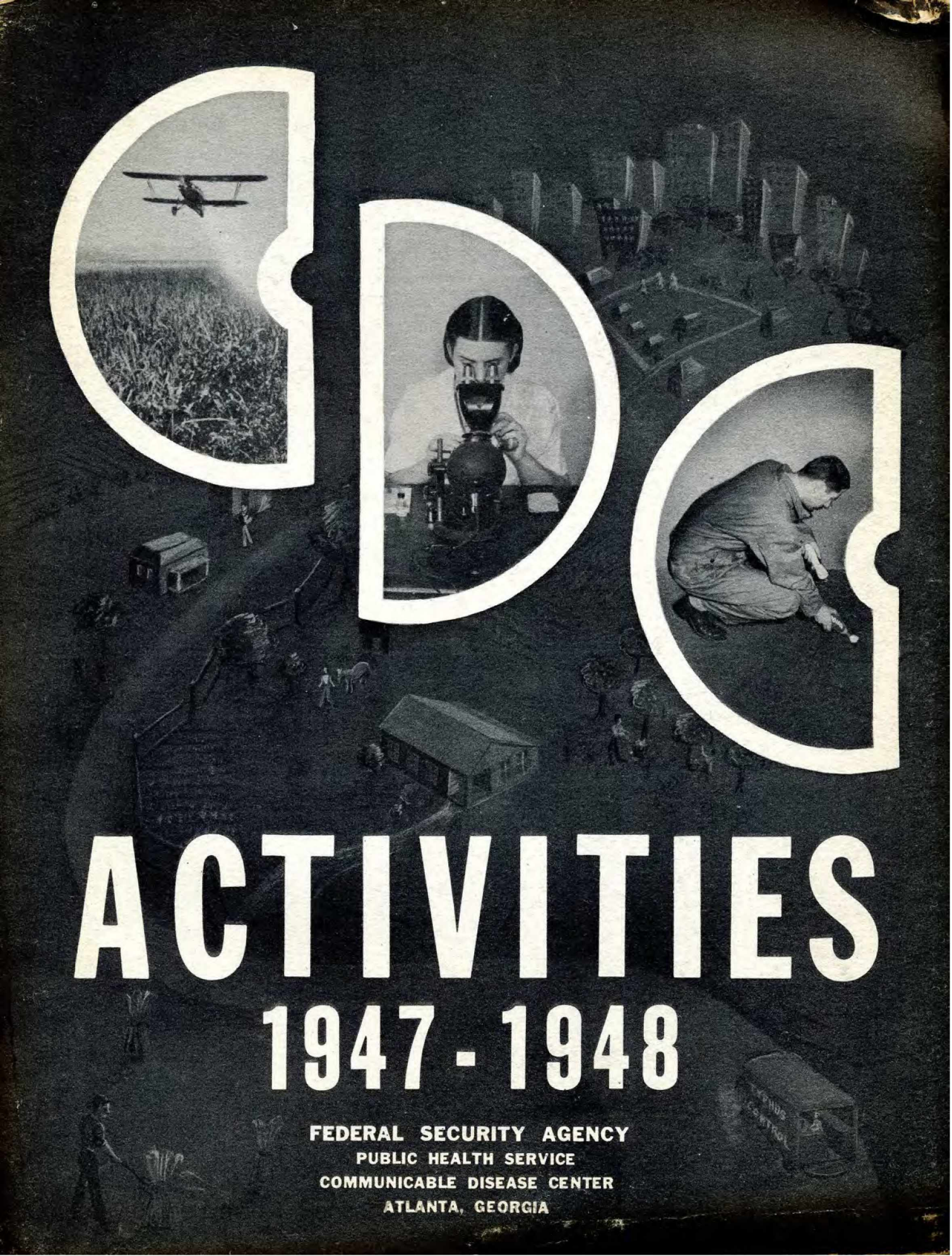


CDC ACTIVITIES 1947-1948

FEDERAL SECURITY AGENCY
PUBLIC HEALTH SERVICE
COMMUNICABLE DISEASE CENTER
ATLANTA, GEORGIA

COMMUNICABLE DISEASE CENTER ACTIVITIES 1947-1948

FEDERAL SECURITY AGENCY
PUBLIC HEALTH SERVICE
COMMUNICABLE DISEASE CENTER
ATLANTA, GEORGIA

Contents

CONTENTS (Continued)

Material in this report is not for publication.

Introduction

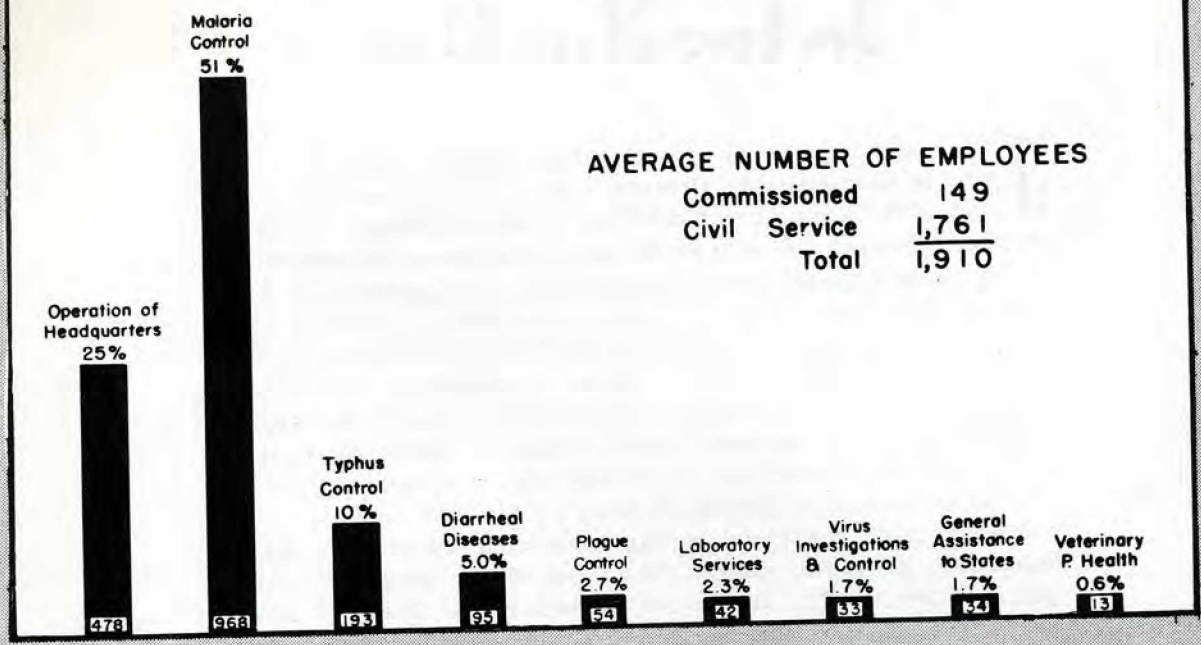
This report is intended to summarize the major activities of the Communicable Disease Center during the fiscal year 1948. The text is arranged in a manner thought applicable to the focusing of attention upon the basic objectives and accomplishments of the Center during that period. It is impractical to record in detail the varied activities of the several headquarters and operational units. In pursuit of immediate and projected objectives, the several units of the Center adhere to the concept of the Public Health Service that the functions of component units transcend administrative subdivisions in a coordinated, total attack against disease.

The Communicable Disease Center (activated July 1, 1946) is concerned with the field investigation and control of all communicable diseases except those for which adequate investigational and control facilities already exist. Diseases accorded primary attention during 1947-48 included malaria, various forms of typhus and plague, hookworm, filariasis, yellow fever, certain neuro-virologic disorders such as poliomyelitis and encephalitis, diverse diarrheas and dysenteries, and related diseases.

The Center transmutes scientific facts about communicable diseases into practical methods of control and promotes their use in the field by demonstrating improved techniques. Further assistance is offered to State and local control programs by the provision of facilities such as personnel, supplies, equipment, and professional services, and by training health personnel.

It should be emphasized that the organization and functions of the Communicable Disease Center are flexible and dynamic. As problems of control change, as new knowledge indicates new approaches, and as certain diseases assume larger or lesser importance, activities of the Center are redirected and modified. Functional relationships exist with the National Institutes of Health and with other U. S. Public Health Service components including the Divisions of Foreign Quarantine, Public Health Methods, Commissioned Officers, and Sanitary Engineering, and with State and Territorial Health Departments through U.S.P.H.S. District offices.

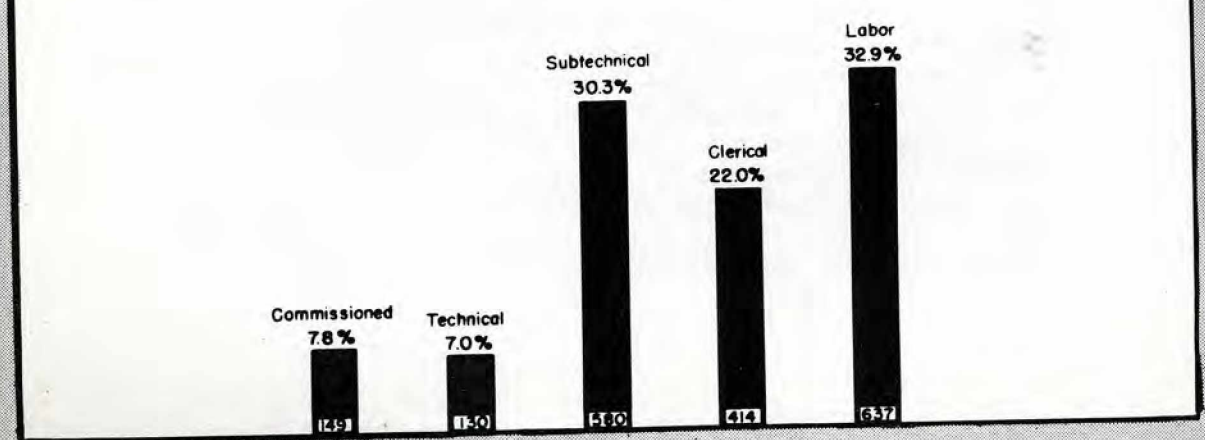
PERSONNEL FISCAL YEAR 1948
BY PROGRAM



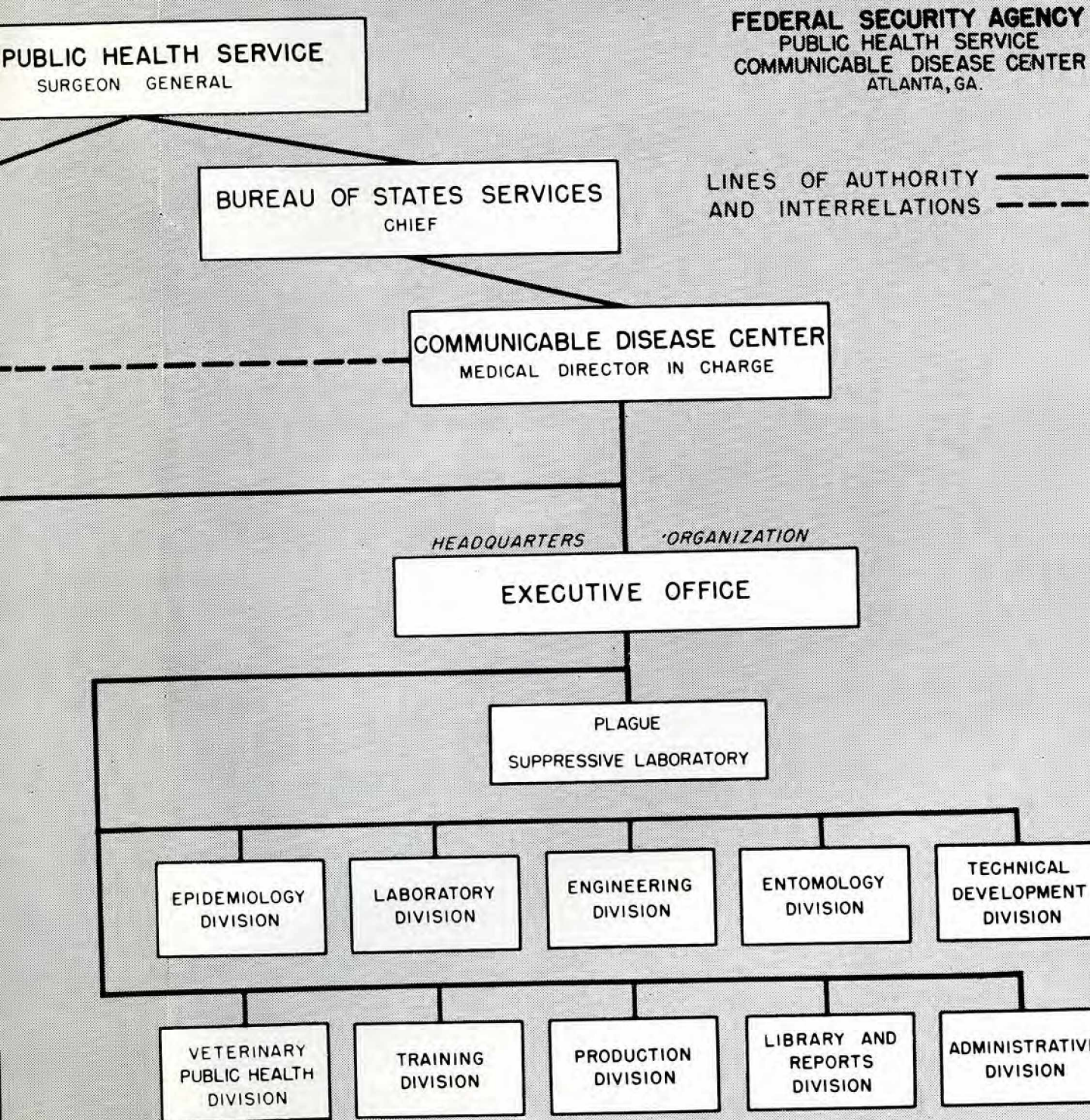
AVERAGE NUMBER OF EMPLOYEES

Commissioned	149
Civil Service	1,761
Total	1,910

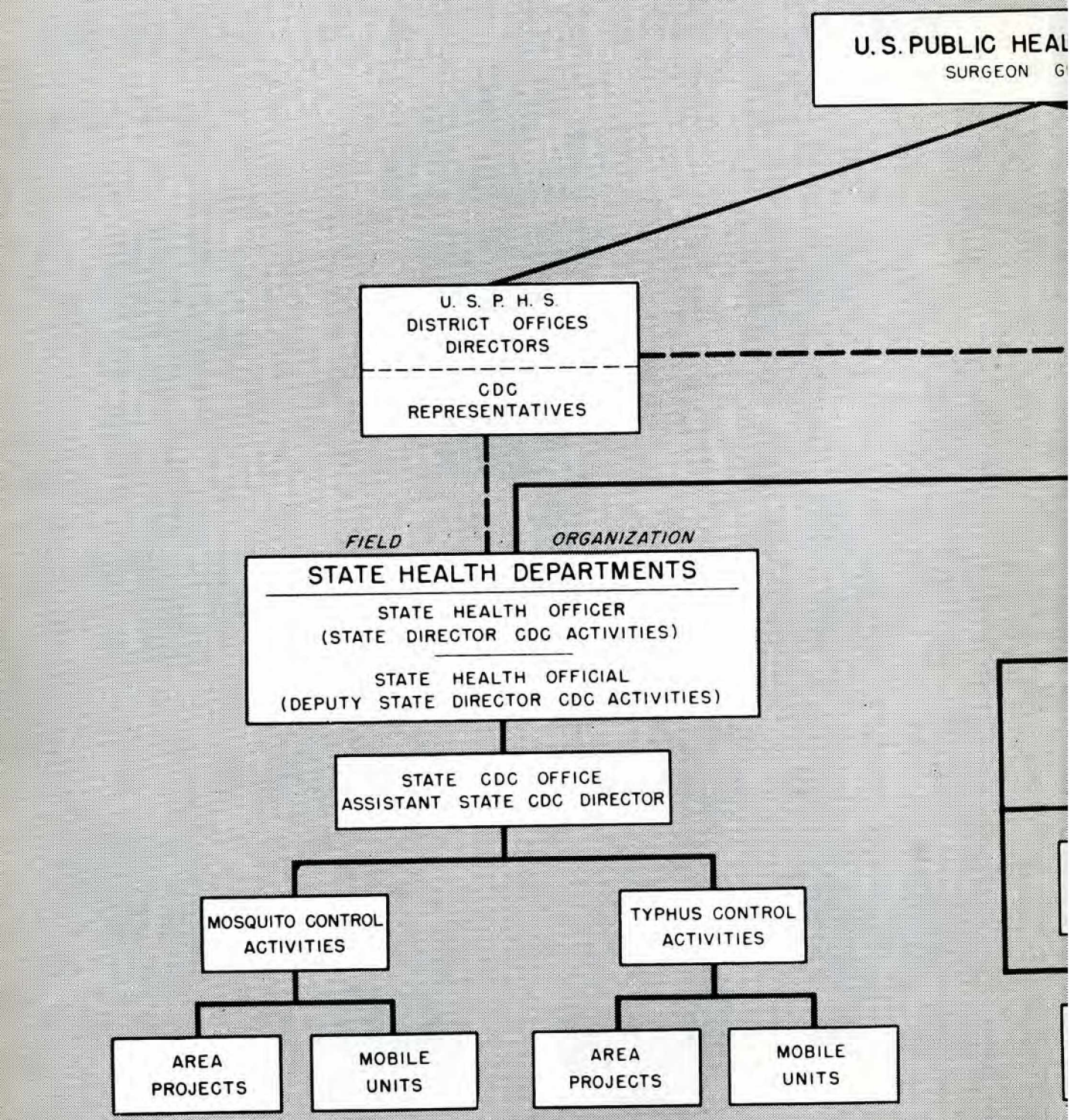
BY CLASSIFICATION



CABLE DISEASE CENTER

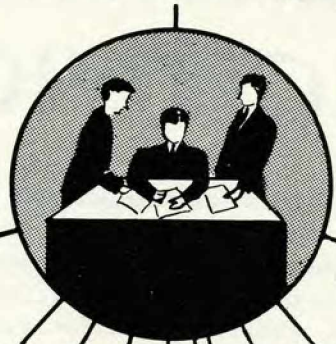


COMMUNICABLE D



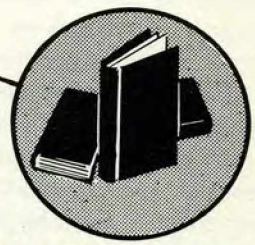
COMMUNICABLE DISEASE CENTER
MEDICAL DIRECTOR In Charge

