ADAPTATION OF JEEP POSTAL VAN DISPATCHER – 100 FOR MOSQUITO CONTROL

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The Southeast Mosquito Abatement District (SMAD) lies wholly within Los Angeles County. The District comprises 255 square miles of the southeastern part of the County, plus the Los Angeles harbor area and Gardena, Carson, and Dominguez area of the County. In 1965, the District annexed all of the San Fernando Valley section of the City of Los Angeles, with an area of approximately 275 square miles. The population of the District is approximately 2,610,000 people. The area comprising the District is highly urbanized and has very little agriculture which is rapidly being converted to homes and industrial parks.

Control needs of the District are general throughout the District with thousands of miles of gutters, thousands of catch basins, and hundreds of miles of improved flood control channels. To adequately and economically control these areas, it has been necessary to make use of right-hand drive vehicles as they become available on the market. Use of right-hand drive vehicles has enabled the District to make use of one-man operations.

Service life of one of our vehicles is limited to about four years. We then replace them to enable the District to maintain the level of service that is demanded by citizens of the District. Bids are called for from the dealers in the District who are marketing this type of vehicle. However in 1971, California State Vehicle Smog regulations prohibited the sale of International and Jeep 4 cylinder engines.

At this time, the District was made aware of the availability of a Jeep Dispatcher 100 Model DJ-5B Post Office Van, made by American Motors Corporation. This is a right-hand drive vehicle with a six cylinder, 232 cubic inch 7 bearing engine, three-speed automatic transmission. The van-type body is built on a standard Jeep frame and the cargo bed has the same space as a standard Jeep DJ5. Sliding doors, right and left sides of the van body can be locked with the ignition key. The van body also has a swinging rear door with latch and lock, that is almost as wide as the cargo area. Options available with this vehicle are limited. The only options that were available at the time of purchase were right- or left-hand drive and paint. The vehicle otherwise was sold as manufactured.

The District has equipped the vehicles with a galvanized 55-gallon tank. The pump is powered by 24 volt, 7 amp, 1/8 hp motor and is integral. This pump and motor is a surplus aircraft fuel transfer pump. Motor and pump when used on a 12-volt system develop 40 pounds of pressure and meets the needs of the District in our larvicide oil spray program. Actuation of the pump unit is by a toggle switch mounted on the dashboard convenient to the operator. Each vehicle is also equipped with a three gallon stainless steel B & G hand spray can, one PCB granule spreader, inspection dipper, and sample bottles. All of the District vehicles are also equipped with two-way FM radios. operating on an exclusive frequency in the Local Government Radio Service.

Use of right-hand drive vehicles, in our one-man operational spray program has resulted in substantial savings in labor costs to the District. Trade-in value of our right-hand drive vehicle averages about $500.00 per vehicle. Savings to the District in labor costs with a one-man operation is approximately $1,500 per season over a two-man operation using left-hand or standard-drive vehicles.

OBSERVATIONS ON MALATHION THERMAL FOGGING IN A MIXED CONIFER FOREST AT LAKE TAHOE[1]

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Thermal fogging of 5% malathion and diesel mixture was the chief means of mosqutio control for the residents of South Lake Tahoe, California, during the years 1963 through 1966. Based on recommendations of a program review by the California State Department of Public Health, Bureau of Vector Control (Womeldorf 1966) more emphasis was placed upon larviciding during 1967 and 1968, however, malathion thermal fogging during this period was also applied routinely. Applications were administered on a weekly basis in all residential areas. Thermal fogging with

the exception of several experimental applications was terminated after the 1969 mosquito season.

In the summer of 1968, the pine needle scale, *Phenacaspis pinifoliae* was found to be heavily infesting pine trees throughout much of the residential area of the City of South Lake Tahoe (Hunt 1968; Dahlsten et al. 1969). It was suspected that the natural enemies which normally controlled the pine needle scale had been severely reduced in numbers by the action of the malathion fog used for mosquito control (Dahlsten et al. 1969). Roberts (1971) summarized the extent of the scale outbreak and its relationship to the thermal fogging program. Since termination of the program the natural enemies have rebounded dramatically with a corresponding crash in the scale populations (Luck 1971, pers. comm.).

