AERIAL CONTROL OF ADULT *AEDES* MOSQUITOES OVER IRRIGATED WYOMING PASTURES

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ABSTRACT. During the summers of 1974 and 1975 an extensive mosquito control program was conducted near Laramie, Wyoming. Part of this work included aerial control of adult *Aedes*, primarily *A. dorsalis* and *A. melanimon* over irrigated pastures southwest and northwest of Laramie. It was concluded that adulticiding efforts of both years stopped an influx of adult *Aedes* into Laramie. In 1974 this influx was delayed for 26 days from the southwest and 14 days from the northwest. In 1975 the influx was delayed for 14 days from both the southwest and northwest. The results indicate that near Laramie, adult *Aedes* move approximately 5 mi. in a period of 14 to 26 days.

During the summers of 1974 and 1975 an extensive mosquito control program was conducted near Laramie, Wyoming. Part of this work was done with ULV malathion for the control of adult *Aedes*. Hay pastures southwest and northwest of Laramie are flood-water irrigated and produce tremendous numbers of mosquitoes. Water may stand on the fields from mid May until the end of June. Larval counts average 1–3 per dip in the irrigation water. These areas are adjacent to Laramie and extend for 6 mi. In addition, flooding of the Laramie River can produce great numbers of *Aedes*.

The aerial treatment for adult control which occurred on June 28 and July 18, 1974 included 2,900 acres of irrigation water. Earlier in the season (end of May and early June) this area had been treated by air with Witco GB1313® a petroleum distillate larviciding oil at the rate of 2 gallons per acre. In 1975 the aerial treatment for adults in the same areas occurred on July 7 and July 18. These areas were larvicided in 1975 in late May and mid June with Baytex® Liquid Concentrate, 9.67 lbs/active fenthion per gallon, at 1 oz./acre. The Laramie River flood plain was not extensively treated due to very little flooding in 1974 and 1975. Although larval control was very successful, adult control was necessary because adults from adjacent flooded areas moved into treated areas. These adjacent areas southwest of town continue beyond the treated areas for at least another 20 miles along the Laramie River.

Previous light trap collections in Laramie, and larval collections in the field

showed the predominant species of *Aedes* in order of importance to be *A. dorsalis, A. melanimon, A. campestris,* and some *A. flavescens, A. vexans, A. idahoensis, A. nigromaculis,* and *A. fitchii. A. dorsalis* and *A. melanimon* together totaled about 60 percent of the light trap and larval collections for 1974 and 1975. Mosquitoes captured in a bovine-baited trap in an irrigated pasture near Laramie showed similar species composition (Pennington and Lloyd 1975).

Stage et al. (1937) discovered that females of *A. vexans* and *A. aldrichi* stained with methylene blue or eosin traveled about 0.5 mi. in 24 hr and that both sexes were dispersed with and against wind currents for about 2 mi. Some female *A. aldrichi* moved nearly 5 mi. Flights of *A. melanimon* in excess of 12 mi. were recorded in the general direction of prevailing winds and following waterways in a downwind or crosswind direction (Reed 1969). Baily and Gould (1975) marked many *Culex fuscocephala, C. gelidus,* and *C. tritaeniorhynchus* with fluorescent dusts and incidentally recovered some marked *A. vexans* 1,100 meters from the release site in northern Thailand. Smith et al. (1956) felt that they demonstrated a mass movement of *Aedes* mosquitoes over a distance of 20 to 30 mi. and perhaps as much as 58 mi. Shemanchuk et al. (1955) recovered radio-active tagged *A. flavescens* as far as 6.6 mi. from a release point.

One of the purposes of the program was to treat large block areas for adult control and try to determine *Aedes* species movement (distance and time) into and across irrigated pastures from which few adult mosquitoes had emerged because of larvicidal treatments.