HEADQUARTERS ORGANIZATION



EXECUTIVE OFFICE

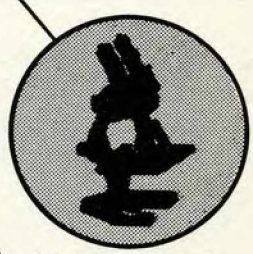
ADMINISTRATIVE DIVISION



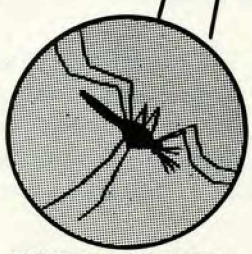
LIBRARY and REPORTS DIVISION

PLAGUE SUPPRESSIVE LABORATORY

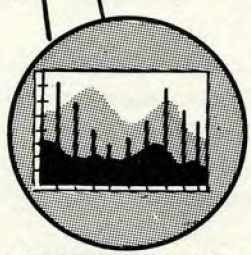
ENGINEERING DIVISION



LABORATORY DIVISION



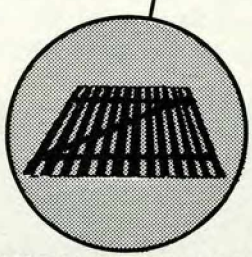
ENTOMOLOGY DIVISION



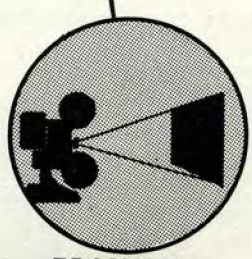
EPIDEMIOLOGY DIVISION

PRODUCTION DIVISION

VETERINARY Public Health DIVISION



TECHNICAL DEVELOPMENT DIVISION



TRAINING DIVISION

ADMINISTRATIVE DIVISION

The continuing objective of the Administrative Division is to promote the efficiency and effectiveness of the Communicable Disease Center programs by relieving professional and operational personnel of administrative management responsibilities to the optimum degree. Toward this end, effort was made to secure further decentralization of authority to expedite administrative operations. Appointment and classification authority through grades CAF-11 and P-4 was delegated to the Center during the fiscal year. The autonomy now exercised by the Center with respect to personnel, procurement, and budget and fiscal activities has resulted in more efficient administrative services in support of CDC operations.

Major responsibilities of the Administrative Division embrace personnel administration; control of budget and fiscal activities; management of procurement; warehousing and distribution of supplies, materials, and equipment; and direction of service operations.

During the fiscal year an average of 200 persons was employed by the Division and assigned as follows: Office of the Chief, 13; Budget and Fiscal Branch, 55; Supply Branch, 76; Service Branch, 35; and Personnel Branch, 21. In addition, decentralized service units were located throughout the operational area on the basis of need and performed administrative functions at field operational levels.

BUDGET AND FISCAL BRANCH

During the fiscal year the name of the Fiscal Branch was changed to Budget and Fiscal Branch. The Washington Audit Unit, which was under the direct supervision of the Central Office, was merged with the Voucher Audit Section of CDC, and all audit activities were transferred to the Voucher Audit Unit of the Budget and Fiscal Branch. This reorganization resulted in a more expeditious processing and payment of all accounts.

Many procedural changes designed to improve efficiency and reduce administrative costs were instituted following a staff workload study completed during the last quarter of the fiscal year. The changes resulted in more adequate consolidation of budgetary data for use in annual budget preparation, and in a smoother flow of all Division activities with a minimum number of employees.

Travel voucher audit unit of the budget and fiscal branch.

SUPPLY BRANCH

The level of activities of this Branch continued high in all phases of operations, including procurement, warehousing and distribution, maintenance and repair of automotive vehicles and equipment, and property records.

During the year, all warehouse stocks were consolidated in a new warehouse installation. The warehouse consolidation, which entailed the transfer of 13,150 items from the Terminal Warehouse and 19 Porter Place to a new location at 195 Whitehall Street, resulted in improved service and a reduction in costs. A revision of property regulations required the reclassification of property items. The revision was particularly helpful in the matter of speeding disposal of unserviceable property and tightening control over nonexpendable items.

In addition to operating a garage for the storing, servicing, maintaining, and repairing of automotive equipment, this Branch maintains records of location, mileage, fuel consumption, and the operational maintenance cost of approximately 2,000 vehicles. It also provides messenger, pick-up service, and transportation accommodations from two central locations in the headquarters area.

Automotive shops and storage.

Property control records.

Drafting service unit.

Headquarters mail room.

Machine records equipment — card punching, sorting.



Interviewing applicant for a position; fingerprinting applicant accepted for employment; administering preenrollment physical examination.

PERSONNEL BRANCH

Personnel management activities during the year were governed largely by the provisions of the Civil Service Commission's program for expediting the reconversion of Federal service personnel to permanent status. During the year, permanent status was secured for approximately 50 percent of CDC personnel. Two new sets of classification standards were developed and given approval by Washington. Position classification actions during the year exceeded 5,000. Recruiting activities embraced the conducting of approximately 5,000 interviews with applicants and the enrollment of 500 employees. Personnel actions included 1,888 accessions, 1,736 separations, 332 promotions and demotions, and 676 periodic increases.

SERVICE BRANCH

Designed to facilitate the work of professional and operational personnel, this Branch functions as a service arm for headquarters and field operations. During the year, it furnished technical assistance and services in drafting, mapping, reproduction, and mechanical statistical projects. The workload increased during the year, necessitating the acquisition of additional reproduction and IBM equipment. A reorganization in June 1948 incorporated into the Branch a Service Section responsible for such miscellaneous functions as the cutting of stencils, vari-typing of forms, maintenance of mailing lists, and control of forms and memoranda numbers.

Reproduction services rendered headquarters and field offices during the year included the preparation of plates for use in making multilith reproductions and the making of reproductions from original material by means of multilith, ozalid, and mimeograph. The card punching, sorting, recording, tabulating, and collating facilities of the Machine Records Section were utilized on an increased scale during the year for the processing of epidemiological, engineering, administrative, and other statistical data.

ENGINEERING DIVISION

It is the responsibility of the Engineering Division to direct and coordinate activities of the insect and rodent control programs of the Communicable Disease Center. Its major functions are: (1) to make possible the operation of malaria and typhus control programs in eligible areas by securing the cooperation of State and local health departments and by the allocation of Federal funds on the basis of approved equitable criteria; (2) to detail professional personnel to State and local health departments, District offices, and special projects where such assistance is requested and is necessary; (3) to determine the equipment and materials required for operating programs and arrange for the distribution of adequate supplies to the field; (4) to reduce the cost of operations by conducting continuing analyses of operational results and by encouraging the adoption of economical practices; and (5) to bring about the prompt correction of difficulties with equipment and materials encountered in field operations. The Division also provides consultant services to other agencies, Federal and nonfederal, operating in the field of insect and rodent control and general sanitation. Cooperative programs are encouraged when and where such operations are appropriate. A continuous activity of the Division is the development of new equipment, control principles, techniques, and methods. Operational features of epidemic and disaster aid activities are a responsibility of the Engineering Division. In executing its mission the Division functions through five component branches: the Malaria Control Branch, the Typhus Control Branch, the Fly Control Branch, the Impounded Water Branch, and the Equipment and Construction Branch.

DIVISION ACTIVITIES

A principal divisional activity during the fiscal year 1948 was the administration of malaria control operations in 15 States and typhus control operations in 11 States. Fly control investigations were made a responsibility of the Division during the year and a Fly Control Branch was activated to handle the assignment. The Muscogee County (Georgia) insect control project, operated 2 years by CDC as an experimental community-wide DDT spray project, was integrated into the program of the local health department during 1948. This project demonstrated the benefits in insect reduction that can be obtained through community-wide DDT spraying operations and provided data as to the cost of such programs. During the year, the Division provided epidemic and disaster aid in connection with the Mississippi, Louisiana, and Florida hurricanes, the Mississippi and Missouri floods, the Northwest flood disaster, and the Florida "red tide" fish kill. Consultant services were made available in the outbreak of equine encephalomyelitis in southern Louisiana. Division activities are detailed in accompanying statistical summaries.

SUMMARY OF RESIDUAL HOUSE-SPRAYING ACTIVITIES
Fiscal Year 1948

State	Number Counties	Number House Spray Applications	Pounds DDT Used	Man-Hours			Pounds DDT per House	Man-Hours per House	Man-Hours per Pound DDT	Unit Cost
				CDC	Local	Percent Local				
Alabama	33	150,493	150,326	138,671	42,612	23.5	1.00	1.20	1.21	2.53
Arkansas	42	181,562	209,422	79,161	194,012	71.0	1.15	1.50	1.30	3.50
Florida	28	92,994	100,980	26,622	103,358	79.5	1.09	1.40	1.29	3.58
Georgia	50	189,774	146,685	60,005	117,776	66.2	0.77	0.94	1.21	2.43
Kentucky	11	15,916	27,179	10,456	40,688	79.6	1.71	3.21	1.88	8.10
Louisiana	18	62,969	77,797	21,109	63,478	75.0	1.29	1.34	1.09	4.45
Mississippi	19	174,494	174,279	108,133	103,456	48.9	1.00	1.21	1.21	2.82
Missouri	12	80,107	63,911	33,136	67,437	67.1	0.80	1.26	1.57	2.57
N. Carolina	30	58,481	52,803	12,444	54,463	81.4	0.90	1.14	1.27	3.99
Oklahoma	15	37,319	40,303	20,143	31,883	61.3	1.08	1.39	1.29	3.21
S. Carolina	41	189,359	176,814	55,333	196,953	78.1	0.93	1.33	1.43	3.24
Tennessee	13	35,426	69,662	23,108	63,938	73.5	1.97	2.46	1.27	9.05
Texas	35	96,056	116,281	100,221	94,281	48.3	1.12	1.87	1.67	3.77
Totals	347	1,364,950	1,406,442	688,642	1,173,735	63.0	1.02	1.36	1.32	3.34

MALARIA CONTROL BRANCH

Although Federal funds for malaria control were reduced when 1948 allocations were made, control activities were expanded appreciably during the year. Spraying operations were conducted in 347 counties located in 13 States compared with spraying activities in 297 counties in 13 States during 1947. This expansion was made possible by increased financial support by State and local governments. Another influencing factor in the expansion of activities was the switch by most States to the single complete 200 mg. per square foot spray application procedure recommended by CDC headquarters. This replaced the 200 mg. per square foot application rate and 4-month spraying cycle previously used.

House spray applications during 1948 totaled 1,364,950 compared with 1,277,989 in 1947, an increase of 86,961. DDT used during 1948 amounted to 1,406,442 pounds or approximately 360,000 pounds more than in 1947. This increase in DDT consumed is accounted for by the greater number of spray applications and by the more comprehensive coverage (walls, ceilings, backs and undersides of furniture, shelves, etc.) during 1948 operations. Local contributions (largely tax-supported appropriations) covered 39.1 percent of total expenditures in 1948 and 29 percent in 1947. In 1948 the average expenditure was 1.32 man-hours, 1.02 pounds of DDT, and $3.34 per spray application. It is believed that the 1.02 pounds of DDT average approximates the recommended application rate of 200 mg. per square foot.

Seasonal DDT spraying activities in the 1947 season were completed, for the most part, by September and reinaugurated during March 1948. The list of preapproved counties released in May 1947 included 369 counties in 13 States, with a provision that counties operating under special approval could continue their programs through the fiscal year 1948. Of the 347 counties covered in 1948 operations, 80 percent were included on the preapproved list. Various models of experimental spray equipment were tested in field operations during the year. The constant-pressure spray can

gained popularity because of its uniform spray pattern and constant discharge rate. However, in most States the combination T-1 air compressor and modified spray can continued to be standard equipment.

Larvicidal activities were pursued in some degree in 10 States and in Puerto Rico. Following summer floods on the Mississippi River, it was necessary to supplement regular hand larviciding operations with airplane spraying in three areas, using 20 percent DDT-Velsicol larvicide. A number of municipalities conducted larvicidal programs entirely financed by local funds. Man-hours expended in larvicidal activities during 1948 totaled 191,827 compared with 245,484 in 1947.

TYPHUS CONTROL BRANCH

The primary mission of this Branch is the direction and coordination of rodent-borne disease operations, consisting of general sanitation measures, ratproofing, rat poisoning, DDT dusting for ectoparasite control, and conducting evaluative studies of such activities. Operational work is carried on in cooperation with State and local health departments in counties approved for typhus control by reason of the endemicity of the disease. Operations were approved for typhus control in 188 counties in 12 States in 1948 where an average of 10 or more murine typhus cases were reported annually during the period 1944-45, or during the year 1946. At the conclusion of the 1947 typhus season, the number of approved counties was reduced to 135 which had an average of 10 or more human typhus cases annually during the 5-year period 1943-47 or during the year 1946 or 1947. This redetermination of control needs is made periodically on the basis of continuing studies of data obtained

SUMMARY CDC LARVICIDING ACTIVITIES

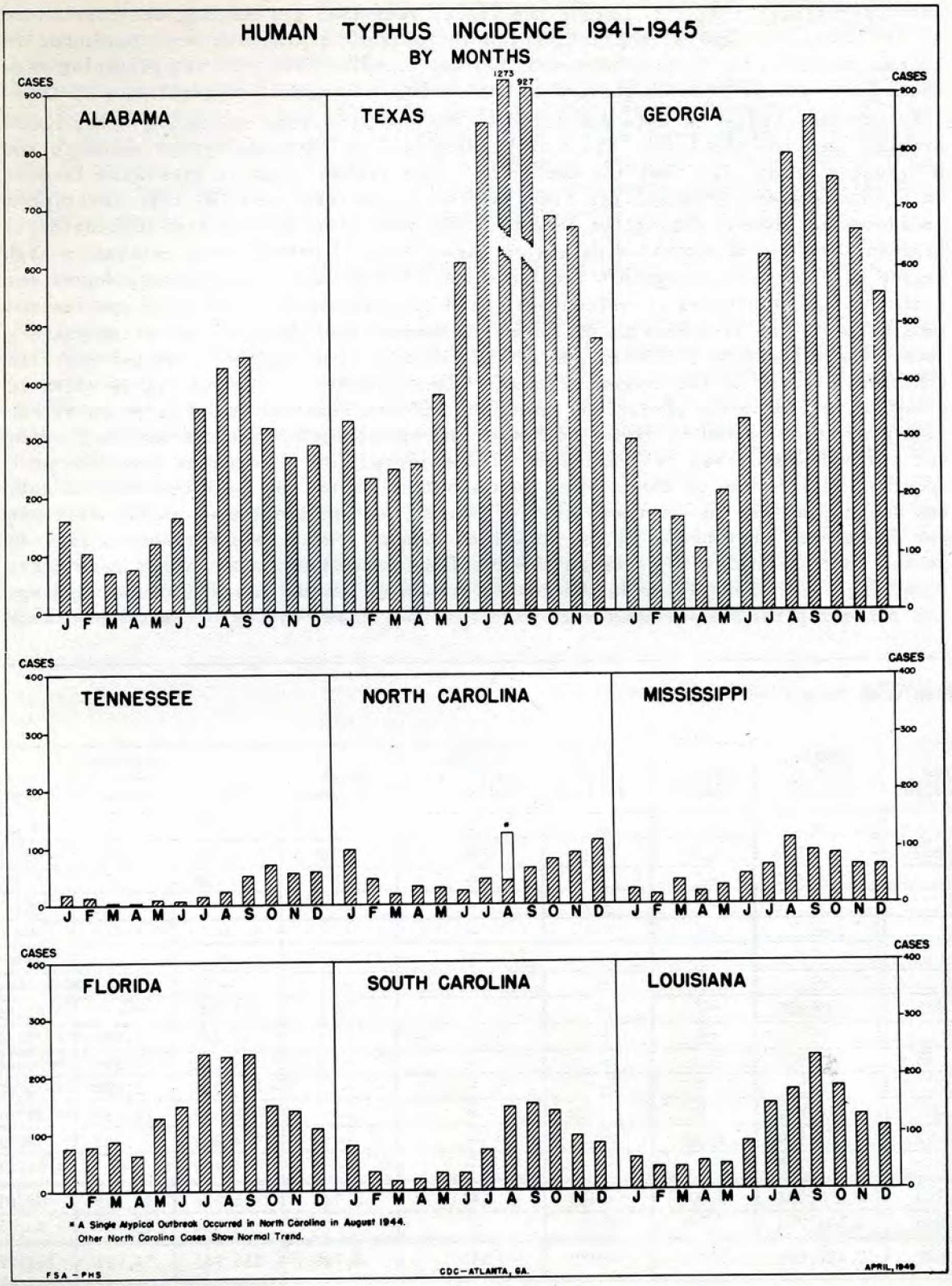
State	Oil (Gals.)	Acres Oiled	Hundred Feet Treated	Paris Green (Lbs.)	Acres Dusted	Hundred Feet Treated	DDT-Oil Mist (Gals.)
Alabama	—	—	—	—	—	—	—
Arkansas	9,028	695	59,491	190	18	—	16,430
Florida	—	—	—	—	—	—	55
Georgia	—	—	—	—	—	—	—
Kentucky	—	—	—	—	—	—	—
Louisiana	—	—	—	—	—	—	—
Mississippi	—	—	—	—	—	—	—
Missouri	—	—	—	—	—	—	1,243
North Carolina	1,920	29	3,971	—	—	—	—
Oklahoma	575	31	500	79	42	300	77
South Carolina	2,111	106	3,605	80	—	240	—
Tennessee	54,950	—	61,542	—	—	—	5,628
Texas	5,609	892	5,519	300	27	275	7,931
Virginia	5,023	23	15,158	90	61	—	1,259
Subtotal Cont. U. S.	79,216	1,776	149,786	739	148	815	32,623
Puerto Rico	—	—	—	700	700	—	28,839
Grand Total	79,216	1,776	149,786	1,439	848	815	61,462

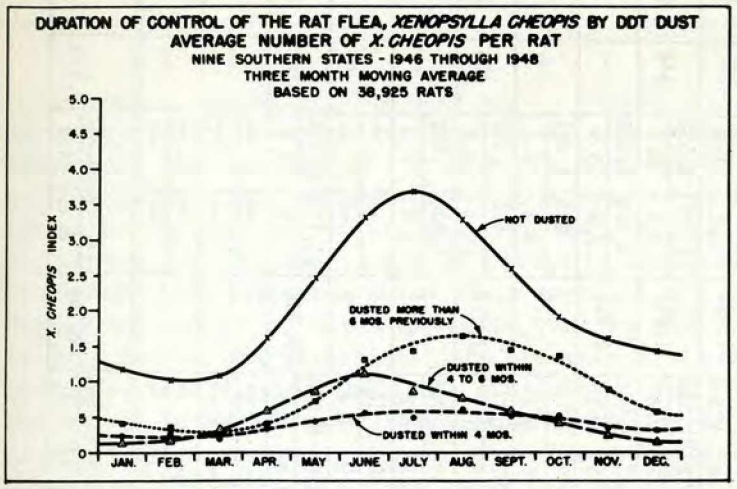
from operational projects. During the fiscal year 1948 DDT dusting was carried on in 118 counties. General sanitation and rat poisoning projects were conducted in conjunction with the dusting programs. Seventy counties conducted rat poisoning with solid bait; and 44 counties carried on ratproofing programs in cooperation with CDC.

