

# NEIC

PESTICIDE USE OBSERVATIONS  
MONROE COUNTY, FLORIDA

March-June 1979



national enforcement investigations center

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
OFFICE OF ENFORCEMENT

PESTICIDE USE OBSERVATIONS  
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NATIONAL ENFORCEMENT INVESTIGATIONS CENTER  
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## PESTICIDE USE OBSERVATIONS

### MONROE COUNTY, FLORIDA

#### I. INTRODUCTION

Annually, the Monroe County Mosquito Abatement Program in southern Florida has, in late March or early April, applied organophosphate insecticides Baytex and Naled (Dibrom 14)<sup>1</sup>, to control mosquito infestations in urban and rural areas of the Florida Keys. In the upper Keys, Naled is applied aerially and Baytex by ground application along U.S. Highway 1 between Key Largo and the Florida mainland. Allegedly, these pesticides enter Everglades National Park in water currents, biotic food chains, direct overspray, drift, or runoff. National Park Service personnel claim that these insecticide applications are causing damage to the park and the surrounding marine environment. These damages are declared to be most noticeable in the bait shrimp fishery, and to a lesser extent in the general commercial finfish and shellfish fisheries in the area of the insecticide applications. Recently, the death of a brown pelican in the park area was attributed to Baytex ingestion.

As a result of inquiries from the National Park Service, the EPA Region IV requested the National Enforcement Investigations Center (NEIC) to conduct an investigation into the use of insecticides for mosquito control in Monroe County, Florida. The objectives of the investigation were 1) to determine if the applications are conducted according to the pesticide label and FIFRA regulations, and 2) to determine the extent and nature of environmental damage in Everglades National Park and the surrounding marine environment as a result of insecticide applications.

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<sup>1</sup> Dibrom 14, EPA Registration No. 239-1721-AA  
Baytex, EPA Registration No. 3125-148-AA

The area under consideration lies at the southern tip of Florida and comprises the marine portion of Everglades National Park and Key Largo in Monroe County [Figure 1]. The Park system is southwest of the causeway linking the mainland and the keys and west of the intercoastal waterway which is considered the boundary. These waters are separated by various narrow land masses and include Long Sound, Little Blackwater Sound, Blackwater Sound, Little Buttonwood Sound, Buttonwood Sound and Florida Bay. The area is also dotted with small low-lying islands. Most of the Sounds are relatively shallow, averaging about 5 feet (1.5m) with sandy or sandy-silt type bottoms.

Tidal differences in the inner Key waters are slight, usually in a range of inches. Exchange of waters is principally controlled by the direction and velocity of the wind. Tidal exchange was minimal in the confined area of this study.

Naled (Dibrom 14) is applied aerially from a fixed wing aircraft as a thermal fog at 0.48% (16 fluid ounces) per 0.4 ha (1 acre) using the following formulation:

Dibrom 14	456 liters (120 gal.)
Ortho additive	627 liters (165 gal.)
No. 2 Diesel Fuel	7,277 liters (1915 gal.)
X-Lite Fog oil	<u>3,040 liters</u> (800 gal.)
	11,400 liters (3,000 gal.)

Ground application of Baytex is accomplished with gasoline-operated Ultra Low Volume (ULV) Fog Generators mounted on 1/2 ton trucks. Baytex 93% Liquid Concentrate Insecticide is applied at the rate of 0.03 % (1 fluid ounce) per minute at a truck speed of 16 km/hr (10 mph).