MATERIALS AND METHODS. Adult mosquito control was done with malathion 95 percent, ULV at 4 oz./acre, applied by a twin engine Beechcraft Model C-45H. Spraying was done early in the morning when winds were 5 mph or less. Flight speed was ca. 150 mph at a height of ca. 70 ft and with an effective swath width of 300 ft. Preliminary runs indicated that 95 percent of the particles were 40–60 microns in diameter. Swath width on the ground was paced and marked. Trucks with revolving lights were used to mark the swath width.

On June 28, 1974 ca. 4,200 acres were treated for adult control in a 1 x 5+ mi. block, southwest of Laramie along the Laramie River and adjacent irrigated fields (Fig. 1). This area was treated for adult control in 1975 on July 7. To determine the effectiveness of the control effort, 5 sampling stations for adult mosquitoes were established (Fig. 1). At these stations 1-minute "landing counts" were taken. Two people participated, one to count mosquitoes on the other's back. The stations were placed throughout the linear distance of the treated area with the first station the farthest from town and near adjacent untreated fields. Station 5 was closest to Laramie (ca. 1 mi.). Wind direction was primarily S.W. to Laramie, and counts were taken early in the morning when wind velocity was 5 mph or less. Immigration would first occur at station 1, nearest the untreated fields. Throughout the entire area blood meals were always available from cattle and some horses.

On July 18, 1974 ca. 3,800 acres of irrigated pasture were treated for adult mosquito control, northwest of Laramie (Fig. 1). This area was treated in 1975 on July 18. Four landing stations were established to determine the effectiveness of control. Station 1 was the nearest to Laramie, less than 1 mi. Numerous cattle were always available for blood meals. The primary direction of wind near Laramie is from the west, southwest, or northwest, and immigration in this area should occur first at stations 2, 3, or 4.

RESULTS AND DISCUSSION. As can be seen from Table 1, pre-treatment landing-rates in the southwest areas ranged from 18 to 33 adults per minute in 1974, and 14 to 65 adults per minute in 1975. On the days after treatment counts ranged from 0 to 10 adults per minute (June 29,

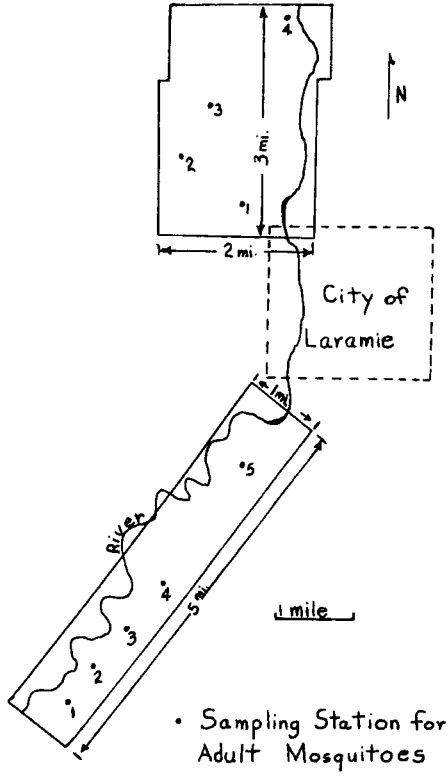

Fig. 1. Aerial Application Malathion ULV.

Table 1. Evaluation of adult mosquito control by aerial application, malathion at 4 oz. per acre, southwest of Laramie, 1 x 5 mi. area.

1974	Dates and Adults Landing Per One Minute							
Station*	June 24	June 29	July 1	July 3	July 5	July 8	July 12	July 23
#1	30	1	2	2	30	9	38	
#2	25	0	2	2	13	9	16	
#3	30	2	1	14	10	1	21	
#4	33	0	0	1	4	0	6	36
#5	18	10	..	2	..	5	1	2
	Application 6-28-74							
1975	June 23	June 27	July 2	July 4	July 8	July 11	July 21	
#1	0	24	69	65	18	23	1	
#2	0	8	15	29	4	5	26	
#3	..	2	17	14	0	2	35	
#4	1	51	..	19	0	0	10	
#5	0	4	8	..	0	0	16	
					Application 7-7-75			

* Station 1 is the most distant from town, approximately 6 mi., while 2 through 5 approach town, with station 5 approximately 1 mi. from town.