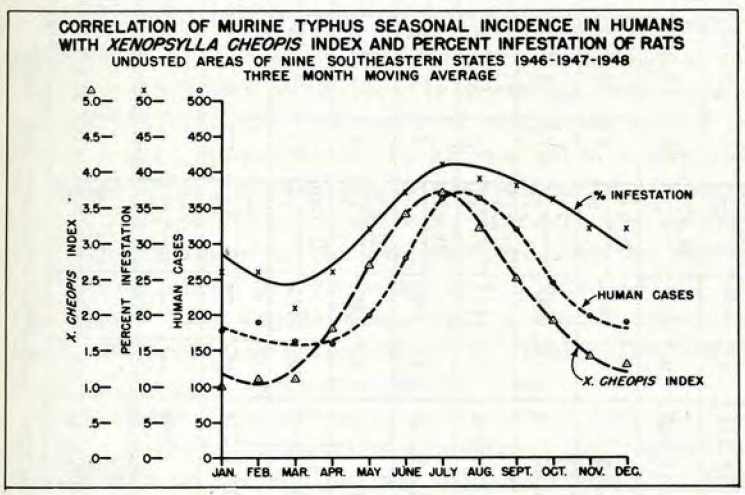
Evaluation studies of data submitted by the participating States and other cooperating agencies disclosed: (1) a continuing decline in human typhus cases in the DDT-dusted areas, (2) that the number of human typhus cases is generally largest in counties where oriental rat fleas are most numerous, and (3) that the typhus incidence is highest during the season of the year when the rat flea population is highest. Studies of submitted data also showed that 10 percent dust retained a high degree of effectiveness against rat fleas for 4 months and a satisfactory degree for 6 months. Other studies revealed that, with the exception of one mite species not implicated in the transmission of typhus to humans, most domestic rat ectoparasites attain their greatest abundance earlier in the year than does the oriental rat flea (the chief vector in the transmission of typhus). Analyzed with respect to climatic areas, data from field operations revealed that the seasonal peaks of oriental rat flea population varied in different States and within sections of States. In Florida and south Texas, areas of relatively high oriental rat flea population, the peak occurred in late May or early June. In the Middle States the peak occurred in July and August; and in the northern tier of States, the peak occurred in the fall. It was discovered that peaks in the number of human typhus cases during the 1941-45 period corresponded with peaks in the rat flea population, with typhus case peaks occurring a few weeks later in the respective areas. On the basis of these findings the following recommendations were entered: That fewer cycles of dusting be made

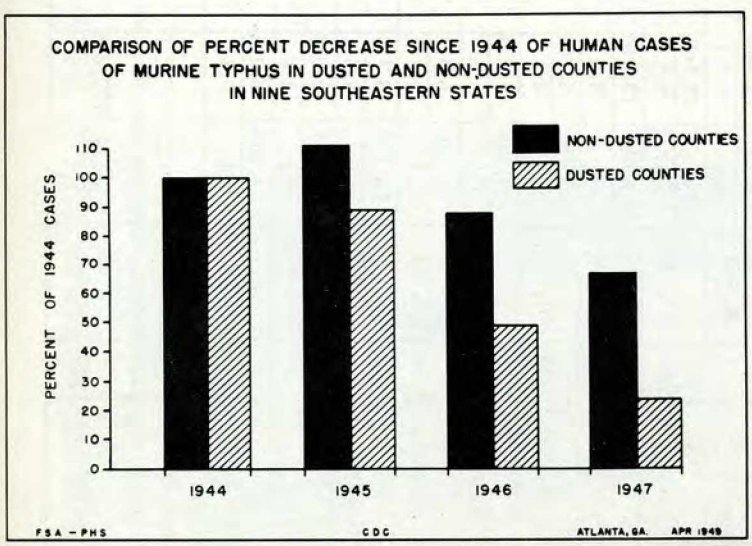
FISCAL YEAR 1948

Acres Treated	Hundred Feet Treated	Misc. (Gals.)	Acres Treated	Airplane Larviciding (Gals.)	Acres Treated	Man-Hours		
						CDC	Local	Total
—	—	—	—	—	—	—	—	—
2,662	507,804	4,197	5,966	540	5,749	6,784	35,776	42,560
—	2,400	—	—	—	—	40	—	40
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
189	19,638	—	—	—	—	3,980	—	3,980
—	—	—	—	—	—	132	1,291	1,423
18	310	—	—	—	—	212	256	468
—	—	—	—	—	—	180	1,829	2,009
1,309	110,854	525	518	—	—	12,319	15,630	27,949
2,555	53,950	4,569	—	—	—	7,801	7,383	15,184
—	3,378	—	—	—	—	4,463	—	4,463
6,733	698,334	9,291	6,484	540	5,749	35,911	62,165	98,076
3,896	1,734,364	158	2,565	—	—	81,034	12,717	93,751
10,629	2,432,698	9,449	9,049	540	5,749	116,945	74,882	191,827









annually than previously considered necessary, that where a single application is made it be completed before the normal seasonal build-up of flea population, and that applications be made so as to cover a larger number of premises, starting with those in potentially dangerous areas.

The number of human cases of murine typhus continued to decline from its 1944 peak. By the end of 1947, the number of cases in counties which had had DDT dusting programs had declined to 24 percent of the number which had occurred in 1944. In counties without DDT dusting programs, on the other hand, the number of cases by the end of 1947 was as high as 68 percent of the 1944 total.

Rodent plague investigations conducted near Lubbock in west Texas revealed that the cotton rat population was much smaller than it had been 5 years previously when the Plague Suppressive Unit surveyed that area. Disease or climatic adversity is presumed to be responsible. Of those plague susceptible mammals currently in the area in numbers, prairie dogs and pack rats appear to be primary reservoirs. The oriental rat flea population in the area is so low that little danger exists of plague epizootics among domestic rats and relatively little danger to humans is involved.

SUMMARY OF TYPHUS CONTROL ACTIVITIES
Fiscal Year 1948

STATE	Ectoparasite Control				Evaluation Activities		Ratproofing			RAT REDUCTION								
										Poison Bait (Food)				Poison Water "1080"			Cyanogas	
	Co's Rep	Premises Dusted	Lbs DDT and Lbs / Prem	MH & MH/ Prem L&LF	USPHS MH L&LF	Others MH L&LF	Proj Rep	Est Complete	MH & MH/ Est L&LF	Co's Rep	Est Poisoned	Lbs Bait & Lbs/ Est	MH & MH/ Est L & LF	Est Poisoned	Pts Used & Pts/ Est	MH & MH/ Est L&LF	Lbs Used	MH L & LF
Alabama	21	86,516	408,912 4.7	36,959 0.4	6,573	1,921	2	24	1,762 74	17	49,619	47,625 1	33,261 0.7	15,887*	28,046 1.7	11,313 .7	8,270	9,781
Arkansas	1	784	901 1.1	725 0.9	895	1,169	1	366	26,628 73	1	22	5 0.2	66 3.0	82	174 2.1	594 7.2	—	—
Florida	5	47,953	161,792 3.4	22,660 0.5	9,959	4,211	5	195	23,538 120	3	6,212	8,935 1.4	3,449 0.5	1,482	1,846 1.2	2,842 1.9	128	122
Georgia	85	137,842	452,500 3.2	72,742 0.5	5,464	3,345	12	493	31,091 63	65	67,328	45,822 0.7	27,328 0.4	1,697	1,787 1.1	3,562 2.1	444	992
Louisiana	7	35,641	76,094 2.1	13,018 0.4	1,536	3,512	4	366	21,938 60	6	23,968	7,363 0.3	8,945 0.4	7,023	6,324 0.9	6,156 0.9	—	—
Mississippi	24	10,712	22,499 2.1	6,160 0.6	754	4	1	30	2,197 73	7	5,781	4,358 0.8	1,949 0.3	575	825 1.4	1,291 2.2	—	—
N. Carolina	11	49,569	64,276 1.3	13,234 0.3	958	902	7	1143	51,553 45	11	16,623	10,887 0.7	5,473 0.3	1,215	505 0.4	1,539 1.3	405	840
S. Carolina	14	3,821	10,218 2.7	6,411 1.7	7,175	3,739	7	416	22,655 54	3	166	49 0.3	204 1.2	1,075	1,426 1.3	7,522 7	—	—
Tennessee	2	8,600	14,116 1.6	3,150 0.4	1,793	716	4	380	22,298 59	1	111	100 0.9	152 1.4	—	— —	— —	—	—
Texas	57	23,307	213,653 9.1	42,832 1.8	11,780	8,232	20	1175	72,680 62	11	9,882	4,020 0.4	8,036 0.8	19,728	11,773 .6	28,734 1.5	267	866
Virginia	2	5,322	14,885 2.8	4,328 0.8	4,363	1,354	—	—	— —	—	—	— —	— —	—	— —	— —	—	46
Kentucky	—	—	— —	— —	—	641	—	—	— —	—	—	— —	— —	—	— —	— —	—	—
Total	229	410,067	1,439,846 3.5	222,219 0.5	51,250	29,746	63	4588	276,340 60	125	179,712	129,164 0.7	88,863 0.5	48,764	52,706 1.1	63,553 1.3	9,514	12,647

** Alabama uses arsenic water - not "1080"*

FLY CONTROL BRANCH

Fly control investigations were made a responsibility of the Engineering Division during the fiscal year and resulted in the activation of the Fly Control Branch. Utilizing the preliminary epidemiological findings of the dysentery control project at Pharr, Tex., and the operational developments of the Virus Branch project, a new series of fly control studies was organized. The new program envisaged establishing fly control studies in a group of cities in which dysentery and diarrheal diseases presented a significant problem. This approach, it was reasoned, offered a definite degree of control of these diseases, and in addition afforded an opportunity to conduct further investigations into the role of flies in the transmission of poliomyelitis. Accordingly, the vital statistics of all cities in the United States in the 50,000 to 200,000 population range were studied. The lower limit of 50,000 was established as the smallest population group in which statistically significant results could be obtained in the investigation of poliomyelitis. The upper limit was established for economic reasons.

In analyzing the listed cities these criteria were established: (1) that the preponderance of dysentery and diarrhea mortality should have occurred in the summer months coincident with the fly breeding season; (2) that no serious outbreak of poliomyelitis should have occurred within the past 3 years; and (3) that no wide scale insecticidal operation be in effect which might influence normal fly activity in the immediate vicinity. A list of eligible cities was sent to the various Public Health Service District offices. Since it was anticipated that the selected cities would participate in the proposed programs by sharing the costs, the selection of the cities could not be based on epidemiological findings alone. At the close of the fiscal year negotiations with a number of cities had progressed to the point where the following selections were likely: Troy, N.Y.; Charleston, W.Va.; Muskegon, Mich.; Phoenix, Ariz.; and Topeka, Kans.

The program is planned to cover the 5-year period 1948-52 and it is expected to produce improved community sanitation and insecticidal practices, more detailed information on the ecology and habits of domestic flies, and more widespread factual knowledge on the role of domestic flies in the transmission of human diseases.

Lawrence spray machine utilized in space spraying operations.

IMPOUNDED WATER BRANCH

Activities of this Branch are designed to facilitate the control of malaria and infectious encephalitis by providing guidance and technical consultative services to Federal, State, and other agencies involved in the construction and operation of impounded water projects. Existent and proposed impoundments are covered in these services, with emphasis on the prevention and alleviation of health hazards caused by impounded waters. Data compiled through surveys, made by this Branch, the P.H.S. District offices, or the State health departments, are analyzed to determine (1) the inherent malaria and/or encephalitis potential under preimpoundage conditions, (2) the expected mosquito-borne disease hazard which would result from development of the project, and (3) the recommended means and estimated costs of mitigating the hazard. All reports conform to State laws or regulations and are approved by the State health department.

Operations of the Branch during the fiscal year 1948 centered around surveys and reports on proposed water impoundments at the request of the Corps of Engineers, Department of the Army. The work was handled on a reimbursable basis. Surveys and reports were made on 31 projects, involving 65 separate impoundments in 20 States-- from Pennsylvania to California and from Minnesota to Florida. The primary purpose of most of the surveyed impoundments is flood control. However, many impoundments are multiple-purpose and include additional features such as irrigation, navigation,

CLEARING SUMMARY
July 1, 1947 — June 30, 1948

State	Square Feet	Man-Hours		
		CDC	Local	Total
Arkansas	7,881	—	107	107
South Carolina	423,100	1,424	—	1,424
Virginia	1,160,438	3,565	—	3,565
Total	1,591,419	4,989	107	5,096

CLEANING SUMMARY
July 1, 1947 — June 30, 1948

State	Linear Feet	Man-Hours		
		CDC	Local	Total
Alabama	26,800	2,028	—	2,028
Arkansas	206,220	142	2,500	2,642
North Carolina	66,000	18	1,380	1,398
South Carolina	29,900	2,486	—	2,486
Tennessee	83,957	1,398	3,716	5,114
Texas	34,260	5	1,291	1,296
Virginia	9,173	416	—	416
Subtotal Cont. U. S.	456,310	6,493	8,887	15,380
Puerto Rico	653,735	23,156	3,303	26,459
Grand Total	1,110,045	29,649	12,190	41,839

DRAINAGE AND MAINTENANCE SUMMARY
July 1, 1947 — June 30, 1948

State	Linear Feet	Cubic Yards	Man-Hours		
			CDC	Local	Total
Arkansas	900	33	—	32	32
Florida	600	—	—	240	240
South Carolina	600	67	310	—	310
Tennessee	1,465	572	1,700	5,873	7,573
Texas	25	360	—	272	272
Subtotal Cont. U. S.	3,590	1,032	2,010	6,417	8,427
Puerto Rico	12,560	459	1,574	70	1,644
Grand Total	16,150	1,491	3,584	6,487	10,071

A properly prepared pond. Note clean edge and steep banks.

Dense vegetation in impounded water increases mosquito breeding potential.

stream pollution abatement, municipal water supply, hydroelectric power generation, recreation, and wildlife conservation.

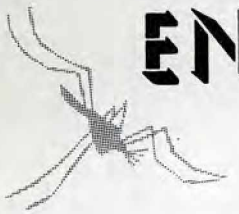
To alleviate the disease hazards associated with impounded waters, the following mosquito control measures are emphasized in the reports: (1) proper clearance of reservoir prior to impoundage, (2) drainage of marginal depressions, (3) filling the reservoir during the nonmosquito breeding season, (4) recession of lake level during summer months, (5) proper utilization and disposition of irrigation water, (6) location of wildlife areas of a type favorable for mosquito production at a safe distance from centers of population or recreational areas with housing facilities, (7) location of recreational areas on sections of the shore where the mosquito potential is low, and (8) destruction of obnoxious aquatic plants in or near the reservoir.

Personnel of this Branch participated during the fiscal year in a school of malaria control on impounded waters held at Fort Worth, Tex., for Soil Conservation Service personnel from regional and State offices. Consultative services were given on the alleviation of health hazards in connection with municipally- and privately-operated impoundments.

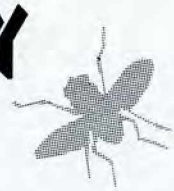
EQUIPMENT AND CONSTRUCTION BRANCH

This Branch functions principally as a service agency in: (1) the securing of necessary information as to equipment and material needs of the operational programs and special activities of the Communicable Disease Center; (2) the distribution of materials and equipment and the maintenance of reserves consistent with operational requirements; (3) the procuring of special equipment and the conversion of existing equipment to meet changing field activities involved in the utilization of space and equipment associated with headquarters Divisions.

During the fiscal year, considerable effort was devoted to the reconditioning of 11 buildings at Lawson Veterans Administration Hospital acquired for Communicable Disease Center purposes. Alterations were made in connection with other headquarters relocations. The movement of materials and equipment to field operational units continued to be a major activity. Further development of more efficient spraying devices, the modification of existing equipment to better fulfill operating requirements, and the constant search for more adaptable chemicals remained preferred objectives.