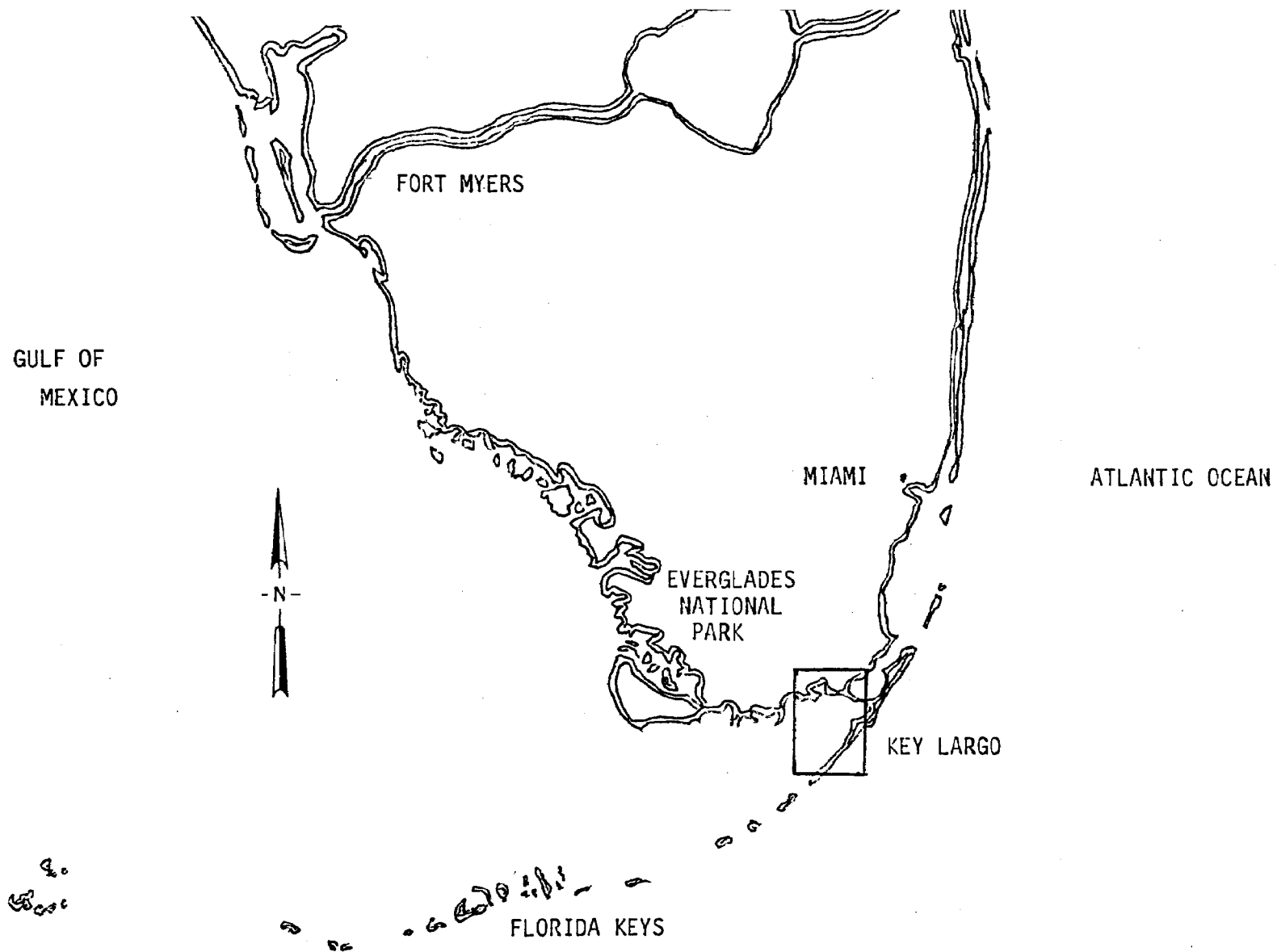


FIGURE 1. Geographic Location of Pesticide Investigation  
Florida. June, 1979.

Aerial application when performed is from about 6:00AM to 8:00AM and from approximately 7:30PM to 9:30PM. Ground fogging activities when done are between sundown and sunrise. Appendix C.

To ascertain the effects of the Monroe County Mosquito Abatement Program, NEIC conducted a pesticide use-observation which consisted of pre-application sampling in March, 1979 followed by a thorough investigation in June, 1979. During both studies, samples were collected from the marine environment of Everglades National Park and analyzed to determine the levels of the insecticides Naled and Baytex. Appendix A. Samples from the marine system consisted of fish, shellfish and water. In-situ exposures of fish, shrimp, and shellfish were monitored during the June investigation. Air sampling equipment was located on the perimeter of the Everglades Park to determine spray drift characteristics<sup>2</sup>.

Follow-up sampling of surface water film using filter paper was done in July by National Park Service personnel. Except for on-site hydrographic field analyses, all samples collected were preserved and returned to NEIC for analysis.

The work was performed under established NEIC chain-of-custody and document control procedures (i.e., each sample was tagged, custody sheet completed, field data recorded in log book, etc.). Samples collected during the investigation were in proper custody from the time of collection until analyses were completed.

Field personnel followed applicable NEIC Safety Requirements during the study which consisted of appropriate safety attire during boat and land sampling.

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<sup>2</sup> Field sampling was conducted by NEIC personnel assisted by members of the National Park Service. Analyses of environmental samples were completed by Chemistry Branch personnel at NEIC. Appendix B.



## II SUMMARY AND CONCLUSIONS

From June 3 to 14, 1979, a pesticide use observation study was conducted by the National Enforcement Investigations Center (NEIC) in Monroe County, Florida. During the study, an EPA team evaluated the environmental effects resulting from the aerial application of Naled (Dibrom-14) and ground application of Baytex for the control of mosquitos.

### SUMMARY

1. A reconnaissance survey in March of the marine environment in the Everglades National Park revealed no pesticide residues were detected prior to the initiation of the mosquito control program by Monroe County.
2. Lack of precipitation in the spring reduced mosquito breeding activities and consequently the necessity for intensified pesticide applications. Records indicate only three aerial and two ground applications occurred from June 3 to 14, 1979.
3. Of the thirty-seven surface water samples collected from the Everglades Park marine environment, two contained detectable amounts of pesticide. At Station 10 on June 5, Naled was found at a concentration of 0.02mg/l. On June 14 at Station 04, Naled appeared at a concentration of 0.06µg/l. No Baytex was found in the water samples.
4. Pesticide drift into the area adjacent to the Park was confirmed by the use of Hi-Vol air samplers at Station 12 (Ranger Station) on three occasions. On June 4, filter paper in the Hi-vol samplers captured 0.18µg of Baytex sprayed via ground applications. June 5 and 12 the air monitoring filters revealed a capture of 0.06µg and 0.02µg respectively.

5. Uptake by exposed marine organisms of the applied pesticide was negligible. The only observed instance of uptake occurred at Station 05 (Manatee Creek) where the oysters accumulated an average of  $0.0007\mu\text{g/g}$  of Naled. Baytex was not found in detectable amounts.
6. Field analyses of hydrographic conditions were made daily throughout the 11-day study to determine if the aquatic environment affected the survival rate of the test animals. From June 3 to 14, records revealed that conditions were at a seasonal norm and as such appeared to have had no direct influence on test organism survival during the exposure studies.
7. The test to relate the presence of an oily film on the water surface to a pesticide incursion into a non-target area proved inconclusive. Two filter paper samples of a surface film were obtained and neither contained measurable amounts of Naled nor Baytex.
8. The Monroe County Mosquito Control District supervises the disposal of used containers at a local sanitary landfill which operates a drum crusher. The Safety Director was advised that, because Naled and Baytex are kept in Group II containers, it is recommended that each empty container be triple rinsed and crushed prior to disposal in a landfill.

### CONCLUSIONS

1. Limited precipitation and the consequent diminishing of mosquito control activities by Monroe County probably lessened an observable pesticide impact on the Everglades National Park marine environment during the study. However, indications of pesticide intrusion into the Park or adjacent marine waters were recorded on six occasions which involved both Naled and Baytex. These results imply that more precise applications practices should be adopted by the Mosquito Control District.
2. Disposal methods of used containers by the Monroe County Mosquito Control District were not in compliance with FIFRA regulations. The District failed to triple rinse containers before crushing and disposal as regulation [Sec. 165.9(b)] recommend. Although the District was reminded of this fault, further efforts should be made to determine if correct disposal practices are now being followed for used containers and the resulting rinse waters.
3. Except for failing to follow FIFRA regulations pertaining to recommended disposal of used containers, the Monroe County Mosquito Control District is in conformity with proper pesticide control practices.

### III. METHODS

Several species of local fauna were used to assess the environmental impact resulting from the possible influx of pesticides on the Everglades National Park marine ecosystem. In some instances, marine specimens were placed in-situ in pre-determined locations and monitored throughout an eleven-day study while secondary efforts were made to capture indigenous species for pesticide uptake analyses. The test organisms used for in-situ experiments were pinfish, Logodon rhomboides, shrimp, Penaeus duorarum, and oysters, Ostrea frons. Additional species were either trapped or caught by otter trawl and consisted of blue crabs and a diverse assortment of small fish.

