris and water in order to wet the cloth, which provided an attractive moisture gradient and resembled tree-hole water in consistency. To assess the number of eggs laid per black cloth liner, the cloth has to be submerged in water and viewed microscopically, or the cloth has to be bleached white. Both procedures are cumbersome, with the former process entailing difficulties in accurate counting and the latter process injuring the eggs.

The purpose of this paper is to report about an oviposition substrate modification such that; (1) the presence or absence of eggs can be determined visually in the field, and (2) eggs can be counted accurately without prior treatment of the substrate.

Preliminary laboratory trials with black oviposition cans using strips of several light wood veneers, pressed board and balsa wood were tested against black muslin cloth liners. All of these trials were done in 1 m^3 colony cages using 25 gravid *Ae. triseriatus* per cage. The infusions used in conjunction and in various combinations with these substrates were dried materials of oak leaf, maple leaf, cottonwood leaf, beech leaf and grass. The results revealed that the balsa wood strips used with oak leaf infusion was the most attractive combination to ovipositing females and that the eggs present could be seen and counted with ease on the light colored background of the balsa wood.

Field trials to test the comparative effectiveness between oviposition substrates of balsa wood and black muslin cloth were carried out at Potato Creek State Park, Indiana during August, 1978. A transect having 4 stations with 3 oviposition cans per station was established. Each of the 4 stations had an oak tree (*Quercus* spp.) to which the oviposition cans were fastened, with the bottom of the oviposition cans resting on the ground. All of the oviposition cans contained approximately 250 ml of oak leaf infusion. The 3 substrates used at each station were: (1) a balsa wood strip, (2) a black muslin cloth liner, and (3) a balsa wood strip plus a black muslin cloth liner. The oviposition cans were serviced every 2 days at which time the infusions and substrates were changed. The substrates were rotated to different cans at this time to inhibit position biases. The substrates were returned to the laboratory to determine the number of eggs present.

During the course of the field experiment, 1754 eggs of *Ae. triseriatus* were collected. The data in Table 1 show that a strong preference for the balsa strips was exhibited by gravid females. Of the eggs collected, 87% were on the balsa strips with the remaining 13% on the black cloth liners. Periodic challenges of the balsa wood strip, modification with black muslin cloth lined cans during the summer of 1979

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