ENTOMOLOGY DIVISION



The Entomology Division is concerned primarily with surveys and evaluations of the effect of control measures on arthropods associated with the transmission of human diseases. Major emphasis is placed on the vectors of malaria, typhus, encephalitis, plague, and bacillary dysentery. Field surveys are instigated to ascertain the need and desirability of control operations, and recommendations are submitted as to the extent and type of control measures applicable. Following the inauguration of control measures, inspections are made to evaluate properly the extent of control achieved. All activities of the Division are closely correlated and integrated with those of all agencies and parties interested in similar operations in any given area so as to promote maximum effectiveness in communicable disease control. Division personnel of the type and in the quantity required to handle the respective assignments are detailed to State health departments and to Public Health Service District offices to coordinate and assist in the execution of cooperative enterprises.

During the fiscal year 1948, work of the Division included: (1) continued evaluation of the extensive residual DDT spray control program in the continental United States and in Puerto Rico; (2) expansion of the Pharr, Tex., diarrhea-dysentery fly control program (a cooperative enterprise of CDC and NIH since 1945) to include new stations in New Mexico and Georgia; (3) cooperative work on arthropod-borne virus encephalitis with the Hooper Foundation of the University of California; (4) cooperative work on water-hyacinth investigations with the Corps of Engineers, the U. S. Fish and Wildlife Service, and the U. S. Department of Agriculture; (5) malaria investigation programs at Emory University Field Station in Georgia, and at the Manning Station in South Carolina where detailed studies are made on biological factors related to the transmission of malaria; (6) survey and evaluation of typhus control activities (in table 1); and (7) preparation of reports of investigations and research work for publication in scientific journals and/or presentation at meetings of scientific societies. In addition, a variety of activities of a less comprehensive nature were carried on as developments in the public health field required, included rodent plague investigations in the Brownfield, Tex., area.

MALARIA — ERADICATION PROGRAM AND INVESTIGATIONS

The effectiveness of the residual house spraying operations on the malaria eradication program in decreasing the malaria transmission hazard has been measured by the extent to which houses are kept free of *Anopheles quadrimaculatus*. Inspections were made of a small percentage of sprayed houses selected at random. Table 2 summa-

Table 1

CONTROL OF "X. CHEOPIS" BY 10% DDT DUSTING
Nine Southern States

Month	UNDUSTED PREMISES			PREMISES DUSTED 1-180 DAYS			PREMISES DUSTED 181 DAYS		
	No. Rats Combed	Percent Rats Infested	Av. No. "cheopis" per Rat	No. Rats Combed	Percent Rats Infested	Av. No. "cheopis" per Rat	No. Rats Combed	Percent Rats Infested	Av. No. "cheopis" per Rat
1947									
July	1,063	29.3	3.0	511	10.8	0.7	84	36.9	1.7
August	750	39.7	3.0	344	8.4	0.5	154	21.4	1.4
September	271	36.5	2.0	326	9.2	0.6	53	28.3	4.3
October	376	39.6	1.9	636	6.6	0.2	114	57.9	2.9
November	437	37.7	1.8	477	9.4	0.2	89	23.6	0.8
December	546	33.5	1.4	521	4.0	0.1	76	14.4	0.3
1948									
January	499	26.7	1.4	415	2.7	0.03	100	9.0	0.3
February	481	19.1	1.0	502	2.6	0.04	182	8.8	0.1
March	388	10.3	0.3	263	2.3	0.1	211	5.2	0.1
April	220	15.5	0.6	153	2.0	0.1	231	11.3	0.4
May	398	21.9	1.2	191	13.1	0.8	174	18.4	0.8
June	393	27.5	1.8	149	3.4	0.1	104	22.1	2.4
Total	5,822	—	—	4,488	—	—	1,572	—	—

Grand Total — 11,882

Table 2

EXTENDED MALARIA PROGRAM, 1945 THROUGH 1947
Total Treated Houses Inspected and Percent Free
of "Anopheles quadrimaculatus" in Afternoon

SPRAYED HOUSES					
Mo. After Spraying	No. Houses Inspected	No. with "A. quad." in P.M.	Percent of houses free of "A. quad." in P.M.	Percent of houses free of "A. quad." in P.M.	
			1947*	1946*	1945**
0 — 1	1,546	12	99.2	99.2	98.9
1 — 2	2,690	40	98.5	99.0	98.3
2 — 3	2,538	32	98.7	99.1	95.7
3 — 4	1,578	20	98.7	98.7	94.7
4 — 5	442	5	98.9	98.2	94.2
Total	8,794	109	—	—	—
Percent	—	—	98.8	99.0	97.2
UNSPRAYED HOUSES					
Year					
1947	1,170	328	72.0	—	—
1946	1,639	208	87.3	—	—

*200 mg./ft.^{2}
**100 mg./ft.^{2}

rizes the results of these inspections for 1947 together with comparative figures for 1946 and 1945. As indicated, the percentage of inspected houses found entirely free of *A. quadrimaculatus* in the afternoon was 98.8 in 1947, 99.0 in 1946, and 97.2 in 1945. Only 72.0 percent of unsprayed houses inspected in 1947 were entirely free of *A. quadrimaculatus* in the afternoon, while in 1946 the percentage was 87.3. This seems to indicate that in spite of the apparent increase in mosquito density in 1947, the same high degree of mosquito-free houses was obtained through DDT residual spraying operations.

In table 3, inspection records for 1946 and 1947 for both sprayed and unsprayed areas are arranged to show the density of malaria mosquitoes in natural resting places in the vicinity of houses inspected. Evidence is shown that as the outside density of mosquitoes increases, the percent of houses infested also increases. Furthermore, both in 1946 and in 1947 for any given density group, the percentage of sprayed houses harboring mosquitoes was many times smaller than that for unsprayed houses.

Table 3

EXTENDED MALARIA PROGRAM, 1946 AND 1947

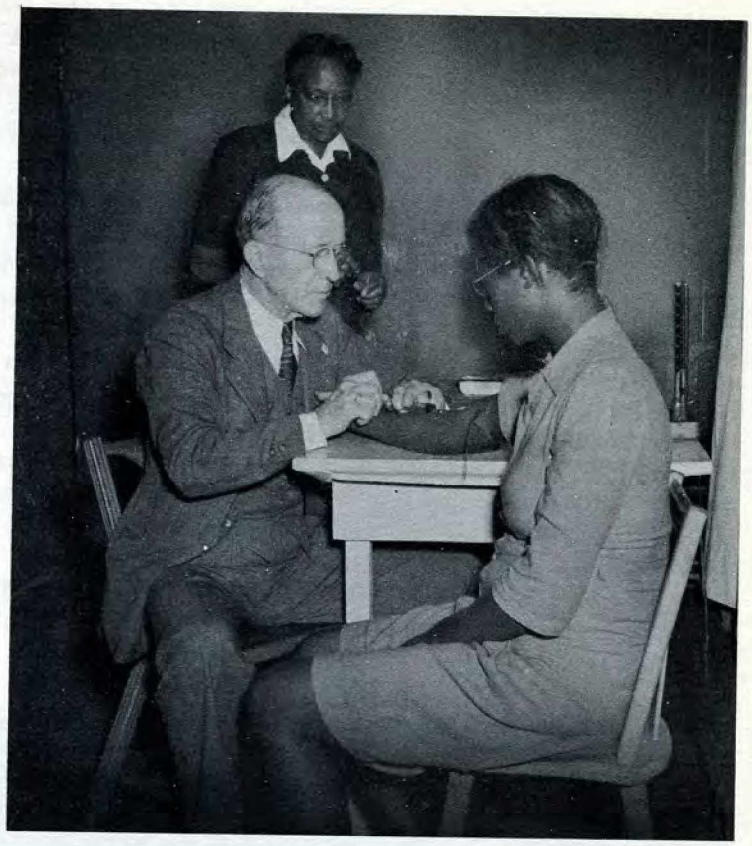
Number of House Inspections in Various "Anopheles quadrimaculatus" Density Groups in Both Sprayed and Unsprayed Areas and Percent of "Quad. — positive" Houses in Afternoon

	Natural Resting Place "Quadrimaculatus" Densities						All
	0 — 10	11 — 50	51 — 100	101 — 200	201 — 400	400 —	
SPRAYED AREAS							
No. houses inspected*	5,244	2,338	589	355	531	26	9,083
No. houses with *A. quad.*	39	82	19	12	34	5	191
Percent houses with *A. quad.* in 1947	0.7	3.5	3.2	3.4	6.4	19.2	2.1
Percent houses with *A. quad.* in 1946	0.5	1.3	2.4	3.0	3.7	8.3	1.0
UNSPRAYED AREAS							
No. houses inspected	688	312	64	41	65	—	1,170
No. houses with *A. quad.*	125	118	32	15	38	—	328
Percent houses with *A. quad.* in 1947	18.2	37.8	50.0	36.6	58.5		28.0
Percent houses with *A. quad.* in 1946	7.1	43.5	38.2	77.8	50.0	66.7	12.7

*Includes inspections of houses made more than 5 months after spraying.

Malaria Investigations. The malaria investigations program was designed to obtain current information on the occurrence of human malaria in selected areas and to observe causal factors related to transmission of the disease. Stations were operated at Manning, S. C., in cooperation with the State board of health, and at Newton, Ga., in cooperation with Emory University. During the year, plans were developed for establishing an additional station on the Mississippi Delta. Since 1944, investigations of malaria and *Anopheles* through the facilities of these stations have been conducted cooperatively with the Entomology Division. Recently activities at these stations were modified to serve as malaria observation or "lookout" stations. The areas involved are representative of regions where malaria has been endemic in the United States. It is expected that malaria will persist in these areas as long, or longer,

than in other sections of the country; and if a general resurgence of malaria occurs, the disease probably can be detected first in these areas where close contact is maintained with the various factors which cause, influence, or indicate the transmission of malaria. Observations have been made to (1) determine the amount of malaria present in man, (2) evaluate relative densities of *Anopheles*, (3) determine blood feeding characteristics of *Anopheles* in the areas studied, and (4) study other factors related to the natural history of malaria.



Periodic blood film surveys are conducted within the field station experimental areas.

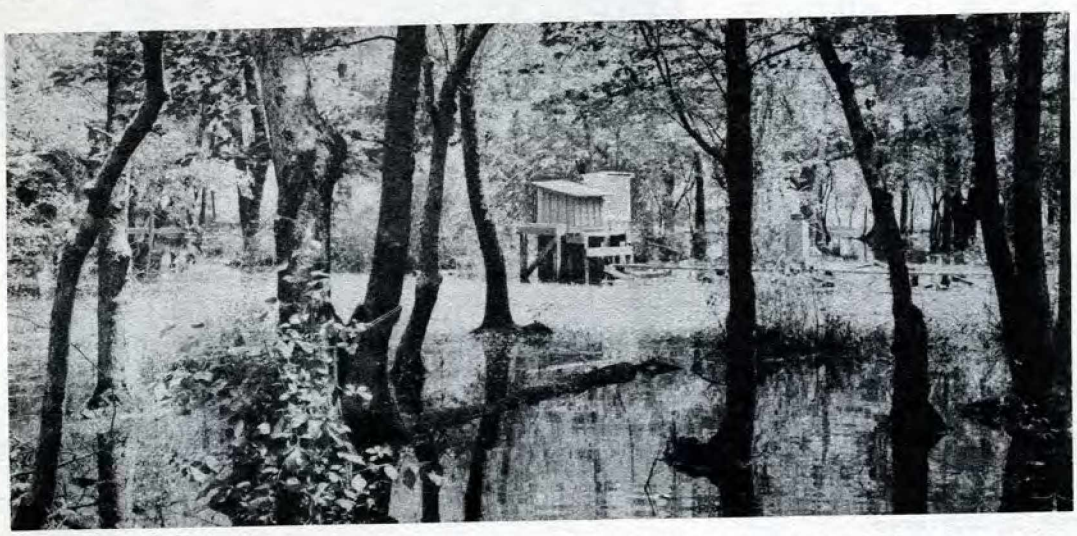
Malaria Infections in Man. The decline in malaria incidence experienced throughout the country has been observed at the "lookout" stations. No positive films have been found in the Georgia station area since 1944. During the year regular nursing visits were made within the experimental area to detect symptoms of malaria if any reappeared. Clinical indications of malaria were not evident nor did periodic blood film surveys of school children and other groups disclose the presence of parasites. Malaria parasites were still demonstrable in the South Carolina area in 1947-48, however, even though incidence of malaria was unprecedently low. During the year, positive blood films (South Carolina area) were obtained in 47 instances. More than half of this number were individuals who were positive for the first time and who had been examined repeatedly previously. Malaria transmission thus continues to a very small degree in the area.

"Anopheles" Studies. The probability of malaria propagation in South Carolina was further attested by the finding of *Anopheles* with infective stages of parasites in their salivary glands. Gland-positive specimens were detected, however, far more frequently than could be explained on the basis of human malaria incidence. This created doubt that the sporozoites were stages of human-infecting plasmodia and prompted the inauguration of studies to explore other possible sources of infection. Efforts to introduce the infection into avian hosts by injection of positive glands found in mosquitoes were unsuccessful. More than 12,000 blood-engorged *Anopheles* specimens were tested for blood meal source at the Georgia and South Carolina stations. Less than 0.1 of 1 percent of these had fed on human blood. The identity of the sporozoites has not been determined as yet nor is there sufficient evidence to indicate whether the parasites are more likely from man or from a lower animal. Many of the gland-

positive mosquitoes were *Anopheles crucians*, a species which has been considered as a possible but highly improbable malaria vector. Work was undertaken to investigate the biology of this species. Information accumulated indicates that *crucians* may overwinter in the larval stage, unlike *quadrimaculatus*, the recognized malaria vector, which passes the colder months in the adult stage. These studies are inconclusive as yet and are being pursued.

Information on densities of *Anopheles* was obtained by regular examination of established collecting stations. During the summer of 1948 *quadrimaculatus* was virtually absent from the South Carolina area but was as abundant in the Georgia area as it had been in previous years. The *A. crucians* populations did not vary significantly from previously observed levels.

At the Georgia station an extensive program concerning the relation of physical factors to *Anopheles* occurrence, abundance, and longevity was virtually completed. Data on rainfall, temperature, humidity, pond levels, ground water levels, and other factors have been collected and analyzed. Methods were devised for predicting pond levels and for calculating the area of mosquito breeding surface from easily made observations of climatic and hydrologic conditions. Correlation of entomological data with other information obtained by observation of physical phenomena has provided indications of physical environmental requirements of *Anopheles* species. Laboratory experiments were initiated to check the relationships apparent from information obtained in the field.



Gaging station employed in studying the relation of physical factors to *Anopheles* occurrence.

DYSENTERY VECTOR CONTROL

By the beginning of the fiscal year 1948 it was evident that fly control measures in the Pharr, Tex., area had reduced significantly the prevalence of dysentery among Latin-American children. Most of the diarrheal disease in this area was caused by the *Shigella* type of enteric infection, and the significant reduction in prevalence occurred in this category. This has prompted further studies to determine whether fly control measures inaugurated in other areas would have similar effects upon

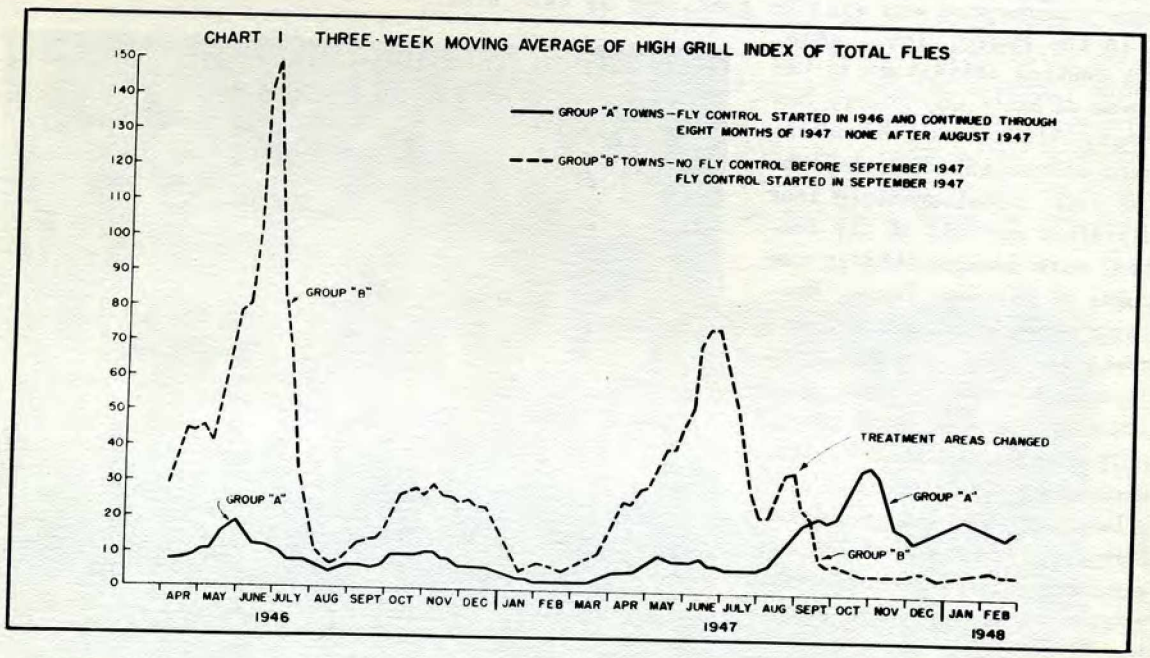
dysentery prevalence. Albuquerque, N. Mex., and Thomasville, Ga., were selected as sites for further investigations, since both areas had appreciable diarrheal incidence and had economic, climatic, and topographic conditions at wide variance with each other and with the original demonstration area at Pharr, Tex. Surveillance of fly breeding and species prevalence was inaugurated in these two additional areas near the end of August 1947. Control operations were begun in the spring at Albuquerque, but by the end of the fiscal year it was evident that fly control problems were so complex and varied that the degree of fly control being obtained was disappointing; nevertheless, an intense effort was made to maintain the scheduled control activities and to determine the effect on decreased diarrhea rates. At Thomasville, Ga., scheduled operational work had to be postponed. However, studies of fly breeding conditions in the area were intensified. Basic studies of seasonal species abundance and ecology were inaugurated and will be continued in this area.