The pinfish and shrimp used for in-situ exposure were purchased locally and the oysters were gathered in an area known as Joe Bay, located several miles west of the zone under investigation. Ten fish and ten shrimp and as many as eighty small oysters were placed in perforated bait buckets near the water surface at six locations (Table 1, Figure 2). The condition of the exposed animals was monitored daily. The shrimp, because of their molting habits, were replaced by fresh animals after seven days. The originally exposed fish and oysters remained in-situ for the eleven-day study.

Field analyses of hydrographic conditions were obtained at the six exposure locations to determine if the aquatic environment was conducive to animal survival. These measurements of the marine ecosystem involved daily recordings of dissolved oxygen, water temperature, pH, and salinity.

Surface water and sediment samples, for pesticide analyses, were collected at the same six locations on three occasions during the study. Because of the rapid breakdown characteristics of Neled (Dibrom 14) the water samples were immediately forwarded to NEIC for chemical analyses.

Other exploratory sample collecting devices used were not directly associated with the pesticide impact on the aquatic environment but rather were used to evaluate the likelihood of pesticide drift into the Everglades National Park resulting from adverse air currents during specific applications. The devices used were battery operated high-volume air samplers equipped with 8" x 10" (20x25cm) paper filters located on the face plate to capture pesticide residue. These devices were placed in operation when either a land or aerial pesticide application was anticipated.

To test the theory that a surface film of oil might be associated with pesticide drift (pesticide and diesel oil are mixed for fogging applications), supplementary sampling was conducted following the June survey. This sampling was done in the original survey zone by Forest Service personnel using filter paper to absorb the surface film of suspected oil and pesticide. The filter papers suspected of being contaminated with pesticide were immediately forwarded to NEIC for analysis.

TABLE 1

SAMPLES AND STATION DESCRIPTIONS  
PESTICIDE USE OBSERVATIONS  
MONROE COUNTY, FLORIDA

RECONNAISSANCE SURVEYMarch, 1979Station NumberDescription

01	Channel Marker #56
02	Channel Marker #54
03	Channel Marker #48A
04	Blackwater Canal
05	Manatee Creek
06	Shell Creek
07	Joe Bay
09	Davis Cove

OBSERVATION STUDYJune, 1979Station NumberDescription

01	Channel Marker #56
04	Blackwater Canal
05	Manatee Creek
08	Blackwater Sound, West
09	Davis Cove
10	Blackwater Sound, East
10A	Gilbert's Marina Dock
12	Ranger Station Dock, Key Largo

Base Data Samples

20	Tampa Shrimp Holding Water (Bill's Bait Shop)
21	Tampa Shrimp (Bill's Bait Shop)
22	Biscayne Bay Shrimp
23	Control Shrimp (Bill's Bait Shop)
25	Pinfish Holding Water (Ron's Bait Shop)
26	Pinfish (Ron's Bait Shop)
27	Oysters (Joe Bay)
28	Pinfish (Buttonwood Sound, North)