Few controlled studies have been made of the effectiveness of thermal fogging for mosquito control in the Sierra Nevada mountains. Fontaine and other workers from the Bureau of Vector Control in the late 1950's observed almost complete reductions of mountain *Aedes* based on body landing rate counts from one to two hours after fogging moderately large areas with vehicle mounted aerosol equipment applying DDT, malathion and lindane (Sherman 1972, pers. comm.; Smith 1972, pers. comm.). Lewallen (1964) reported 50% to 100% reductions of several species of mountain *Aedes* in small scale tests using fenthion, dichlorvos, Lethane 384® and malathion, basing his reduction percentages on body counts before and 30 minutes following treatment. Husbands and Soroker (unpublished data, 1968) observed inconclusive results with fenthion, Lethane and dibrom based on body counts before and up to 24 hours after treatment. Prine (unpublished data, 1969) observed very spotty results with a caged strain of malathion susceptible *Culex pipiens quinquefasciatus* exposed to the malathion thermal fog at South Lake Tahoe.

During 1970 and 1971, larviciding and source reduction techniques provided more effective control in the concentrated residential areas of South Lake Tahoe (Roberts 1971). However, because of economic constraints within the program, this level of control could not be provided to smaller residential populations living in scattered outlying areas. Residents of these areas have been requesting more effective mosquito control. Primarily because it is less expensive, and expedient, a malathion thermal fogging program is currently being reconsidered as a method to provide mosquito control to these outlying districts. The purpose of this study was to determine the effectiveness of this technique for mosquito control in small isolated forest residential districts.

MATERIALS AND METHODS.–The Spring Creek summer home tract in El Dorado National Forest, five miles west of the City of South Lake Tahoe was selected as the test area for treatment. An untreated control area was selected at Cathedral Meadows summer home tract on the west side of Fallen Leaf Lake, about one mile southeast of the test area. The Spring Creek tract was treated on the 4th and 17th of August, 1971 in the morning between 5 and 6 a.m. A Dyna-Fog 1200-B® insecticidal fog generator mounted on a vehicle was used for application of the malathion. The equipment was operated in the same manner in which the thermal fogging was done in the original program in the City of South Lake Tahoe. The vehicle was driven at a speed of between five and seven mph with an insecticidal output of 40 gallons (5% malathion in diesel oil) per hour. Treatment of the entire area required about 30 to 35 minutes.

Mosquito populations were sampled at both areas on the nights before and after treatments with modified CDC portable light traps baited with about two lbs of dry ice. Three traps were operated in each area in the same position each night. Traps were set out at dusk and picked up between 4 and 5 a.m.

During the second fogging application on the morning of August 17, aspirator collections at the same time intervals were made in both areas before, during and after the fogging treatments. Collections were made by teams of two workers each, one individual making the collections off the other's body, for 30 minute collecting periods during which the teams remained for ten minutes each at three separate sites approximately 50 to 100 feet apart. The team in the test area collected in an area entirely inundated by the malathion fog. Mosquitoes collected for each 30 minute period were placed in separate cloth bags and held 24 hours to determine mortality and then identified under a microscope in the laboratory.

Weather conditions during both tests were relatively similar. Ambient air temperature during the time of fogging was between 55° to 60°F. Air movement was almost calm with a slow drift from south to north. The fog coming from the generator first lifted to approximately 30 to 40 feet, and then settled to the ground creating a thick blanket which moved with the air flow to the north and down the drainage course of Spring Creek.

RESULTS AND DISCUSSION.–Mosquito species collected by CO_2 baited light traps are listed in order of dominance in Table 1. The snow *Aedes* represented over 50% of the collections during the first fogging test; however, by the second test the culicine mosquitoes were the most abundant.

Table 2 shows that mosquitoes were numerous in both the test and check areas during the first fogging treatment, but less numerous in both areas by the time the second fogging took place. This suggests that a natural decline in mosquito abundance had taken place. A comparison of light trap collections in the test versus the check areas reveals a high degree of variability among the light traps. No consistent or strong differences were evident to indicate satisfactory control due to fogging by light trap evaluation (Table 2).