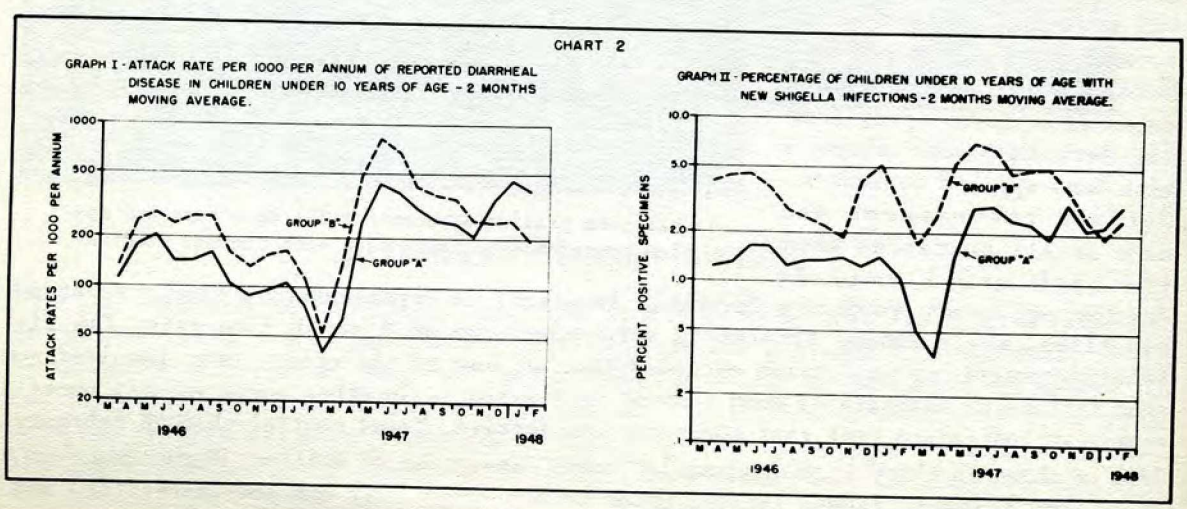
In the Pharr, Tex., area, fly control activities in the towns of McAllen, Pharr, San Juan, Alamo, and Edinburg were discontinued in September 1947. Simultaneously four different methods of fly control were inaugurated in the towns of Mission, Donna, Weslaco, and Mercedes. These towns had been used previously as untreated checks. Mission was treated outdoors only with 5 percent DDT emulsion space spray applied with a Lawrence Aero-Mist sprayer. Donna was treated indoors and outdoors with 5 percent DDT emulsion spray applied by hand. Weslaco was treated outdoors only with 5 percent DDT emulsion applied as an aerosol, using a TIFA machine. Mercedes was treated outdoors with space spray from the Aero-Mist and indoors with hand applied residuals. Outdoor retreatment was made in all instances when the high grill reading (number per square yard in a favorable location) in representative blocks exceeded six flies, while indoor treatments were scheduled at 2-month intervals. The fly breeding potential in Mission exceeded that of any of the other towns involved so that failure to maintain as good control in Mission as in other towns was not necessarily an indication that mist spray was ineffective. Total control through February 1948 is shown in chart 1, with group "A" towns consisting of McAllen, Pharr, San Juan, Alamo, and Edinburg (towns treated prior to September 1947 but not thereafter) and

Utilizing grill in determining fly abundance and species prevalence in connection with control studies.

group "B" towns Mission, Donna, Weslaco, and Mercedes (untreated checks prior to September 1947 and treated thereafter). The development of a poliomyelitis epidemic in the Pharr area in March drastically altered operational plans. Although the basic treatment methods were followed through June 1948 they were supplemented by other methods as the opportunity to test the effects of fly control in the midst of a poliomyelitis outbreak was exploited. The investigations are being pursued.

Graph I of chart 2 shows the effect of fly control activities upon the attack rates of reported diarrheal disease in children under 10 years of age. Graph II shows the percentage of children under 10 years of age with new *Shigella* infections in treated as compared with untreated towns. It will be noted that the 1947 trend lines cross in November and December, respectively, or 2 months after the crossing of the fly grill indices (chart 1).





ENCEPHALITIS INVESTIGATIONS

Cooperation with the Hooper Foundation of the University of California in investigative studies of encephalitis continued during the year. Two members of the staff of the Division, one wildlife biologist, and one entomologist have been assigned to this project. During active field operations, additional personnel was detailed to assist in the work. These studies are concerned with various aspects of the epidemiology of the arthropod-borne virus encephalitides. The studies are under the direction of Dr. W. McDowell Hammon, professor of epidemiology, and Dr. William C. Reeves, research associate, in the Hooper Foundation. Field work is conducted at the field laboratory on the grounds of the Kern General Hospital, Bakersfield, Calif., and the testing of specimens is carried on at the Hooper Foundation Laboratories in San Francisco.

Problems investigated during the year included: (1) prevalence of encephalitic virus infection in mosquitoes and mites; (2) prevalence of antibodies for the encephalitic viruses in domestic and wild birds; (3) prevalence of encephalitis and inapparent infections with encephalitis viruses in man and equines; (4) natural mode of transmission of these viruses to domestic birds; (5) biology of known mosquito vectors of these viruses; (6) biology and vector potential of mites and wild birds; (7) biological and ecological studies of wild birds of Kern County, including study of their blood parasites and the vectors of these parasites.

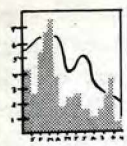
During the year, the following arthropods were collected and frozen for virus isolations: 5,218 *Culex tarsalis* (females); 410 *Culex stigmatosoma* (females); 3,808 *Aedes* spp. (females); and 44,192 mites. No virus was isolated from these specimens during the year.

The following results were obtained from an antibody survey of bloods from domestic and wild birds:

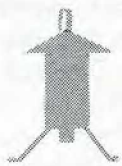
Bird Species	Number Bloods Tested	Positive Western Equine Encephalomyelitis	Percent Positive	Positive St. Louis Encephalomyelitis	Percent Positive
Chicken	80	2	2.5	1	1.25
English Sparrow	120	20	16.0	10	8.0
House Finch	40	5	12.5	3	7.5
Lake Sparrow	26	1	4.0	0	0.0
Bullock Oriole	20	11	55.0	0	0.0

The results from the 1947 study of the methods of transmission of the encephalitic viruses to chickens under natural conditions have been analyzed but infection rates were so low that definitive conclusions are difficult. The study continued during 1948 and sera are still under test.

The study of the biology of mosquito vectors of encephalitis has continued with emphasis on that of *Culex tarsalis*. As yet, efforts to colonize this species have not been successful. Biological studies on *Liponyssus sylviarum*, the common wild bird mite of Kern County, are in progress. Studies of wild birds and their blood parasites, carried on during the year, have produced comprehensive data that are in process of being sorted, tabulated, and evaluated.



EPIDEMIOLOGY DIVISION



Through studies, investigations, and evaluations of morbidity and mortality data, the Epidemiology Division determines the relative importance of communicable diseases with which CDC is primarily concerned and makes recommendations for control measures. The Division also provides facilities for evaluating the effectiveness of control operations. Upon request, States are provided trained scientists to assist in combating epidemics and other unusual health problems. Through the Statistical Branch comprehensive morbidity and mortality records on communicable diseases within the scope of CDC operations are made available to CDC units and other interested agencies and institutions.

OFFICE OF THE CHIEF

PERSONNEL. The Division staff was expanded during the year by the addition of five assistant surgeons and two assistant nurse officers. The nurse officers were assigned to give technical direction to public health nurses attached to CDC. Other personnel developments during the year included a change in Division Chief in December 1947.

EPIDEMIC AID. Five epidemic aid calls were received during the year. One from Louisville, Ky., and one from Butte, Mont., requested assistance in connection with outbreaks of diphtheria. These were referred to the Laboratory Division which found that the epidemics were mainly diagnostic problems. An epidemic of an acute upper respiratory disease in Tucker County, W. Va., was referred to the Division by District 2. This was tentatively diagnosed by CDC as acute laryngotracheobronchitis. The National Institutes of Health later confirmed this diagnosis. A poliomyelitis epidemic in Iowa resulted in a request from the State health officer for aid. The situation was well in hand by the time a representative of the Division arrived on the scene. In response to a request from the State health officer, assistance was rendered in connection with a ringworm epidemic in North Carolina. Assistance was provided in inaugurating control and survey measures and instructions were given local health department personnel in the use of the Wood's Lamp as a diagnostic aid.

DISASTER AID. Division personnel and equipment participated in airplane spraying operations in the New Orleans area following the hurricane during late September 1947. Thirty percent DDT in Velsicol NR-70 was applied at the rate of 0.3 pound of DDT per acre which provided adult fly control as well as mosquito control. Spraying operations started September 29 and continued through October 8. Aerosol applications were made over densely populated areas and wing sprays used in sparsely populated areas. Despite unfavorable weather conditions excellent results were obtained. Airplane larviciding was performed in the vicinity of Helena, Marianna, and West Memphis,

Ark., in July and August 1947, for the purpose of controlling anopheline breeding in areas inundated by flood waters of the Mississippi River. Control obtained during the initial phase was spotty due to the dense vegetation canopy over the flooded area. The dosage was increased from 0.1 pound to 0.2 pound of DDT per acre and excellent results were obtained.

CONSULTANTS MEETING. In May 1948, the Epidemiological Consultants of CDC met in Atlanta and advised with the staff of the Center concerning some of its technical epidemiological problems such as planning the multi-city poliomyelitis study, dysentery control with its possible impetus to fly control, and other program planning problems.

TYPHUS INVESTIGATIONS BRANCH

Work was continued on the Thomasville, Ga., typhus investigations project inaugurated (1946) in an attempt to determine the effectiveness of murine typhus control methods, particularly DDT dusting, on such epidemiological aspects of the disease as human incidence, rat (reservoir) prevalence, and abundance of rat ectoparasites. The study area (Brooks, Thomas, and Decatur Counties with Grady County as a control check) was placed on a surveillance status during the fourth quarter of the year. However, studies pertaining to the three principal aspects of typhus epidemiology continued.

Thomasville, Ga.: Case of murine typhus with physician in attendance 2 days after beginning of aureomycin therapy.

In Brooks and Thomas Counties 10 percent DDT in pyrophyllite was applied. In Decatur County rat poisoning was conducted. In Grady County, the control check county, no rat or rat ectoparasite control operations were carried on. Dusting operations commenced in Brooks County on April 1, 1946, with three rounds in 1946 and two rounds in 1947. The fifth round was completed near the end of

Public health nurse on a follow-up visit to home of the same patient.

September 1947. Dusting started in Thomas County May 15, 1946, with three rounds in 1946 and two rounds in 1947. The fifth round was completed in July 1947. Rat poisoning was conducted in Decatur County during May and June 1946. The U. S. Fish and Wildlife Service promoted rat poisoning in parts of Decatur County during the survey period. Also the malaria DDT spray program included Decatur County in 1946 and 1947 (two rounds in 1946 and two rounds in 1947). Operations in Grady County were limited to studies of human typhus incidence, reservoir prevalence, and ectoparasite abundance.

Some of the findings accumulated through these studies have been published (Public Health Reports, December 17, 1948; Vol. 63, No. 51). In brief they support these conclusions: "By the application of 10 percent DDT in pyrophyllite to rat runs and harborages in a county-wide type of program, without the aid of other rodent or rodent ectoparasite control measures, murine typhus incidence was significantly reduced in Thomas and Brooks Counties, Ga. In contrast with levels observed in an untreated county (Grady), satisfactory county-wide control of *Xenopsylla cheopis* and *Leptopsylla segnis* was obtained by county-wide treatment with 10 percent DDT in pyrophyllite. A significant reduction of typhus complement-fixing antibodies in the rat population closely followed and probably was a result of the ectoparasite control which was obtained. *Liponyssus bacoti* (tropical rat mite), and *Polyplax spinulosa* (rat louse), populations on rats were reduced only slightly in the treated counties. DDT dusting operations, as executed, disturbed the normal ecology of rat ectoparasite populations in a variety of ways and by so doing altered the epidemiological picture of murine typhus, thereby reducing prevalence of the disease in rats and man."

HUMAN INCIDENCE STUDIES. For the 18-month period (January 1945 through June 1946) prior to the completion of the first DDT dusting cycle in Thomas and Brooks Counties and rat poisoning in Decatur County, the number of confirmed cases of typhus was 42 for Brooks County, 95 for Thomas County, 49 for Decatur County, and 58 for Grady County (table 1). For the 18-month period (July 1946 through December 1947) subsequent to the completion of the first cycle of DDT dusting in Brooks and Thomas Counties and rat poisoning in Decatur County, the number of confirmed cases of murine typhus was 4 for Brooks County, 15 for Thomas County, 14 for Decatur County, and 63 for Grady County. Since the latter period (July 1946 through December 1947) contained two peak seasons, the incidence ordinarily would be considerably greater than in the period January 1945 through June 1946, containing only one peak season. Assembled data indicate that typhus occurred with greater frequency among white males than in any other population group.

RESERVOIR AND VECTOR STUDIES. During the study period a change in the domestic rat population was noted with a relative increase in the number of *Rattus norvegicus*. However, *Rattus rattus* consistently outnumbered *R. norvegicus*. During and after July

Table 1

HUMAN CASES OF MURINE TYPHUS BY DATE OF ONSET IN FOUR COUNTIES IN SOUTHWESTERN GEORGIA

Type Control	County	Precontrol Period — 18 Months January 1945—June 1946	Postcontrol Period — 18 Months July 1946—December 1947
DDT Dusting	Brooks	42	4
DDT Dusting	Thomas	95	15
Rat Poisoning	Decatur	49	14
No Control	Grady	58	63

Urban home of a 1948 case of murine typhus. Infection probably was contracted in shopping area of the city.

1946, the prevalence of murine typhus antibodies in the rat population declined noticeably in Brooks and Thomas Counties. In Decatur County rather wide fluctuations in the prevalence of antibodies occurred with a leveling off at about the prevalence observed prior to the poisoning campaign in May and June 1946. Prevalence of antibodies in the rat population remained at a fairly even level in Grady County (untreated) throughout the study period.

More than 96 percent of the total number of ectoparasites collected in Brooks, Thomas, and Grady Counties during the period May 1946 through April 1948 was among four species. They were the oriental rat flea, *Xenopsylla cheopis,* 10.6 percent; mouse flea, *Leptopsylla segnis,* 6.1 percent; tropical mite, *Liponyssus bacoti,* 27.3 percent; and common rat louse, *Polyplax spinulosa,* 52.1 percent. In the untreated county (Grady) 16.3 percent of the ectoparasites were *X. cheopis,* 9.8 percent *L. segnis,* 25 percent *L. bacoti,* and 44.6 percent *P. spinulosa.* Although some reduction in flea infestation rates occurred in the untreated county as the study progressed, the much greater reduction in dusted counties indicated control of *X. cheopis* and *L. segnis* by DDT dusting.

VIRUS BRANCH ACTIVITIES

During the year headquarters of the Virus Branch was transferred from Montgomery, Ala., to Atlanta, Ga.

WILMINGTON POLIOMYELITIS PROJECT. As a part of the study being conducted by the Communicable Disease Center to determine the role of the fly in the transmission of poliomyelitis, a community-wide fly control program was inaugurated in Wilmington, Del., early in the fiscal year.

On August 19 information was received that a potential poliomyelitis epidemic was developing in Wilmington. Virus Branch personnel proceeded to the scene immediately for an appraisal of the situation. A rising incidence of the disease was indicated. Personnel and equipment suitable for a speedy launching of a community-wide fly control program were dispatched to the area. Operations, which consisted of airplane application of DDT at the rate of 0.3 pound per acre supported by application by ground equipment, were started August 29. Weekly applications of DDT by airplane and

supplemental ground spraying measures were initiated. Garbage dumps were treated daily by ground spraying equipment.

Entomological activities carried on in conjunction with spraying operations included (1) rapid survey of the area to obtain precontrol fly index, (2) routine inspection of each section one day after each airplane application to locate high count areas and determine effectiveness, (3) reinspection of high count areas after treatment by ground equipment, (4) daily inspection of garbage dumps, (5) trap collection of flies in the vicinity of poliomyelitis cases for virus examination, (6) operation of light traps for obtaining sample mosquito population, and (7) inspections in adjacent area to check normal fly activity.

The fly index was reduced from 4.7 (precontrol) to 1.6 in 3 days and was down to 0.7 when control operations were discontinued September 19. Fly trap collection operations indicated a decrease of 89 percent in flies during the 4-week period. A project epidemiologist was installed as a temporary visiting resident in the Communicable Disease Unit of the Wilmington General Hospital and observed cases of poliomyelitis hospitalized during the period. Laboratory facilities of the Public Health Service and of the National Foundation for Infantile Paralysis were made available to local physicians. There was considerable debate over how much of the disease was poliomyelitis. Specimens were obtained from all city resident patients. Certain specimens from nonresidents were supplied to cooperating research agencies and it was from one of these pools that the only poliomyelitis virus identified was reported. A complete case report was made on all reported cases, including inspection of the residences of patients. All specimens obtained from patients, fly trap collections, and mosquito collections were shipped to the Virus Laboratory in Montgomery. None of the stool specimens from that city showed virus and it was predicted that the epidemic had been caused by a new unknown virus.