SURFACE FILM STUDYJuly, 1979Station NumberDescription

29	0.5 mi. West of Marker #57A
30	0.25 mi. N.W. of Marker #57A

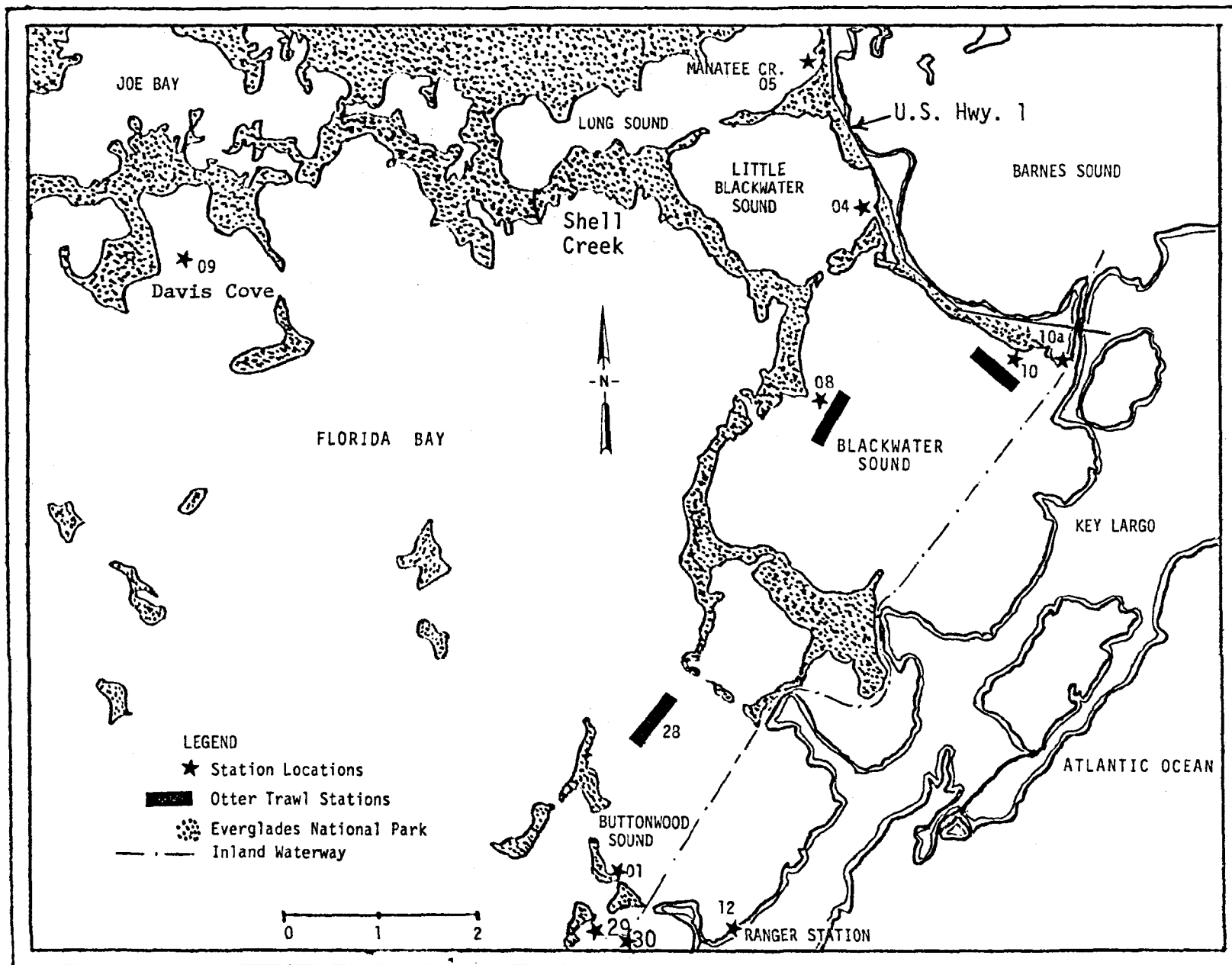


FIGURE 2. Station Locations, Monroe County, Florida, June, 1979.

#### IV. RESULTS AND DISCUSSION

##### Reconnaissance Survey, March, 1979

Prior to the full-scale pesticide use study scheduled for June, 1979 a reconnaissance or pre-application investigation was undertaken in the area of potential pesticide contamination. This survey was in March, 1979 for the purpose of selecting areas to be monitored and for the collection of various types of samples to determine background conditions. These samples consisted of surface water, local fish species, and sediment. Seven of the water samples obtained were analyzed and none contained Naled or Baytex. Analysis of fish from Davis Cove and sediment from Blackwater Canal revealed no detectable amounts of either Naled or Baytex [Table 2]. These results provided evidence that the area to be investigated was uncontaminated by any significant amount of Naled or Baytex prior to the initiation of the 1979 mosquito control program.

##### Use Observation Study, June, 1979

Low mosquito abundance prior to and during the study, because of an unseasonable decrease in local precipitation, resulted in a less intensified program of pesticide application, both aerially and from the ground. Records indicate only three aerial and two ground applications occurred between June 3 and 14.

##### Water and Sediment Samples

Over a period of 11 days there were 37 surface water samples collected from the Everglades Park marine environment. Separate



TABLE 2

## ANALYSES OF SAMPLES COLLECTED DURING RECONNAISSANCE SURVEY

MONROE COUNTY, FLORIDA  
March, 1979

Station Number	Station Description	Date	Naled ( $\mu\text{g/l}$ )	Baytex ( $\mu\text{g/l}$ )
<u>Water</u>				
01	Marker 56	3/13/79	ND <sup>a</sup>	ND
02	Marker 54	3/13/79	ND	ND
03	Marker 48A	3/13/79	ND	ND
04	Blackwater Canal	3/13/79	ND	ND
05	Manatee Creek	3/13/79	ND	ND
06	Shell Creek	3/13/79	ND	ND
07	Joe Bay	3/13/79	ND	ND
<u>Fish</u>				
09	Davis Cove	3/14/79	ND <sup>b</sup>	ND
<u>Sediment</u>				
04	Blackwater Canal	3/14/79	ND <sup>c</sup>	ND

a None Detected - The detection limit for the preliminary study was  $1.0\mu\text{g/l}$  for Naled and  $0.5\mu\text{g/l}$  for Baytex.

b None Detected - The detection limit for the preliminary study was  $0.005\mu\text{g/l}$  for Naled and  $0.02\mu\text{g/l}$  for Baytex.

c None Detected - The detection limit was  $0.1\mu\text{g/l}$  for both Baytex and Naled.

TABLE 3  
ANALYSES OF WATER SAMPLES FOR NALED AND BAYTEX

MONROE COUNTY, FLORIDA  
June, 1979

Station Number	Station Description	Date	Naled ( $\mu\text{g/l}$ )	Baytex ( $\mu\text{g/l}$ )
20	Bill's Bait Shop, Shrimp Holding Tank	6/4/79	NA <sup>a</sup>	ND <sup>b</sup>
25	Ron's Bait Shop	6/4/79	NA	ND
01	Channel Marker #56, Buttonwood Sound	6/5/79	ND	ND
04	Blackwater Canal	6/5/79	ND	ND
05	Manatee Creek	6/5/79	ND	ND
08	Blackwater Sound, West	6/5/79	ND	ND
09	Davis Cove	6/5/79	ND	ND
10	Blackwater Sound, East	6/5/79	0.02	ND
01	Channel Marker #56, Buttonwood Sound	6/11/79	ND	ND
04	Blackwater Canal	6/11/79	ND	ND
05	Manatee Creek	6/11/79	ND	ND
08	Blackwater Sound, West	6/11/79	ND	ND
09	Davis Cove	6/11/79	ND	ND
10	Blackwater Sound, East	6/11/79	ND	ND
08	Blackwater Sound, West	6/13/79	NA	ND
01	Channel Marker #56, Buttonwood Sound	6/14/79	ND	ND
04	Blackwater Canal	6/14/79	0.06	ND
05	Manatee Creek	6/14/79	ND	ND
08	Blackwater Sound, West	6/14/79	ND	ND
09	Davis Cove	6/14/79	ND	ND
10	Blackwater Sound, East	6/14/79	ND	ND

a Not analyzed.

b None Detected - The nominal detection limit for Naled was  $0.02\mu\text{g/l}$  and for Baytex  $0.01\mu\text{g/l}$ . These limits varied due to sample size and interferences.

samples were obtained at each station for analysis of Naled and Baytex. The nominal detection limit for Naled is  $0.02\mu\text{g/l}$  and for Baytex  $0.01\mu\text{g/l}$  [Table 3]. Naled was the only pesticide detected. At Station 10 on June 5, Naled was found at a just detectable concentration of  $0.02\mu\text{g/l}$ . On June 14 at Station 04, Naled appeared at a concentration of  $0.06\mu\text{g/l}$ . Both of these stations are located at the north-east zone of the study area and because the flight pattern of the application plane is along U.S. Highway 1, they would likely be susceptible to minor drift or overspray contamination.

An influx of pesticide into the area of Station 04 could possibly be attributed to run-off or direct drift from an aerial application. That found in the vicinity of Station 10 could also be the result of run-off or the direct contamination of canal waters traveling between Barnes Sound and Blackwater Sound.

Sediment samples were collected but not analyzed.