1974) and 0 to 18 adults per minute (July 8, 1975). In 1974 this reduction held until July 5 (8 days) when the adult counts at station 1 rose to pre-treatment levels. Station 1 was nearest adjacent untreated fields. On July 8, 1974 (11 days) counts at all stations were again low. On July 12, 1974 (15 days) counts were high at stations 1–3. However, counts at stations 4 and 5 (closest to town) were still low. On July 23, 1974 (26 days) the landing rate at station 5, nearest Laramie was still low.

In 1975, by July 11 (5 days after treatment) mosquitoes appeared at station 1, and by July 21 (15 days) stations 2, 3, 4, and 5 had large numbers although numbers at station 1 were again low.

Southwest of Laramie in 1974 it was concluded that a movement of mosquitoes from nearby untreated fields started about 14 days after treatment, but mosquitoes did not cross the 5 mi. area to Laramie from the southwest for at least 26 days. A movement from the southwest apparently started within 5 days after application. Mosquitoes apparently reached town 14 days after application, and it is thought that a major movement toward town was delayed for 14 days.

On July 9, 1974, before treatment, there was a great abundance of adults in the area north and west of Laramie (Table 2). On July 19, 1974 the day after application the counts ranged from 0/min. to 9/min. There was some influx into station 3 on July 22 and 24, but the other stations had low counts. Station 3 is near the west side, adjacent to untreated fields. On July 31 (14 days after treatment) all stations had lower counts than pre-application counts, and this is probably related to a general decline in mosquito populations in the Laramie area by that date.

On July 14, 1975 the northwest area showed a very large population of adult mosquitoes. On July 19, 1975, the day after application, a tremendous drop in landing rates occurred. By July 28 (10 days after application) a heavy influx was noted at station 3, and by July 31 (14 days after application) there was an influx at station 1, the closest to town. Mosquitoes had taken 2 weeks to reach station 1, but at station 1 counts started to decline by August 5, at which time a general decline of mosquito populations was apparent.

It is concluded that adulticiding efforts of both years stopped an influx of adult *Aedes* into Laramie. In 1974 this influx was delayed for 26 days from the southwest and 14 days from the northwest. In 1975 this influx was delayed for 14 days from the southwest and 14 days from the

Table 2. Evaluation of adult mosquito control by aerial application, malathion at 4 oz. per acre, northwest of Laramie, 2 x 3 mi. area.

1974	Dates and Adults Landing Per One Minute								
Station*	June 17	July 2	July 5	July 9	July 19	July 22	July 24	July 29	July 31
#1	9	38	..	50+	0	0	1	4	1
#2	5	12	..	Too many to count	2	2	0	0	3
#3	11	..	40	36	7	19	30	5	5
#4	25	..	24	35	9	3	15	3	7
1975	June 27	July 2	July 8	July 14	July 19	July 23	July 28	July 31	Aug. 5
#1	..	0	23	100 est.	0	13	28	109	63
#2	..	7	28	Too many to count	0	5	9	23	
#3	..	6	66		1	18	150 est.	60	
#4	2	61	37	18	0	3	15	7	

Application 7–18–74

Application 7–18–75

* Station 1 about 0.5 mi. from town, station 4 ca. 3 mi. from town.

northwest. The results indicate that near Laramie adult *Aedes* move approximately 5 mi. in a period of 14 to 26 days. Apparently a second brood of plains *Aedes* is seldom of importance near Laramie. This confirms the work of Owen (1951) as to the relative importance of second brood *Aedes* in the high plains of Wyoming.

Adult control may be practical in mosquito producing fields near populated areas if 2 or 3 weeks of control can be achieved by adulticiding these nearby mosquito producing fields. These efforts can give relief from mosquito infestations in centers of population.

ACKNOWLEDGMENTS. The author thanks Dr. J. E. Lloyd, Entomology Section, University of Wyoming, and Everett Spackman, Extension Entomologist, University of Wyoming for their criticism of the manuscript. The Albany County Weed and Pest District is thanked for financial support.

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