Tables 3 and 4 show that mosquitoes, especially snow *Aedes*, were fairly numerous and troublesome in both areas before, during and up to four hours after the second fogging trial. Although culicine mosquitoes were present in the areas in comparable numbers to the snow *Aedes* as indicated by light trap collections (Table 2), they were not as readily attracted to human hosts during the morning collecting period. Of the total of 258 mosquitoes collected off human hosts, the culicines were represented by only 14 *Culiseta inornata* and 2 *Culiseta incidens*.

Figure 1 demonstrates the percentage reduction of snow *Aedes* occurring in the test area as compared to the check. This graph shows some relative depression in *Aedes* biting activity during and shortly after fogging, similar to, but not as great as those seen by Lewallen (1964) 30 minutes after fogging with a portable fog generator. By four hours after the fogging, however, there was almost as much activity as

Table 1.–Species of mosquitoes collected in order of dominance by CO_2 baited CDC light traps from Spring Creek and Cathedral Meadows near South Lake Tahoe during August 1971.

Aedes increpitus
Culiseta inornata
Aedes communis-hexodontus
Culex tarsalis
Culiseta incidens
Aedes fitchii
Aedes cinereus
Aedes sierrensis
Aedes vexans
Aedes cataphylla
Culiseta impatiens
Total mosquitoes – 4,591

would have been expected without the treatment.

Mosquitoes that were aspirated from human hosts during and after the treatment and held 24 hours had a much higher mortality than those collected in the untreated area. Out of 56 mosquitoes collected in the treated area, 43 died after the holding period as compared to one death from the untreated area. The highest mortality (97%) occurred in the group collected during the treatment and the lowest mortality (64%) four hours after treatment. These data suggest that from an operational standpoint the equipment and insecticide were performing satisfactorily.

In the evening following the morning treatment of August 4, four residents of the Spring Creek Tract were interviewed in regard to mosquito biting activity during the day. Their observations were mixed and contradictory as to the benefits of the control procedure.

The two sets of collection data obtained by the light trap and human landing counts, combined with the subjective observations of the investigators and residents at the

Table 2.–Mosquitoes collected in CO_2 baited CDC light traps at Spring Creek and Cathedral Meadows near South Lake Tahoe during fogging tests conducted on August 4 and 17, 1971.

	Treated Area – Spring Creek Tract					Untreated Area – Cathedral Meadows				
		Pre-test	Post-test		Pre-test	Post-test		Pre-test	Post-test		Pre-treat	Post-treat
Species Collected	Site	4 Aug.	5 Aug.	6 Aug.	17 Aug.	18 Aug.	Site	4 Aug.	5 Aug.	6 Aug.	17 Aug.	18 Aug.
Snow *Aedes*	E1	84	30	8	3	8	C1	284	235	203	32	38
	E2	268	M*	M	12	9	C2	258	156	76	9	13
	E3	305	228	40	17	17	C3	28	80	44	2	6
Culex tarsalis	E1	3	16	5	0	2	C1	32	45	68	2	19
	E2	44	M	M	5	4	C2	12	8	20	2	3
	E3	68	32	40	2	4	C3	4	6	14	1	1
Culiseta inornata	E1	28	16	5	0	2	C1	66	215	96	52	42
	E2	328	M	M	4	11	C2	24	36	44	6	7
	E3	74	92	58	25	20	C3	40	46	54	3	1
Culiseta incidens	E1	0	0	0	0	0	C1	16	15	4	2	8
	E2	24	M	M	3	2	C2	21	12	8	3	2
	E3	4	4	3	3	3	C3	24	4	10	2	0

*M indicates trap malfunction, collection not counted.

Table 3.–Species of mosquitoes attracted to humans in order of dominance at Spring Creek and Cathedral Meadows near South Lake Tahoe on August 17, 1971.

Aedes increpitus – fitchii
Aedes communis – hexodontus
Culiseta inornata
Aedes sierrensis
Culiseta incidens
Total mosquitoes – 258

test site, indicate that malathion thermal fogging was not very effective as a program to protect residents in small isolated mountain areas. Any apparent benefits that might be inferred from the data presented in this study should be qualified by the following observations:

1. Light trap comparisons between the treated and untreated areas did not demonstrate differences that indicated satisfactory control (Table 2).
2. Human landing collections conducted during the second fogging trial obtained results which suggested that the reduction of snow *Aedes* was transitory and returned to

pre-treatment activity within a few hours after fogging (Figure 1).