#### Hi-Volume Air Samples

Pesticide drift was monitored with high volume air samplers. For the major part of the study one Hi-Vol sampler was assigned to Station 12, the Ranger Station, Key Largo, and another was situated at Station 10A, Gilbert's Marina Dock. At these two locations, the air filtering devices were operated on a nightly basis for the capture of ground applied Baytex. These stations were both situated on boat docks over or adjacent to waters in the study area and would thus verify a possible occurrence of pesticide drift into the marine environment.

Pesticide drift into the Buttonwood Sound area was confirmed by air samples at Station 12 on three occasions. On June 4, when Baytex was applied in the vicinity, 0.18 $\mu$ g was captured on the filter paper. An all night operation on June 5 revealed a Baytex capture in the amount of 0.06 $\mu$ g. A final instance of ground applied pesticide drift took place during the evening of June 12 when 0.02 $\mu$ g of Baytex was collected on the filter [Table 4].

Prior notification of a scheduled aerial fogging application of Naled on June 12 allowed the placement of five high volume air sampling devices in the southern and north-eastern perimeter of the study zone. These established positions were Stations 01 and 12 in Buttonwood Sound, Stations 08 and 10 in Blackwater Sound, and Station 05 at Manatee Creek.

The air filtering device located at Station 10 was incapacitated before the aerial application and therefore only four filter papers were retrieved as samples.

Chemical analyses of the filter papers removed on the day of the aerial application revealed that Naled was not present in detectable amounts, indicating no major drift of the pesticide into the marine environment from the aerial application on June 12.

TABLE 4  
ANALYSES OF HI-VOL FILTERS FOR NALED AND BAYTEX<sup>a</sup>  
MONROE COUNTY, FLORIDA  
June 1979

Station Number	Station Description	Date	Naled <sup>b</sup> ( $\mu$ g)	Baytex ( $\mu$ g)
<u>Hi-Vol Filters</u>				
12	Ranger Station Dock	6/3/79	--	ND <sup>c</sup>
12	Ranger Station Dock	6/4/79	--	0.18
10A	Gilbert's Dock	6/5/79	--	ND
12	Ranger Station Dock	6/5/79	--	0.06
10A	Gilbert's Dock	6/6/79	--	ND
12	Ranger Station Dock	6/6/79	--	ND
10A	Gilbert's Dock	6/7/79	--	ND
12	Ranger Station Dock	6/7/79	--	ND
12	Ranger Station Dock	6/8/79	--	ND
12	Ranger Station Dock	6/9/79	--	ND
12	Ranger Station Dock	6/10/79	--	ND
12	Ranger Station Dock	6/11/79	--	ND
01	Channel Marker #56, Buttonwood Sound	6/12/79	ND	ND
05	Manatee Creek	6/12/79	ND	ND
08	Blackwater Sound, West	6/12/79	ND	ND
12	Ranger Station Dock	6/12/79	ND	0.02
12	Ranger Station Dock	6/13/79	--	ND
12	Ranger Station Dock	6/14/79	--	ND
10A	Gilbert's Dock	6/14/79	--	ND

a The detection limit for Naled was 0.02 $\mu$ g, for Baytex 0.01 $\mu$ g.

b Air samples collected and analyzed for Naled on 6/12 only.

c Non detected.

### Oyster Samples

Oysters from Joe Bay used in the exposure tests at the six established locations suffered varied and wide degrees of survival. These differences in survival rates ranged from 8% at Station 01 in Buttonwood Sound to a high of 90% at Station 05, in Manatee Creek. Per cent survival at the remaining stations were: 04 (76%), 08 (45%), 09 (80%) and 10 (16%). Hydrographic conditions observed during the 11-day exposure period appeared normal for the season and consequently cannot be considered the attributing cause of the mortalities encountered during the in-situ experiment. The paucity of confirmatory analytical results relating mortality to pesticide uptake in oysters during this study leaves the reason for the wide range of mortalities to either poor initial handling or an unknown natural cause.

Oyster samples from Stations 01, 04, 05, 09 and 10 were analyzed for possible pesticide uptake. Of these only Station 05 in Manatee Creek produced a trace of pesticide. Naled was found at an average concentration of  $0.0007\mu\text{g/g}$  [See Appendix]. The nominal detection limits for both Naled and Baytex are  $0.0003\mu\text{g/g}$ . These limits varied due to sample size and interferences [Table 5]. The intrusion of Naled into Manatee Creek (Station 05) and its accumulation by the in-situ oysters ( $0.0007\mu\text{g/g}$ ) is confirmatory proof that the pesticide was entering the Everglades National Park aquatic system via some route. Whether this entrance was the result of aerial overspray, wind drift or translocation from Manatee Bay by way of the connecting culvert, is undetermined. Dilution and the rapid breakdown characteristics of

Naled are the probable reasons for its undetectability in water samples from this general area.

#### Shrimp Samples

After seven days of exposure, all shrimp were removed from the six in-situ test locations and replaced with fresh specimens. Survival rate was between 70 and 100 percent for these initial exposures. There appeared to be no definite relationship between shrimp mortalities and the application of pesticides. Chemical analyses for the determination of possible pesticide uptake were made on the original shrimp from Stations 01, 04, 09 and 10. Neither Baytex nor Naled was detected in the test shrimp. The nominal detection limit for Naled was  $0.003\mu\text{g/g}$  and for Baytex it was  $0.001\mu\text{g/g}$ . These limits varied due to sample size and interferences [Table 5].

#### In-situ Fish Studies

Survival studies conducted for 11 days at the six locations in the Everglades National Park marine environment were inconclusive. Rates of fish survival at each station was between 10 and 20% and consequently did not provide an adequate amount of sample for chemical analyses. Poor survival rate was attributed to the delicate physiological characteristics of the pinfish and possibly resulted from the excessive handling that was necessary in preparing the fish for exposure tests.

To compensate for the high percentage of fish loss in the exposure tests and the resulting small sample, additional pinfish for chemical analyses were captured at three locations using a bottom fishing otter trawl. Each location was fished on two occasions during the late evenings of June 6 and 12. The particular areas were situated near Stations 08, 10, and 28 in Buttonwood Sound. Fishing time at each location was ten minutes and each catch was bagged, labeled, and returned to NEIC.