THOMASVILLE (N. C.) POLIOMYELITIS. During the second quarter of the year inquiry was made into a late season poliomyelitis epidemic in Thomasville, N. C. Over 30 patients were examined, and blood, stool, and naso-pharyngeal specimens were collected for further laboratory study. Clinically all patients examined presented a picture compatible with the diagnosis of poliomyelitis, and laboratory studies substantiated this when two stool specimens employed in monkey inoculations proved to contain poliomyelitis virus.

ENCEPHALITIS — NASHVILLE (TENN.) PROJECT. For a number of years there has occurred a severe type of encephalitis in the Midsouth, particularly in central Tennessee. Not all the etiologic agents have been identified. Studies by Vanderbilt University investigators in cooperation with the Hooper Foundation have yielded only negative neutralizations against known viruses. Twenty-five cases of this disease were hospitalized at Vanderbilt University Hospital during the spring and summer of 1947. In addition there is another type of respiratory infection which occurs in large epidemics in this area as well as in other parts of the United States.

Because of these epidemics the Virus Branch inaugurated studies in Tennessee during July 1947. An epidemiological and entomological survey was conducted in the vicinity of Nashville and Oak Ridge. Medical and entomological specimens revealed an active agent of a nature as yet unidentified. During a revisit to the area in October 1947 convalescent sera were obtained along with acute sera on a few cases which occurred subsequent to the first visit. Vanderbilt University investigators agreed to obtain repeat serum samples on any cases that returned to the hospital clinic. Numerous insect collections, which are being used for encephalitis virus isolation studies, were made from the area. (Eastern equine encephalomyelitis virus was isolated from

arthropods collected in close association with clinical encephalitis.)

LAFAYETTE (LA.) PROJECT. In September 1947, a field base unit was established in LaFayette, La., to investigate an epizootic of equine encephalomyelitis. The epidemic occurred principally in coastal Louisiana, west into Texas, and some cases were reported as far north as DeSoto Parish (Shreveport), La. Two fatalities occurred while the investigators were on the scene, and autopsy material was obtained. Field investigators uncovered a human case which was sent to Charity Hospital in New Orleans where death occurred. Autopsy material was obtained in this case also. The intervention of the Louisiana hurricane and other factors disrupted efforts to obtain mosquito collection in the area. Blood sera were obtained from domestic animals from the area where human cases occurred.

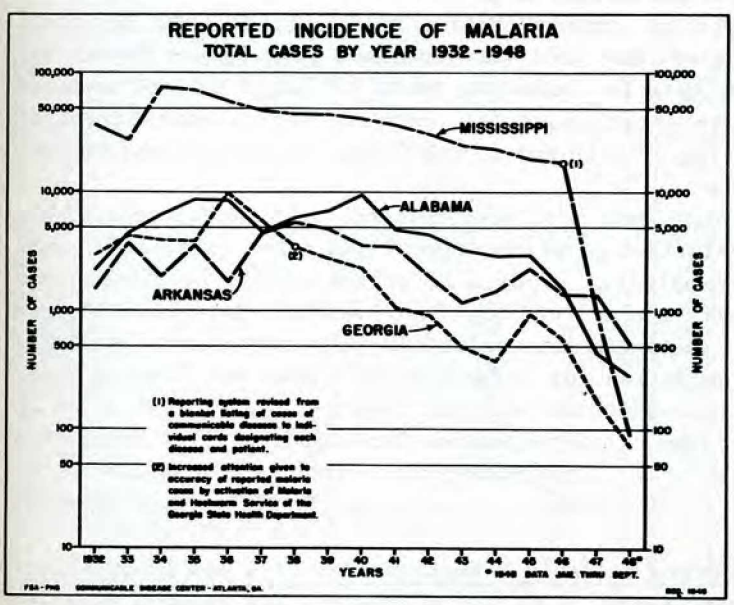
Two revisits to the area were made during the second quarter of the year, at which time several additional human cases were contacted for environmental studies. An attempt to collect blood from wild fowl for neutralization tests was not very productive due to inexperienced personnel. Nevertheless, two cormorants were found to have protective antibodies against Eastern equine encephalitis.

DETERMINATION OF HIDALGO COUNTY, TEX., FLIES. Seventy-five collections of flies from nine localities were forwarded from the Dysentery Control Project to the taxonomist of the Virus Branch for identification. In the 5,080 specimens examined, the most common species was *Phaenicia sericata*. The numbers of each species were *Phaenicia sericata*, 2,718; *pallescens*, 1,174; *eximia*, 1,151; *Callitroga macellaria*, 27; *Phormia regina*, 6; *Morellia scapularis*, 2; *Phaenicia caeruleivridis*, 1; and *Cryptolucilia caesarion*, 1.

A preliminary report was completed on the male sarcophagids forwarded from the Dysentery Control Project in the summer of 1947 for determination. A total of 1,158 specimens representing 35 species were examined. Fifteen of the species are not to be found in the Aldrich revision of the group, and it is likely that a number of these will prove to be new to science.

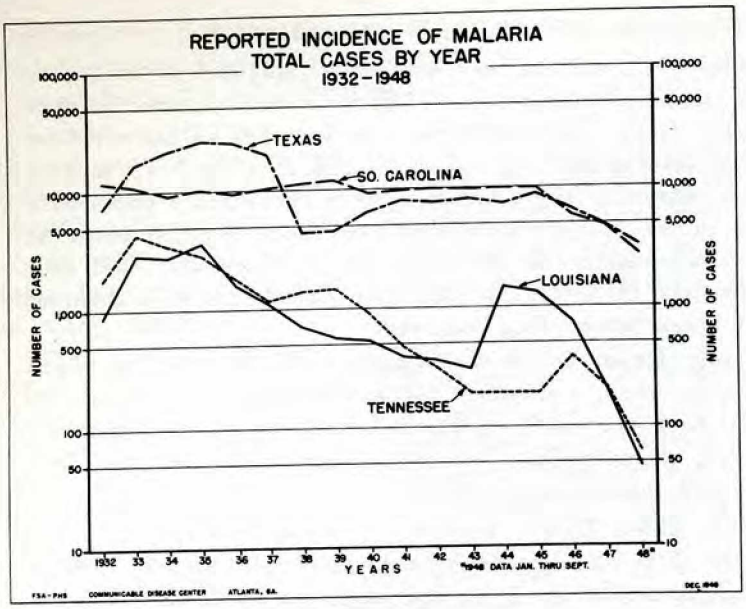
MALARIA BRANCH

A program of appraisal of malaria morbidity reporting was emphasized during the year. In consultation with the various State health departments and with CDC personnel, a malaria case appraisal record form was developed, printed, and distributed to the CDC epidemiologists assigned to those States reporting the greatest number of cases. The form was used in Alabama, Georgia, and Mississippi. This investigation of the accuracy of each report resulted in a marked decline in cases reported during 1948 as evidenced in graph 1.



Graph 1

South Carolina and Arkansas used a more general approach to the problem. These two States worked directly with



Graph 2

the groups of cases reported by physicians or did area blood surveys without necessarily using the form to appraise each individual reported case of malaria. Their results are indicated on graphs 1 and 2.

Since Texas and South Carolina currently report more malaria than all the remainder of the nation, South Carolina's revision of their malaria morbidity system may leave Texas as the principal malaria reporting problem unless the findings of this year's study are applied also in that State. Two States, Tennessee and Louisiana, with a minor malaria morbidity reporting problem experienced a comparable decline in reporting during this interval without exerting any special corrective measures (graph 2).

STATISTICAL BRANCH

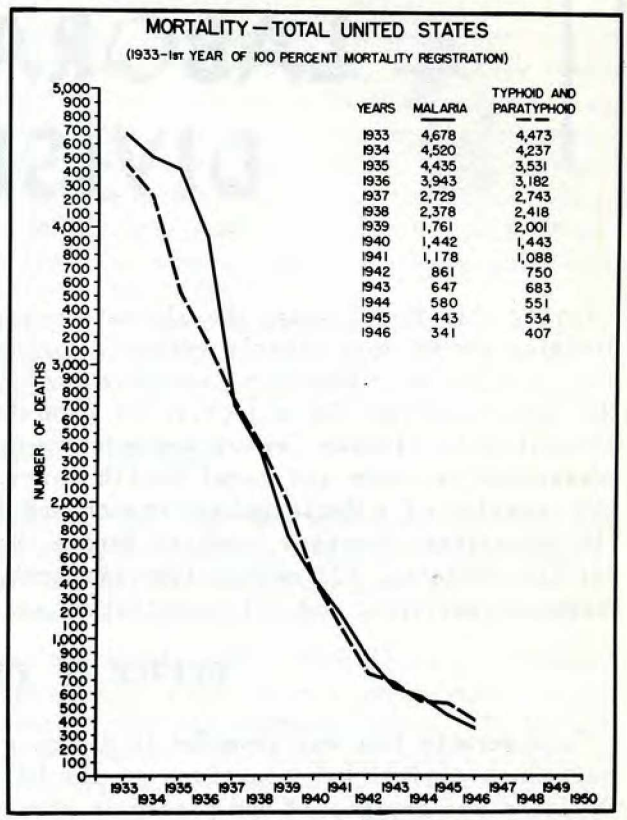
The Statistical Branch provides statistical and consultative services to all operational units of CDC and to other Federal and nonfederal agencies engaged in the study and control of communicable diseases. Comprehensive data pertaining to such diseases as malaria, typhus, typhoid, poliomyelitis, encephalitis, and diarrheal diseases were compiled and evaluated. Services were rendered both to the Typhus and Malaria Control Branches providing data for selecting areas for which control measures were recommended. Procedures were established for analysis and interpretation of entomological and epidemiological data collected in the Typhus Investigations Project at Thomasville, Ga.

As regards poliomyelitis, morbidity data were kept current; statistical records and procedures for collection and evaluation of entomological and other operational data in poliomyelitis control were formulated; reports of poliomyelitis by States were plotted and epidemicity evaluated by the "control chart" method; data collected in the Wilmington, Del., project were tabulated and evaluated; and a cooperative statistical program with the National Foundation for Infantile Paralysis was planned. Continuous services were supplied in connection with the Dysentery Control Project at Pharr, Tex. These included establishment of procedures for compiling life experience tables on six towns in the project area. In addition, a statistical evaluation of the importance of diarrheal diseases in 10 cities and counties in 10 different geographic areas was prepared.

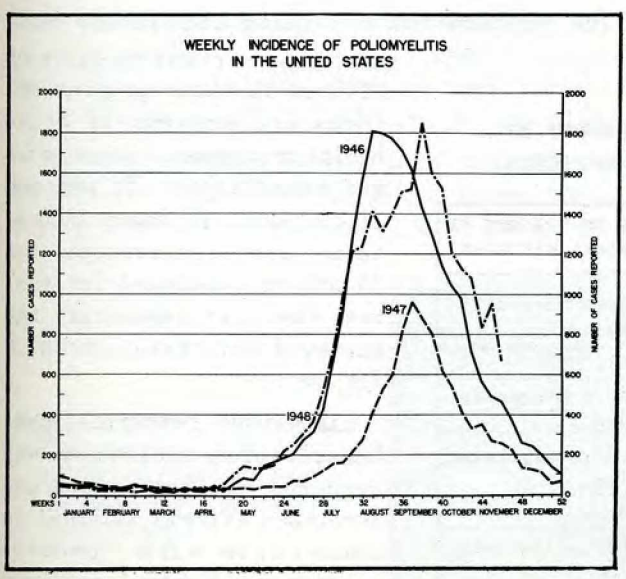
Consultation services were rendered to field investigation units and headquarters units of the Communicable Disease Center, a number of States, and various agencies and institutions engaged in health activities. The type and character of services

performed in consultative activities were governed by the requirements of CDC operations and requests from the agencies served.

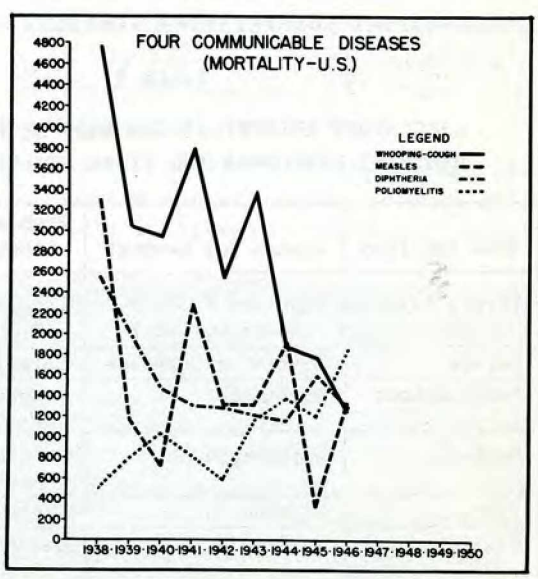
COMMUNICABLE DISEASE MORTALITY. During this year, closer liaison with the National Office of Vital Statistics enabled the Center to study national trends in certain of the diseases in which the Center should be vitally interested. Graph 3 illustrates a remarkable similarity in decline in the nation's deaths due to malaria and typhoid. There has been a great deal of conjecture as to why malaria and typhoid have decreased with almost identical rapidity between 1933 and 1946, but there has been no proven explanation. Further intensive study on this problem is indicated. Graph 4 presents the seasonal incidence of poliomyelitis during the last 3 years for the nation. Graph 5 shows for the nation the annual deaths due to whooping cough, measles, diphtheria, and poliomyelitis during the period 1938-1946. Whooping cough kills more children than any other communicable disease in the United States.



Graph 3



Graph 4



Graph 5

LABORATORY DIVISION

During this fiscal year, the ultimate organization and functions of the Laboratory Division became more clearly evident. Through the acquisition of additional equipment and the recruitment of new personnel, considerable progress was made toward the achievement of the objective of furnishing the laboratory services required by Communicable Disease Center units and providing more comprehensive laboratory assistance to State and local health units. Major efforts were concentrated upon the creation of a Bacteriology Branch and formulating sound basic principles for its operations. Services rendered during the year included (1) diagnostic services for CDC projects, (2) methodology research, (3) training services, (4) reference diagnosis services, and (5) consultation and evaluation services.

OFFICE OF THE CHIEF

Considerable time was expended in planning for future activities and in recruiting personnel to fill key positions on the Division staff. An assistant chief of the Division was designated and placed in charge of all training activities, including student recruitment and Extension Service operations.

LABORATORY CONSULTATION SERVICES. The pattern for providing laboratory consultation services to District offices in their program reviews and surveys of State health department laboratories was established. By the end of the year, 12 State laboratories had been surveyed and 18 others scheduled for survey. One city laboratory was surveyed and three scheduled for survey.

Table 1

LABORATORY INVESTIGATIONS MADE AT REQUEST OF DISTRICT DIRECTORS AND STATE HEALTH OFFICERS

Area Involved	Reason for Request	Problem as Defined by Laboratory Division
Virgin Islands	Reported Typhoid Fever Outbreak	Laboratory Diagnosis Problem
Kansas	Enteritis Outbreak	Enteritis
North Dakota	Amebiasis	Laboratory Diagnosis Problem
Montana	Diphtheria	Laboratory Diagnosis Problem
Kentucky	Diphtheria	Diphtheria
Mississippi	Amebiasis	Laboratory Diagnosis Problem
Ohio	Dysentery	Amebiasis

LABORATORY INVESTIGATIONS. Consultation assistance was rendered six States and one Territory (Virgin Islands) in connection with "problem epidemics." Table 1 reflects the scope and results of this

activity. Members of the staff were active throughout the year in transcribing studies and investigations into manuscripts for publication in professional journals and/or for presentation before sessions of scientific societies.

EXTENSION SERVICE. Each month two or more parasitological specimens were mailed to 273 laboratories, distributed over 48 States and 3 Territories, where they remain available for review and demonstrations. Two laboratories in Washington, D.C., and four in Canada also received this material. This year the Extension Service mailed 2,979 packages of refresher material to cooperating laboratories. These packages included three species of malaria organisms, two adult mosquitoes, two ticks; ova of *Schistosoma mansoni, Trichuris trichiura,* and *Ascaris lumbricoides;* cysts of *E. histolytica, E. coli, E. nana,* and *Giardia lamblia;* smears with *Trypanosoma gambiense, T. cruzi, Leishmania donovani,* and *Wuchereria bancrofti.*

Special specimens, available as training aids when requested, were furnished 23 States. Fifteen regular loan sets were sent out, while 677 items were included in 126 other shipments of specimens particularly requested by various laboratories.

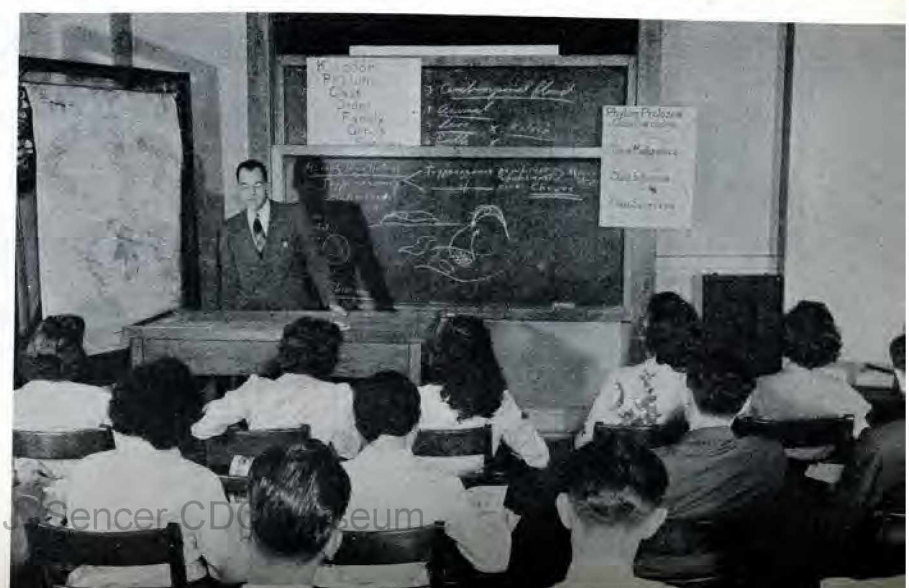
PARASITOLOGY BRANCH

Development of this Branch continued during the year. New equipment was obtained and a parasitologist was assigned to San Juan, Puerto Rico, to collect and prepare specimens for use in the training courses and for the Extension Service.