3. Forest entomologists suggest that thermal fogging is disruptive to natural arthropod regulating mechanisms in forest ecosystems and may induce other pest problems (Dahlsten, et al., 1969).

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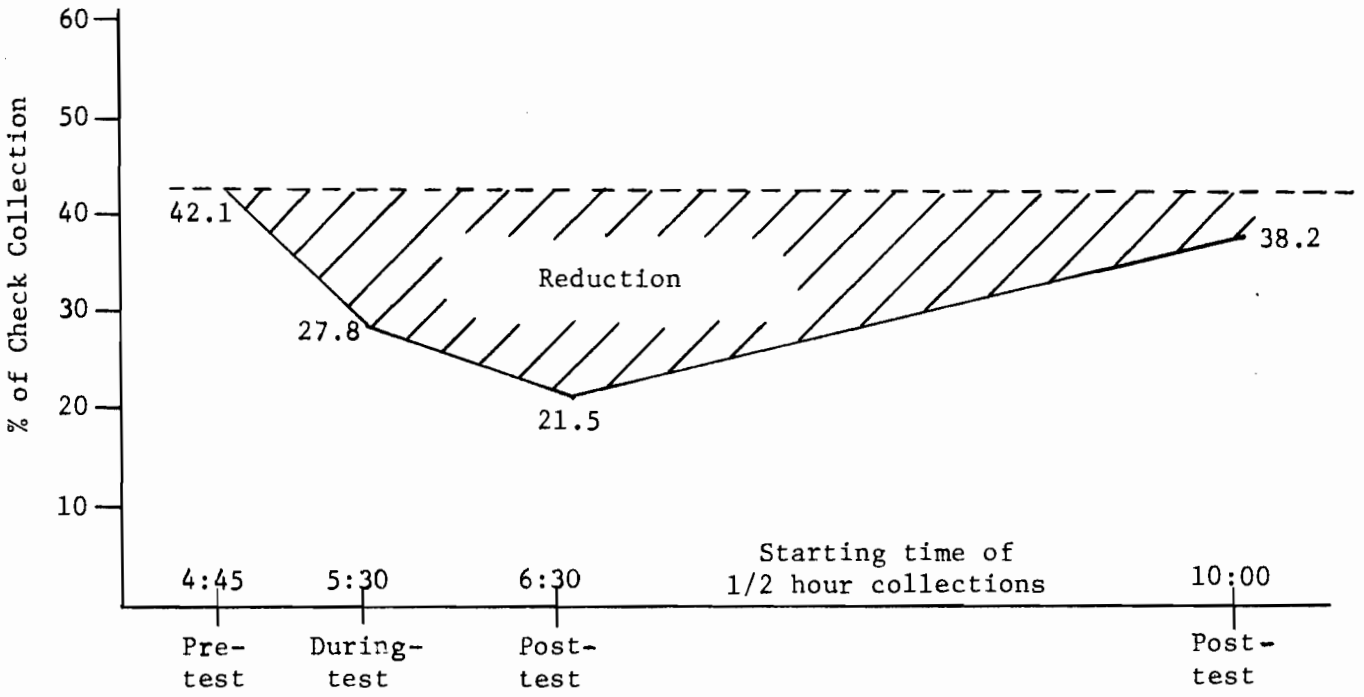

Fig. 1.–Aspirator collections of Snow *Aedes* females in the treated Spring Creek area shown as percent of collections in the untreated Cathedral Meadows area, South Lake Tahoe on August 17, 1971.

Table 4.–Total number of mosquitoes aspirated from human hosts at ½ hour intervals at Spring Creek and Cathedral Meadows near South Lake Tahoe.

Time of Sampling August 17, 1971		Treated Area	Untreated
Pre-treatment	4:45 AM to 5:15 AM	10	21
During-treatment	5:30 AM to 6:00 AM	23	56
Post-treatment	6:00 AM to 6:30 AM	19	80
Post-treatment	10:00 AM to 10:30 AM	14	35