Because a water sample on June 5 from Station 10 (Blackwater Sound, east) indicated a trace of Naled,  $0.02\mu\text{g}/\text{l}$ , pinfish collected during a night fishing trip at Station 10 on June 12 were selected for chemical analysis. Both the viscera and muscle from a random sample of the catch, ten fish (7 to 10 cm total length) was used for the analysis. Neither Naled nor Baytex was found in detectable quantities in the sample. The detection limits for viscera were  $0.005\mu\text{g}/\text{g}$  for Naled and  $0.002\mu\text{g}/\text{g}$  for Baytex; for muscle they were  $0.004\mu\text{g}/\text{g}$  for Naled and  $0.002\mu\text{g}/\text{g}$  for Baytex [Table 5].

#### Blue Crabs

In order to analyze a wide spectrum of commercial species in the marine environment for possible pesticide contamination, attempts were made to capture the blue crab, Callinectes sapidus. Two baited commercial-type crab traps were set at each of the six monitored locations in the study area. These traps were inspected and re-baited on a regular basis during the study; however, insufficient numbers of blue crabs were caught to perform chemical analyses for pesticides.



Table 5  
Analyses of Oyster, Shrimp, and Fish for  
Naled and Baytex  
Monroe County, Florida  
June, 1979

Station Number	Station Description	Date	Naled ( $\mu\text{g/g}$ )	Baytex ( $\mu\text{g/g}$ )
<u>Oysters</u>				
01	Channel Marker #56, Buttonwood Sound	6/14/79	ND <sup>a</sup>	ND
04	Blackwater Canal	6/14/79	ND	ND
05	Manatee Creek	6/14/79	0.0007	ND
09	Davis Cove	6/14/79	ND	ND
10	Blackwater Sound, East	6/14/79	ND	ND
<u>Shrimp</u>				
01	Channel Marker #56, Buttonwood Sound	6/11/79	ND <sup>b</sup>	ND
04	Blackwater Canal	6/11/79	ND	ND
09	Davis Cove	6/11/79	ND	ND
10	Blackwater Sound, East	6/11/79	ND	ND
<u>Fish (otter trawl)</u>				
10	Blackwater Sound, East-Viscera	6/12/79	ND <sup>c</sup>	ND
10	Blackwater Sound, East-Muscle	6/12/79	ND	ND

- a None Detected - The nominal detection limits for Naled and Baytex were both 0.003  $\mu\text{g/g}$ . These limits varied due to sample size and interferences.
- b None Detected - The nominal detection limit for Naled was 0.003 $\mu\text{g/g}$  and for Baytex it was 0.001 $\mu\text{g/g}$ . These limits varied due to sample size and interferences.
- c None Detected - The detection limits for viscera were 0.005 $\mu\text{g/g}$  for Naled and 0.002 $\mu\text{g/g}$  for Baytex; for muscle they were 0.0004 $\mu\text{g/g}$  for Naled and 0.0002 $\mu\text{g/g}$  for Baytex.

### Hydrographic Conditions

Field analyses of hydrographic conditions were made daily throughout the study to determine if the aquatic environment affected the survival rate of the test animals. From June 3 to 13, records revealed that conditions were at a seasonal norm and as such appeared to have had no direct influence on the exposure studies.

Average surface water temperature varied one or two degrees centigrade at all locations and these differences were attributed to either the time of day or degree and length of cloud cover. The average range of water surface temperature was between 29.4°C and 30.6°C [Table 6].

Unlike water temperature, the salinity varied according to location and was influenced by the confines of land areas and the exchange of waters from adjoining areas. Stations 01, 04, 08, and 10 were located in areas where free exchange of water was limited and evaporation the probable reason for high salinities. Contrasting these high saline waters are those of more brackish waters at Station 05 and 09. Station 05 located at the eastern end of Manatee Creek had the widest range of salinity (13.5-31.0 ppt) and the lowest average (20.4 ppt). Tidal exchange between Manatee Creek and Manatee Bay, northeast of Barnes Sound, through a 5 ft. (1.5m) diameter culvert, accounts for this wide variation in salinity. Freshets from Glades Canal into Manatee Bay appear to cause the occasional low saline waters found in Manatee Creek. Moderate salinities at Station 09 in Davis Cove, average 28.2 ppt, can be attributed to fresh water run-off from the Everglades National Park lake system. The brackish waters in this location probably fluctuate according to season.

The pH at all stations remained relatively steady throughout the study and remained in the realm of that expected for sea water (7.5-8.4)<sup>1</sup>.

Dissolved oxygen at most stations appeared normal during the study and whatever differences were found were believed to be either caused by the time of day the sample was collected or the intensity and duration of cloud cover. Station 10 produced some unaccountable results which ranged between a low of 2.5 and a high of 7.9. All the samples at this location resulted in an average dissolved oxygen content of 4.3.

TABLE 6  
HYDROGRAPHIC CONDITIONS RECORDED AT  
EVERGLADES NATIONAL PARK  
JUNE 3-13, 1979

Station Number	Temperature(°C)		Salinity%		pH		Dissolved Oxygen	
	Range	Average	Range	Average	Range	Average	Range	Average
01	27.4-32.2	29.6	36.2-38.2	36.8	7.9-8.3		4.9-7.6	6.1
04	28.6-32.1	30.6	29.8-37.0	33.5	7.8-8.3		4.2-8.3	6.2
05	27.5-32.0	30.4	13.5-31.0	20.4	8.0-8.2		3.5-7.6	6.7
08	27.8-31.6	29.4	29.1-37.1	35.7	7.9-8.2		3.3-8.1	5.7
09	28.0-32.1	30.4	26.0-31.5	28.2	8.0-8.3		6.2-8.9	7.5
10	28.1-30.7	29.5	34.9-37.9	36.8	7.9-8.2		2.5-7.9	4.3

### Surface Film Detection

Surface film samples were collected by Park Service personnel on July 17, 1979 from a marine area south of Buttonwood Sound inside the boundary of Everglades National Park. These samples were obtained from an oil slick assumed to be related to pesticide drift from a recent aerial application. Chemical analyses of these filter papers for Baytex and Naled proved negative. The detection limits on these samples were  $0.2\mu\text{g}$  for Naled and  $0.01\mu\text{g}$  for Baytex [Table 7]. Further efforts to collect surface film samples were suspended on August 1, 1979.