Major activities of this Branch during this fiscal year were:

METHODOLOGY RESEARCH. (1) Development of polyvinyl alcohol techniques for fixation and making permanent slides of ameba trophozoites. Fecal smears can be made, dried, shipped, and stained without loss of diagnostic cellular characteristics. (2) The addition of detergents (Triton X-30) to diluted Giemsa stain used for mass staining of blood films decreases the number of false positive malaria diagnoses. It has been shown that during mass staining by usual techniques parasitized cells may float free and be deposited on normal blood slides to cause subsequent false diagnosis. (3) Refinements of preparation were developed to facilitate embedding of gross specimens of many kinds in transparent resin blocks. It is now possible to do large scale production over a wide range of invertebrates for teaching purposes. (4) *Trypanosoma cruzi* was successfully cultured by inoculation into pupae of Lepidoptera.

TRAINING COURSES. During this year the 6-week course in the laboratory diagnosis of parasitic diseases was given three times. The course was designed for regularly employed technical personnel with preference given to applicants from State, local



Training course in laboratory diagnosis of parasitic diseases was given three times.

Table 2

REFERRAL DIAGNOSIS — PARASITOLOGY

Specimen	Source			
	State or Local P. H. Labs. Physicians	CDC Clinic	Presbyterian Clinic	Ardmore Clinic
Fecal specimen for parasites	171	26	445	114
Fecal specimen stool count	—	2	—	10
Fecal specimen protozoan culture	4	—	—	93
Arthropod identification	2,588	—	—	—
Blood smear for parasites	—	1*	—	—
malaria	—	6	—	—
microfilaria	—	3	—	—
Leishmania	—	1**	—	—

* For malaria, microfilaria, microscopic examination and animal inoculation for relapsing fever spirochetes.

** Culture, animal inoculation, direct microscopy.

Table 3

REFERRAL DIAGNOSIS — PARASITOLOGY

Blood smears from surveys, examined for malaria

Source	No. of Slides	No. of Positives
Arkansas	1,610	0
Georgia	180	0
Mississippi	1,480	14
South Carolina	7,577	6
Puerto Rico	1,086	9
Dominican Republic	688	43
Jamaica	1,572	477
Total	14,193	549

health unit, and Veterans Administration laboratories. Enrollment for this course since establishment now totals 215 students representing 44 of the 48 States, 2 Territories, and 5 foreign countries. A short course (2 weeks) of the same type was given twice for laboratory directors and senior laboratorians. Nineteen persons from 11 States and 9 foreign countries attended these courses.

Sixty-eight physicians and technicians attended a special 2-day course in the diagnosis of intestinal parasites conducted in Mississippi. More than 250 physicians and technicians participated in a series of lecture-demonstrations given at the Florida Health Department Laboratories. A staff member presented lecture-laboratory demonstrations to a group of 85 persons in North Dakota.

REFERENCE DIAGNOSIS. Diagnostic services furnished State and local health department laboratories and CDC projects by this Branch during the year are summarized in tables 2 and 3.

VIRUS AND RICKETTSIAL BRANCH

The addition of personnel and equipment during the year enabled this Branch to expand its services and facilities. Considerable emphasis was given to special training for staff personnel. The securing of essential supplies continued to be a problem, particularly with respect to fertile eggs and experimental animals. Activities during the year were confined mostly to neurotropic virus studies with particular emphasis on encephalitis and poliomyelitis.

METHODOLOGY RESEARCH. Bacterium-free fecal suspensions and arthropod materials for the recovery of poliomyelitis and for the isolation of equine encephalomyelitis

are essential in the work of this Branch. A technique for obtaining such material was developed by use of penicillin and streptomycin "treatment" together with ultracentrifugation.

REFERENCE DIAGNOSIS. Poliomyelitis virus was isolated from 6 of 23 human fecal specimens (Texas 4, North Carolina 2). Seventeen specimens from Delaware yielded no virus. Two of eight human autopsy brain specimens yielded Eastern equine encephalomyelitis. The same virus was isolated from 4 of 14 horse brains submitted from Southeastern States. Material from a fatal case of encephalitis in Birmingham, Ala., contained an agent identified as herpes virus. Much of the referral material came from cooperative studies with the Epidemiology Division. State and local laboratories also provided specimens. Tables 4, 5, and 6 show activities of this Branch in reference diagnosis.

Table 5

NEUTRALIZATION TESTS—ANIMAL SERA

Source	Total tests / Positive / (Weakly positive) Virus		
	E.E.E.*	W.E.E.**	St. Louis
TENNESSEE			
Cow	8/1/(1)	6/2/(0)	6/0/(0)
Chicken	110/3/(9)	83/11/(0)	56/0/(0)
Dog	4/0/(0)	5/1/(0)	2/0/(0)
Duck	5/0/(0)	7/0/(0)	3/0/(0)
Horse and Mule	11/0/(0)	3/0/(0)	2/0/(1)
Turkey	6/0/(0)	—	2/0/(0)
Goose	—	2/0/(1)	—
LOUISIANA			
Horse - Mule	36/27/(1)	51/21/(1)	—
Pig	1/0/(0)	1/0/(0)	—
Rabbit	3/0/(0)	3/0/(0)	—
Dog	4/2/(0)	4/2/(0)	—
Cow	6/0/(2)	3/0/(0)	—
Chicken	118/3/(1)	105/20/(5)	—
Duck	6/0/(0)	12/2/(0)	—
Goose	8/0/(1)	15/1/(1)	—
Turkey	4/0/(0)	7/0/(0)	—
Pigeon	25/0/(1)	17/0/(0)	—
Mourning Dove	1/0/(0)	—	—
Canadian Ring-Necked Dove	3/0/(0)	1/1/-	—
Cormorant	2/2/ –	—	—
Water Fowl	5/0/(0)	6/0/(0)	—

* Eastern equine encephalomyelitis
** Western equine encephalomyelitis

Table 4

REFERRAL DIAGNOSIS — VIRUS

Seventy lots of arthropods were collected and processed for injection into mice to isolate virus; seven of these lots yielded Eastern equine encephalomyelitis.

Source	Arthropod (Lots tested/Positive lots)			
	Mosquitoes	Chicken Lice	Chicken Mites	Hemiptera
Alabama	10/0	5/0	1/0	1/0
Delaware	3/0	—	—	—
Louisiana	15/2	—	1/1	—
Tennessee	17/1	1/1	1/1	—
Texas	15/1	—	—	—

Of 36 lots of ticks tested for the presence of Rocky Mountain spotted fever, one lot, from Florida, was positive.

Table 6

NEUTRALIZATION TESTS — HUMAN SERA

Source	Total / Positive / (Weak positive) Virus			
	E.E.E.	W.E.E.	St. Louis	L.C.M.*
Alabama	9/0/(0)	5/1/(0)	3/0/(0)	—
Arkansas	—	21/0/(1)	30/0/(0)	—
Connecticut	4/0/(0)	—	—	3/0/(0)
Delaware	32/0/(3)	—	—	—
Georgia	12/0/(0)	9/0/(0)	9/1/(0)	—
Kansas	—	2/0/(1)	4/0/(0)	1/0/(0)
Louisiana	38/5**/(0)	49/0/(5**)	3/0/(0)	1/0/(0)
Maryland	2/0/(0)	2/0/(0)	2/0/(0)	—
Mississippi	4/0/(0)	2/0/(0)	2/0/(0)	1/0/ –
Tennessee	42/0/(4)	41/0/(0)	26/0/(2)	—
W. Virginia	1/0/(0)	—	1/0/(0)	—

* Lymphocytic choriomeningitis
** These five not from same source

BACTERIOLOGY BRANCH

Throughout the year emphasis was placed on the task of planning, building, equip ping, and staffing the laboratories of this Branch. The Tuberculosis Laboratory wa staffed and equipped. The General Bacteriology, Enteric Bacteriology, and Serolog Laboratories were planned, equipped, and partly staffed. In December 1947 th Rickettsia Serology Laboratory was transferred from Montgomery, Ala. Similarly, th Host Preference Serology Unit was made a part of the Bacteriology Branch. The Mycol ogy Laboratory, organized at Duke University at the beginning of the year, wa transferred to Atlanta and made a part of this Branch. Considerable time and at tention were devoted to the organization of a teaching and training program fo laboratory personnel.

METHODOLOGY RESEARCH. Studies pursued in the several laboratories of this Branch, in the main, are long-term projects designed to furnish statistically valid recommendations for improved diagnostic procedures and techniques.

Type culture collection maintained in Mycology Laboratory.

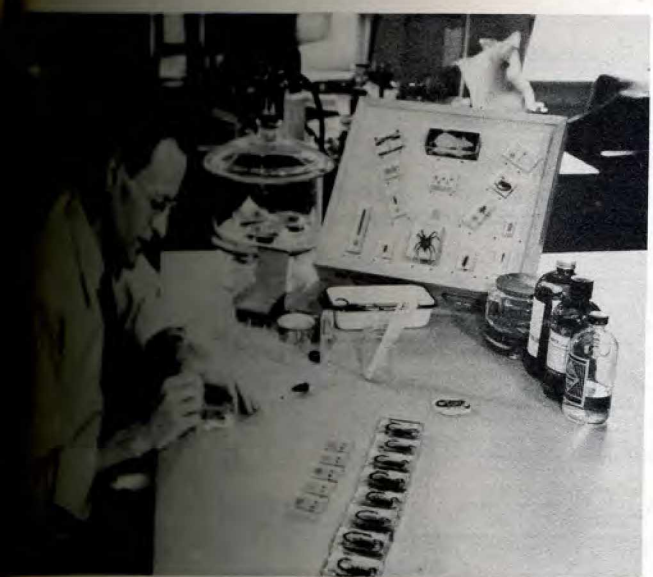
Major projects during 1948 included: (1) Comparison of specified methods for diagnosis of tuberculosis as performed by this laboratory, the New York State Laboratory, and the Georgia State Laboratory. Direct microscopy, concentration, and culture techniques were used for comparison in each laboratory. (2) The agents considered most useful for digestion and concentration of sputum were selected and compared for diagnostic efficiency. (3) The new and most commonly used media for isolation of tubercle bacilli have been selected and the diagnostic efficiency of each is being determined. (4) Biochemical analyses of media have been made to identify those factors which inhibit or enhance the growth of tubercle bacilli. (5) A study was begun to determine the effects upon fungi of the materials used for sputum digestion in tuberculosis diagnosis. Some of these, most useful for recovery of tubercle bacilli, destroy any contained fungi. (6) A study was begun to develop more specific antigens for serological detection of mycotic diseases.

TRAINING COURSES. A 5-week course in the laboratory diagnosis of tuberculosis was given to seven students from as many laboratories. A member of the staff of this Branch lectured in a postgraduate course in thoracic diseases at Duke University.

REFERENCE DIAGNOSIS. During the year the Tuberculosis Laboratories received 4,830 specimens of which 4,709 were for diagnosis, 32 for determination of type, and 89 for streptomycin sensitivity tests.

Rickettsial complement fixation tests for diagnosis were performed on 543 human sera. Results showed 25 percent positive for murine typhus, 12 sera positive for Rocky Mountain spotted fever, one positive for Q fever; and one specimen showed rickettsialpox antibodies. The majority of complement fixation tests were performed

Maintaining colonies of insects, performing host precipitin tests, identifying reference specimens.



Recording data on methodology research by photomicrography.

Plastic embedding of entomological specimens for museum.

Practical training in diagnosis of tuberculosis.

in conjunction with typhus control activities. Four percent of 18,507 human sera tested were positive for murine typhus as were 13.3 percent of 21,437 rodent sera.

During the year, 692 mycological specimens or cultures were received from State and local laboratories, and in connection with epidemiological studies. Of this number, 121 contained pathogens: *Microsporum Audouini*, 54; *Candida albicans*, 40; *Geotrichum* spp., 14; *Microsporum canis*, 7; *Trichophyton rubrum*, 2; *T. mentagrophytes*, 1; *Monosporium apiospermum*, 1; and *Coccidioides immitis*, 1.

CLINICAL PATHOLOGY BRANCH

Activities concerning this Branch were confined to preliminary planning for housing and staffing; no laboratory work was performed during this fiscal year.

Table 7

CDC CLINIC SERVICE

TYPE OF SERVICE	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	TOTAL
Complete Physical Examination	119	117	153	126	515
Local Physical Examination	187	275	235	260	957
Fluoroscopy	18	20	13	6	57
ECG	14	12	—	—	26
BMR	9	4	1	3	17
Treatments	287	350	347	308	1,292
Immunization to Employees	—	—	—	72	72
Skin Sensitization Tests	—	—	—	1	1
Home Calls – Physician	17	34	28	8	87
Home Calls – Nurse	20	35	21	25	101
Coast Guard – Examination	48	47	37	26	158
Forest Service–Immunizations	—	—	—	17	17
Travel, Immunizations for	30	22	18	93	163
Old Patients	383	421	366	413	1,583
New Patients	112	122	119	114	467
LABORATORY					
CBC	66	75	97	85	323
Hematocrit	4	4	—	1	9
Sedimentation Rate	—	3	—	—	3
Blood Sugar	—	14	—	—	14
Glucose Tolerance	—	2	—	—	2
Basophilic Stippling	—	—	—	2	2
Urinalysis	62	66	83	79	290
Urine Culture	—	1	—	1	2
G-C Smear	1	1	—	1	3
Gastric Secretions	—	1	—	—	1

LIBRARY and REPORTS DIVISION

Activities of the Library and Reports Division are designed to facilitate and record operational and investigative accomplishments of the Communicable Disease Center and cooperating agencies by providing library and editorial services. The nature and scope of services rendered varies with the needs of the agencies and individuals served. In general, editorial services include the reporting of CDC undertakings and accomplishments through regular and special publications, the preparation of training aids, and the editing and clearing for publication manuscripts prepared by CDC personnel. Library services provided include basic reference and source books in communicable disease control and a comprehensive collection of pertinent current periodicals.

A number of changes in personnel occurred during the year, involving the Division chief, technical writers, visual presentation information specialists, and vari-typists.

LIBRARY BRANCH

Activities during 1948 centered around the acquisition of additional library holdings and the expansion of services both in scope and number of users. Considerable progress was made in each field. Additions to holdings included 1,693 volumes and many periodicals. Listings in the periodical category numbered 250 titles at the end of the year. In the field of expanded services, new stations served were added in New York, Texas, Ohio, and Illinois.

As in its organization, in expanding holdings and facilities of the library, recognition was accorded the fact that excellent library accommodations exist in the Atlanta area at Emory University and Georgia Institute of Technology; and emphasis was placed on avoiding unnecessary duplication of holdings. The interlibrary loan service inaugurated with these institutions, the Georgia Department of Public Health, and other agencies in the area continued on a cordial basis and enabled the library to serve a larger number of clients in a more comprehensive manner. Although primarily for the use of Communicable Disease Center personnel (headquarters and field), facilities of the library are made available to all public health workers and to citizens interested in public health problems.

Membership in the Medical Library Association and participation in its exchange service netted the library 7,000 items during 1948. Most of these items were periodicals, including whole runs of several years; but a number of valuable books were thus acquired. During the year a complete catalog of holdings of the Technical Development Division was prepared and set up in Savannah, Ga. This catalog is kept up to date by the headquarters library.

By the end of the fiscal year, the second in the library's operations, most of the

Library holdings include basic reference books and current periodicals in the several sciences related to communicable disease control.

organizational difficulties had been solved and the unit was operating efficiently. The purchase of a number of double-faced floor cases relieved shelf congestion. The feasibility of moving the library to larger quarters was explored but suitable space centrally situated could not be obtained. Almost one-third of cataloged volumes, 1,603, are charged out on temporary or indefinite loan. Circulation of periodicals increased during the year to the level where 199 of 250 titles held were serviced to 14 different addresses and to interested staff members not only in headquarters offices but also in field stations — Manning, S. C.; Montgomery, Ala.; Topeka, Kans.; Columbus, Ga.; and Savannah, Ga. Over 1,800 complete volumes of periodicals, most of which should be bound, are now in hand.

EDITORIAL BRANCH

The work of this Branch ranges from the editing of a wide variety of manuscripts submitted by CDC personnel for publication to the compiling of data and writing material for regular and special CDC publications. All CDC publications are edited, illustrated, vari-typed, and "made-ready" for duplication under the supervision of the Editorial Branch.

Major publications processed during the year were: CDC BULLETIN (four issues), a quarterly publication devoted to the professional accomplishments and other activities of CDC and related agencies; ANNUAL REPORT (1945-46), a liberally illustrated detailed account of CDC operations during the fiscal year; ORIENTATION MANUAL (. . .for the Nation's Health), a concise outline of the purposes and functions of the U. S. Public Health Service for use in orienting and training new Public Health Service personnel; LARVICIDING HANDBOOK (revision); and SOURCE DATA ON ENDEMIC TYPHUS FEVER MORBIDITY, prepared for publication at the request of the Epidemiology Division of CDC.

Although not completed and issued during the year, considerable time and effort were expended on a number of other projects, including: FLY CONTROL MANUAL, ANNUAL REPORT (1946-47), and DDT LARVICIDING HANDBOOK.

The Editorial Branch primarily is a service agency; it undertakes publications and other projects upon the request of various CDC units. Prior to publication, material is submitted to appropriate staff specialists for review as to scientific and technical accuracy.

Editorial clerk assists vari-typist in checking finished copy.

Vari-typists prepare copy for reproduction.

Writers and artists collaborate in illustrative art work.