TABLE 7  
ANALYSES OF FILTERS FOR SURFACE FILM DETECTION  
OF NALED AND BAYTEX

MONROE COUNTY, FLORIDA  
JULY, 1979

Station Number <sup>b</sup>	Station Description	Date	Time	Naled (μg)	Baytex (μg)
29	1/2M West of Intercoastal Waterway Marker 57A, Everglades National Park	7/14/79	0830	ND <sup>a</sup>	ND
30	1/4M NW of Intercoastal Waterway	7/14/79	0805	ND	ND

a None Detected - The detection limits were 0.2μg for Naled and 0.01μg for Baytex.

b These stations were assigned new numbers to avoid duplicity.

Mosquito Control Program Evaluation

The Monroe County Mosquito Control District uses approximately 1500 gallons of Baytex and 2800 gallons of Naled annually. All pesticide materials are received in 30 gallon drums which entails the disposal of about 140 empty drums each year.

The District Safety Director supervises the disposal of all drums at a local landfill located at Long Key. This facility is used because of the availability of a drum crusher. Each empty container, although unrinsed, is crushed to prevent possible reuse.

The Safety Director was advised by the EPA Region IV Pesticides Inspector that because Naled and Baytex are stored in Group II containers, it is recommended by FIFRA regulation [Sec. 165.9(b)]<sup>3</sup> that each empty container be triple rinsed and crushed prior to disposal in a landfill.

Appendix C.

Except for the above infraction, the Monroe County Mosquito Control District is in conformity with proper pesticide control practices.

<sup>3</sup> 165.9 Recommended procedures for the disposal of pesticide containers and residues. (b) Group II Containers. Non-combustible containers which formerly contained organic or metallo-organic pesticides, except organic mercury, lead, cadmium, or arsenic compounds, should first be triple-rinsed. Containers in good condition may then be returned to the pesticide manufacturer or formulator, or drum reconditioner for reuse with the same chemical class of pesticide previously contained providing such reuse is legal under currently applicable U.S. Department of Transportation regulations including those set forth in 49 CFR 173.28. Other rinsed metal containers should be punctured to facilitate drainage prior to transport to a facility for recycle as scrap metal or for disposal. All rinsed containers may be crushed and disposed of by burial in a sanitary landfill, in conformance with State and local standards or buried in the field by the user of the pesticide. Unrinsed containers should be disposed of in a specially designated landfill, or subjected to incineration in a pesticide incinerator.

## REFERENCES

- 1 Sverdrup, H. U., M. W. Johnson, R. H. Fleming. 1949.  
The Oceans. Prentice-Hall, Inc., P. 194.



APPENDIX A  
ANALYTICAL METHODOLOGY

## ANALYTICAL METHODOLOGY

Water - The water samples were analyzed by the NEIC as described in "Method for Naled and DDVP in Environmental Water samples". No cleanup procedures were necessary. The extracts were concentrated to 1 ml to lower the detection limit.

Sediment, Shrimp, Oysters, Fish Viscera, and Fish Muscle - These samples were analyzed by the NEIC as described in "Method for Naled, DDVP, and Baytex in Soil, Vegetation, and Fish". The three cleanup procedures were used as necessary. The final volume of the extracts varied from 1 to 10 ml, depending on the level of interferences in the individual extracts.

Hi-Vol Filters - The filters were analyzed by the NEIC as described in "Method for Baytex on Hi-Vol Filters". No cleanup procedures were necessary. The extracts were concentrated to 1 ml to lower the detection limit.

Confirmation - All reported values of Naled and Baytex were confirmed by dual-column chromatography. The retention times were identical on both a non-polar column (6 ft, glass 10% OV-101) and a polar column (14 ft, nickel, 5% OV-210).

## QUALITY CONTROL PROCEDURE

Nineteen spike, twelve replicate, and fourteen blank samples were analyzed during the survey. None of the blanks contained any substances which interfered with Naled or Baytex. Only one of the replicate samples contained detectable levels of either Naled or Baytex. This sample, an oyster at Station 05, contained an average of 0.0007 $\mu$ g/g of Naled.

Replicate	Station Description	Date	Naled	
			#1 ( $\mu\text{g/g}$ )	#2 ( $\mu\text{g/g}$ )
05	Manatee Creek	6/14/79	0.0002	0.0013

The results of the eight water spikes were consistent with the recoveries expected from the method.

Pesticide	Amount of Spike	#1	% Recoveries			Average	Standard Deviation
			#2	#3	#4		
<u>Water Spikes</u>							
Naled	10μg	57	52	62	85	64	13
Baytex	5μg	100	104	97	102	101	2.6

The results of the eleven spikes of other matrices varied widely depending on the matrix and the type of cleanup procedure which was employed.

Matrix	Pesticide	Amount of Spike ( $\mu\text{g}$ )	% Recovery
Hi-Vol Filter	Naled	1	44
	Baytex	0.04	62
	Baytex	0.04	75
Shrimp	Naled	10	36
	Baytex	10	58
Oysters	Naled	10	27
	Baytex	10	96
Fish Viscera	Naled	10	44
	Baytex	10	35
Fish	Naled	10	38
	Baytex	10	27

**APPENDIX B**  
**INVESTIGATION PARTICIPANTS**

INVESTIGATION PARTICIPANTS

## National Enforcement Investigations Center

Robert Campbell, Project Coordinator

Bruce A. Binkley, Biologist

John T. Ellison, Biologist

Geraldine Hilden, Environmental Protection Assistant

Kathleen Carlberg, Chemist

Konrad Nottingham, Chemist

## EPA, Region IV, Pesticides Branch

James B. Griffin, Pesticides Inspector

Carlton Layne, Pesticides Inspector

## National Park Service

Richard H. Dawson, Marine Biologist

H. C. Blatt, District Ranger

F. Whitehead, District Ranger

**APPENDIX C**

**REGION IV - PESTICIDES INSPECTORS REPORT**



## ESTABLISHMENT INSPECTION REPORT

FIRM NAME: Monroe County Mosquito Control District  
Stock Island  
Key West, Florida

DATE OF INSPECTION: 3/13/79 - 3/14/79

### SUMMARY OF FINDINGS:

The Monroe County Mosquito Control District has held accession numbers for two products. These are "Dibrom Fog Solution" EPA Accession number 10400, and "Malathion Solution", EPA accession number 10401. These two accession numbers were cancelled effective February 26, 1979 on request of Mr. Robert J. Bentley, Director of the mosquito control district.

The district no longer does any pesticides manufacturing within meaning of FIFRA. The district is still using "Dibrom" in a liquid spray application and in thermal fogging. Use of Dibrom in thermal fogging was approved in April 1977 by the State of Florida under Section 24(c) of the FIFRA. Records in Atlanta office indicate this 24(c) registration was cancelled by EPA in July, 1977.

This district no longer uses Malathion since the mosquitoes in this area have developed resistance to this chemical.

The district uses "Baytex" for ground fogging for mosquito control.

The district also uses alotosid and Larviciding Oil for mosquito larvae control.

### HISTORY OF ESTABLISHMENT:

This mosquito control district is funded by Monroe County and the State of Florida on a matching funds basis. The previous director, Mr. Robert Bentley has been replaced as of December, 1978 by Mrs. Lois Ryan who is acting director.

Mrs. Ryan is assisted by Mr. John Chalbeck, Chief Pilot and Mr. Robert Ferguson, Safety Director. Mr. Chalbeck has the overall responsibility for the operation of the aircraft utilized in spraying "Dibrom". Mr. Ferguson is in charge of disposal of pesticide containers as well as the direction of the ditching and draining operations.

CONSUMER COMPLAINTS:

Mr. Chalbeck showed the Inspector a chart that had 8 different locations where people have requested no spraying be done. These locations are breeders of tropical fish and "Sea World". Mr. Chalbeck said they instructed their pilots to cut out these areas. So far they had no complaints that these areas have actually been sprayed.

DISPOSAL DATA:

Mr. Robert Ferguson stated he personally disposed of all empty containers. The district uses approximately 1500 gallons of Baytex and 2800 gallons of Dibrom annually. All materials are received in 30 gallon drums, therefore, there would be approximately 140 empty drums to dispose of each year.

Mr. Ferguson said they did not rinse the drums prior to disposal. All drums are disposed of at the Long Key landfill. This facility is utilized because they have a drum crusher. Mr. Ferguson makes sure each drum is crushed to prevent possible reuse.

DISTRICT OPERATION:AERIAL APPLICATION:

Mrs. Ryan and Mr. Chalbeck stated the only product applied aerially is Dibrom. Three methods of application are utilized. These are:

1. Low Volume aerial spraying - Mix as follows:

Dibrom 14 Insecticide	- 120.0 gallons
Ortho additive	- 165.0 gallons
No. 2 Diesel Fuel	- 1915.0 gallons
X Lite Fog Oil	- <u>800.0 gallons</u>
Yield	- 3000.0 gallons

Formulation applied at rate of 16.0 Fluid Ounces per acre.

2. Aerial Thermal Fogging - Mix as follows:

Dibrom 14 Insecticide	- 120.0 gallons
Ortho additive	- 165.0 gallons
No. 2 Diesel Fuel	- 1915.0 gallons
X-Lite Fog Oil	- <u>800.0 gallons</u>
	3000.0 gallons

Formulation applied at rate of 16 fluid ounces per acre.

3. Ultra Low Volume Spraying

.75 to 1.0 fluid ounces Dibrom applied per acre. Equivalent of .0875 to .1093 pounds technical "Naled" per acre.



Aerial application is performed at dusk from approximately 7:30 P.M. to 9:30 P.M. and at dawn from about 6:00 A.M. to 8:00 A.M. The decision to treat a given area is based on mosquito landing rate counts, New Jersey light trap collections, and telephone complaints.

#### GROUND APPLICATIONS OF CHEMICALS

##### LARVICIDING

Application of Larviciding materials are made by 9 truck mounted gasoline operated Larviciding Pump Units and 4 John Bean Larviciding Units. Materials used for ground larviciding are as follows:

1. Larviciding Oil Formulation:  
     Triton X207 - 3.0 Pints  
     30 Wt. ND Motor Oil - 1.0 gallons  
     No. 2 Diesel Fuel to make - 100 gallons

This material is applied at rate of 4.0 gallons per acre.

2. Altosid SR-10 Formulation  
     1.0 fluid ounce of altosid SR-10 to 1.0 gallon water.  
     Applied at rate of 4.0 fluid ounces altosid per acre.

##### ADULTICIDING - GROUND

Application of adulticiding material is accomplished with 12 gasoline operated ULV Fog Generators mounted on  $\frac{1}{2}$  ton trucks.

Materials used: Baytex 93% Liquid Concentrate Insecticide - applied ULV at the rate of one (1) fluid ounce per minute, truck speed 10 M.P.H.

All ULV fogging activities will be carried out between the hours of sundown and sun-up.

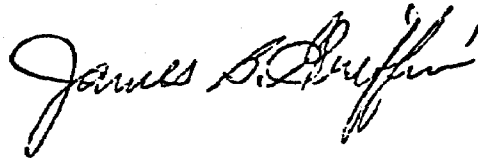
##### DISCUSSION WITH MANAGEMENT:

The information in this report was supplied by Mrs. Lois Ryan, Acting Director, Mr. John Chalbeck, Chief Pilot and Mr. Robert Ferguson, Safety Director. These individuals all stated no Baytex was applied aerially. Dibrom is used exclusively for aerial application and while they have previously used the ULV method in tests they have found this is not effective in the Keys. The thermal fogging method is used almost exclusively although some Low Volume liquid spraying may be done.

Aerial spraying will begin about April 1, 1979 and continue sporadically through December. Historically the 3C-47's used by this district have operated about 200 hours each annually for a total of 600 hours of aerial spraying.

Ground equipment is operated on a year round basis to cover any hot spots of mosquitoes and areas that cannot be sprayed aerially. The ground applications are made between the hours of sundown and sun-up. Baytex is the chemical to be applied by ground equipment.

The Inspector pointed out to Mrs. Ryan and Mr. Ferguson that containers should be triple rinsed prior to disposal in a landfill.

A handwritten signature in cursive script, reading "James A. Griffin". The signature is written in dark ink and is positioned to the right of the "Attachments:" section.

Attachments:

CR DOC

Notice of Inspection

Receipt for samples