PRODUCTION DIVISION

The mission of the Production Division is to serve the Communicable Disease Center and other public and/or professional agencies engaged in public health activities by developing and producing audio-visual aids for training and operational units. In executing this mission, extensive use is made of such media as sound motion pictures, filmstrips, slide films, exhibits, and still photographs. The Division functions through three Branches: the Project Development Branch, which is concerned with translating ideas into scripts; the Production Branch, which handles the problems of converting scripts into audio-visual productions; and the Utilization Branch, which provides guidance to users for the effective employment of audio-visual materials.

Noteworthy occurrences during the fiscal year 1948 include the physical transfer of Division headquarters and operations to new quarters (Lawson Veterans Administration Hospital), the elimination of the necessity of outside contractual services through the acquisition of additional equipment and personnel, wider distribution of finished products among operational and training units, and more effective utilization of audio-visual materials on the part of using agencies.

SCOPE OF ACTIVITIES

The continuing activity of the Production Division is the development and production of audio-visual aids especially adapted to the needs of agencies engaged in public health work. Using agencies range the length and breadth of public health training

Photographer making photomicrographic pictures for CDC production.

Camera crew in action during field shooting.

and field operations, including CDC training activities, schools of public health, departments of preventive medicine in medical schools, sanitary engineering schools, State boards of health, U. S. Public Health District offices, and various professional schools. In conjunction with and independently of the production of visual aids, the Division provides technical assistance and consultative services to CDC and organizations in fields of endeavor of interest to CDC.

Division efforts are concentrated on ascertaining the audio-visual requirements of agencies it serves and on meeting these requirements by initiating appropriate production schedules. This entails continuous consultation with using agencies, exploratory and exhaustive research, coordination with other agencies producing visual aids in the public health field, and close attention to scientific developments in all of the activity areas involved. Motion pictures, filmstrips, and other aids released by the Production Division are intended for use by and for the training of public health and associated professional personnel; they are not designed for general audience purposes.

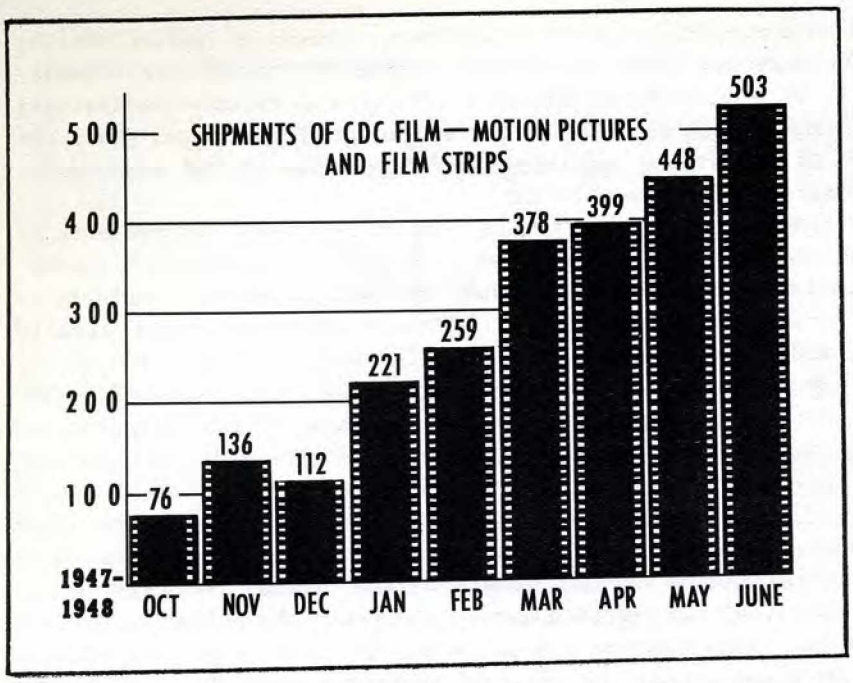
Productions completed and released during the year included the following: motion pictures, 21; filmstrips, 23; exhibits, 8; 2x2 inch slide series, 3; 3¼x4 inch slide series, 9. These released productions, together with previous releases, are listed in a descriptive Film and Training Aids Catalog issued by the Production Division. In addition to productions completed and released during the year, the following productions were initiated but not completed: motion pictures, 9; filmstrips, 18; manuals and bulletins, 4; 2x2 inch slide series, 10; 3¼x4 inch slide series, 3.

During the year there was a reexamination of criteria used for film initiation, of the production flow pattern and its supporting paper, and of standards of successful utilization as related to production thinking. A working manual was prepared on the check-points of script development for use by project supervisors. This was supplemented with a project supervisor's checklist.

The acquisition of additional motion picture and still laboratory equipment permitted the activation of a technical service section to coordinate all activities in the processing of films. This made it possible to accelerate all production and release schedules, and enabled the Division to improve the quality of productions. This new equipment and the consequent reorganization of production facilities also contributed to the ability of the Division to operate independently of outside contractual services. Already this has resulted in an improvement in the quality of

Laboratory personnel enlarging and developing prints in the darkroom.

Members of graphic section at work on CDC production.



Distribution of films since the transfer of film library to the Production Division in October 1947.

productions and in a speed-up in release schedules, since the Division is now capable of pursuing a predetermined production schedule from the initial to the final stage.

Work was started during the year on a projected series of filmstrips on anatomy and pathology. These are being made in pairs, one on the normal anatomy of a selected organ and the other on the pathology of a communicable disease involving the selected organ. The filmstrips are to be released in pairs, simultaneously. Preliminary work was completed on a proposed series of films on "Methods of Fly Control." Consultations were held with various individuals within CDC associated with fly control activities and arrangements perfected for the supervisor of the project to visit Pharr, Tex., to study fly control operations there. It was agreed with the Training Division that it would provide a technical consultant to work with the project supervisor on the "Methods of Fly Control" film project. Work continued on experimental category film-

Sound engineer and announcer narrating a CDC production.

Still photographer shooting filmstrip on Acme animation stand.

strips, experimental film shorts dealing with epidemiology, and on a film seminar on exotic diseases.

Personnel of the Utilization Branch participated actively in a series of conferences with professors of preventive medicine and others in that field, with the view of determining the number and type of films that may be advantageously adapted to teaching that subject. A definitive list of needed productions was formulated and progress made toward the initiation of production schedules. Early in the year a CDC film distribution procedure was formulated. This procedure was inaugurated with the transfer of the film library to the Production Division, October 1947. The accompanying chart reflects activities of the film library from October through the fiscal year 1948. Further improvement in the utilization of the facilities of the film library resulted from the assigning to that unit responsibilities for supervising the procurement and distribution of all films for preview for training and research purposes.

All CDC motion pictures related to medical studies were submitted to the American College of Surgeons for preview, evaluation, and listing in its catalog. Of 15 films so submitted, 13 were accepted by the American College of Surgeons for catalog listing. Films related to veterinary medicine were submitted to veterinary journals for listing. Reviews of films on applicable subjects were submitted to the American Medical Journal. Six pictorial reviews of CDC films were prepared for publication in the CDC BULLETIN.

OUTSIDE ACTIVITIES

In pursuing its over-all mission, upon request and under suitable arrangements with eligible agencies, the Production Division undertakes production assignments not strictly within the realm of CDC operations. During the year, under arrangements with the Venereal Disease Division of the U.S.P.H.S., a motion picture cameraman and still photographer were assigned to the Hot Springs, Ark., Venereal Disease Station in connection with a projected series of productions dealing with venereal diseases. Three filmstrips are planned in this series. They are entitled, "The Diagnosis of Primary Syphilis," "The Horizon of Syphilis," and "Venereal Disease and Tuberculosis Survey in Georgia." The first two are scheduled as color productions and the third in black and white. Upon request of the Hospital Facilities Division of the U.S.P.H.S., the Production Division assumed responsibility for producing four filmstrips for the

Motion picture laboratory technician operating automatic continuous processing machine.

Motion picture editor synchronizing motion picture print and sound.

purpose of orienting State health department and professional personnel on the hospital survey and construction program envisioned in the $75,000,000 hospital expansion appropriation by Congress. The first of these films, "The Hospital of Tomorrow," was completed during the year. Fifty prints, with supplemental color slides, were forwarded to Washington. Plans were perfected with the Hospital Facilities Division to produce a 16-mm. sound motion picture dealing with the same general subject.

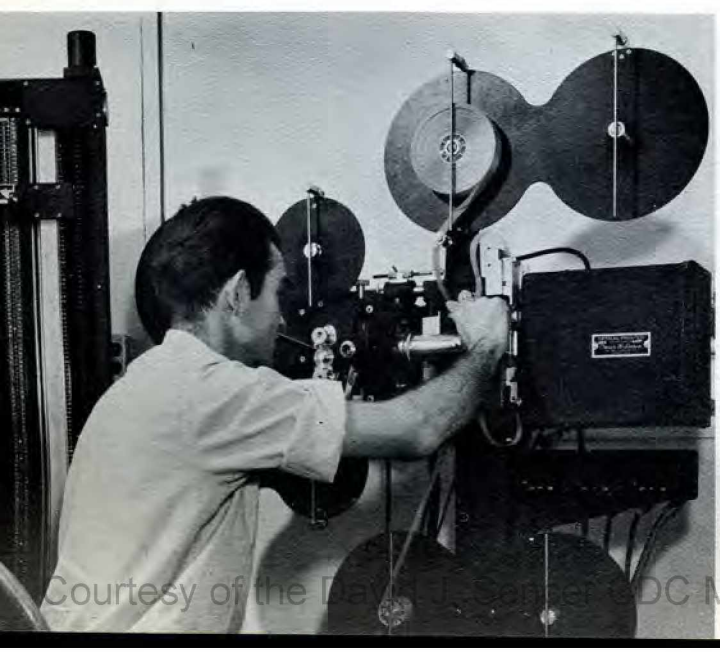
MISCELLANEOUS ACTIVITIES

Personnel of the Division actively participated in conferences and other work of the Interdepartmental Committee (Army, Navy, Air Forces, Veterans Administration, and U.S.P.H.S.) during the year. This committee (representatives from the respective agencies) evolved plans for the Medical Film Institute and selected a director. A uniform production outline formula was promulgated for use by all of the agencies affiliated with the committee. All projects on the CDC production agenda were approved by the Interdepartmental Committee. In connection with the distribution of releases, it was agreed that each agency would provide one print of each release to each of the participating agencies. Accordingly, the CDC Production Division forwarded to the Washington offices of the Army, Navy, Air Forces, and Veterans Administration a copy of each production released. In return, each of the aforementioned agencies furnished CDC a copy of its releases. This policy is designed to implement a program of nonduplication and bring about greater coverage in the several audiovisual fields at a reduced expenditure.

During the year, five exhibits were prepared for the Fourth Annual International Congress on Tropical Medicine and Malaria. A panel exhibit on rabies was made for the Southern A.P.H.A. New Orleans meeting in April 1948. In collaboration with the Engineering Division, an exhibit depicting the work of the CDC was prepared and displayed at the A.P.H.A. Atlantic City meeting, October 1947. Exhibits also were prepared for the Tuberculosis Division, the National Association of Tuberculosis, and the TVA.

Throughout the year activities of the Division were centered around the multiple objective of rendering higher quality service in a wider field to a larger segment of public health personnel, and helping recipients of this service reap greater benefits therefrom through more effective utilization techniques. Emphasis is placed upon quality no less than upon quantity.

Laboratory technician making a motion picture print on an optical printer.



Productions are distributed through CDC film library.

TECHNICAL DEVELOPMENT DIVISION

During the fiscal year 1948, efforts of the Technical Development Division were divided between solving purely operational problems of immediate importance and investigating more basic problems, the solutions to which offered improvements in the efficiency and effectiveness of CDC activities. Some problems encountered fell into both categories since they encompassed aspects of immediate importance and their solutions entailed semibasic investigations. In planning the work of Division personnel stationed at Savannah, highest priority was given to such combination problems.

INSECTICIDE INVESTIGATIONS BRANCH

RESISTANCE OF FLIES AND MOSQUITOES TO DDT. In the earlier stages of the extended malaria control program, DDT residual spraying of the interior of houses proved effective in ridding houses of insects other than anopheline mosquitoes, including houseflies. This caused householders to identify the residual spraying program with fly control. Since enthusiastic reception of the malaria control spraying program because of its fly control features made the work of administrators easier, little or no effort was expended in explaining that it was a malaria and not a fly control measure. During 1947 and 1948 complaints about the failure of the residual spray to control flies became more or less general, even critical in some instances. To counter these complaints and ascertain the facts concerning the receding effectiveness of DDT spraying in fly control, the Technical Development Division initiated an inquiry. Fly eggs were collected from natural breeding media in a number of localities where complaints were most common and shipped to Savannah where the flies were reared under standard conditions. When these adult flies were tested and compared with the insectary strain and with strains collected from field locations where DDT had not been used extensively, it was found that they had developed marked resistance to DDT. The degree of apparent resistance was greatest in those strains from localities that had

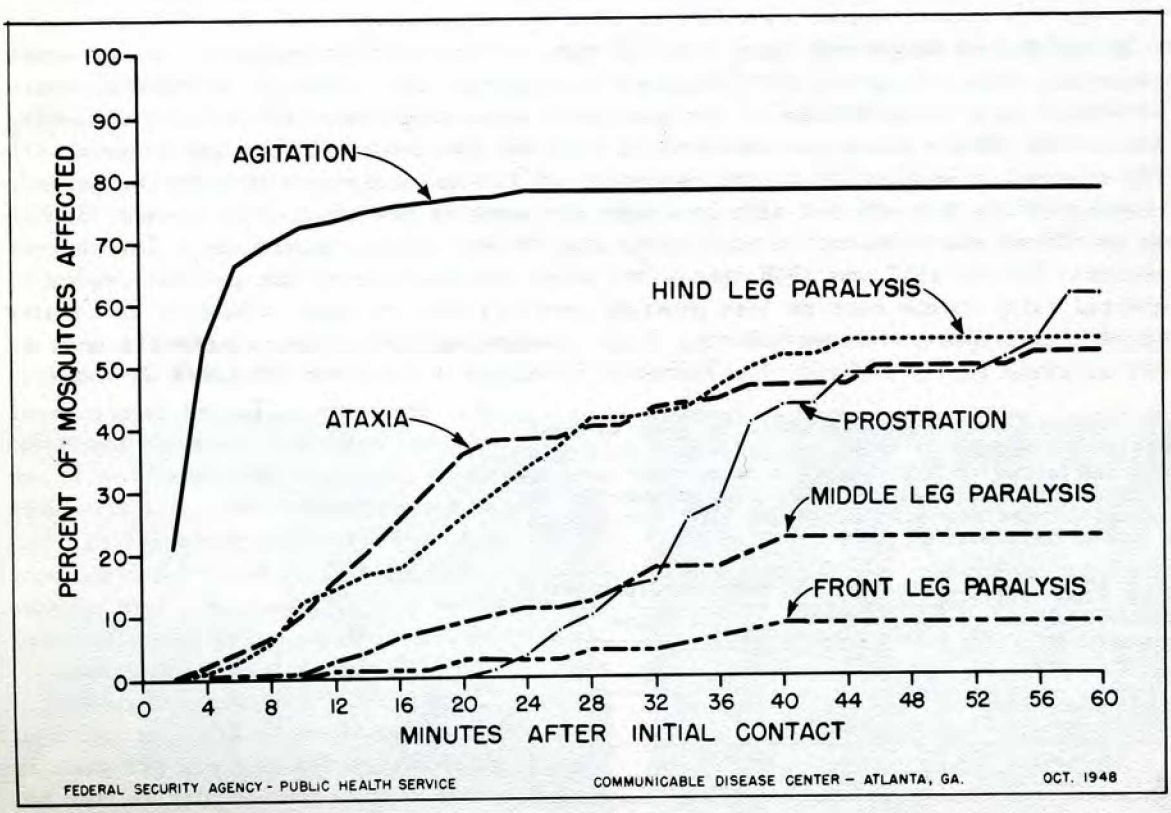
DDT-resistance in flies as shown by mean 24-hour mortality (percent) of adult houseflies from field strains subjected to DDT-control programs for various periods of time. Results from 20-minute laboratory exposures to new deposits of 200 mg. DDT per square foot tested in September 1948.

No. of Strains	DDT Control Program	Mean 24-hour Mortality (percent)	
		Males	Females
3	None	91	82
5	Jan. 1946-Sept. 1947	47	22
4	Sept. 1947-Sept. 1948	30	14

received the most intensive DDT treatment. Resistance was still apparent when some of these strains were inbred in the insectary for four generations, without further exposure to DDT deposits.

Large scale tests were started to determine whether or not other insecticides might be substituted successfully for DDT in dealing with DDT-resistant flies. Towns of approximately 200 houses each were sprayed with one or a combination of two of the several newer formulations. Data from these tests are being tabulated and evaluated. Meanwhile, the question arose as to whether it is reasonable to anticipate that similar resistance may develop in anopheline mosquitoes. This problem was investigated by isolating a strain of *Anopheles quadrimaculatus* in the laboratory, by selecting the survivors of exposures to DDT which killed over 50 percent of the strain; this strain was carried through five generations, and allowed to breed a 6th generation without DDT exposure. The results indicated that the first selection produced marked DDT resistance, that resistance did not increase in succeeding generations, and that the resistance was lost entirely in the first generation without DDT exposure. This resistant strain was found to be similarly resistant to the methoxy analogue of DDT, but to have normal susceptibility to a variety of other insecticides.

STUDIES ON EXPOSURES OF INDIVIDUAL MOSQUITOES TO DDT RESIDUES. To determine more precisely the effect of exposure to DDT on mosquito behavior, individual female *A. quadrimaculatus* mosquitoes were held in a small cylinder, one end of which (the test surface) was either filter paper or plywood. The behavior of these mosquitoes when the test surface was treated with DDT or untreated was observed and recorded. On the basis of some 180 individual mosquitoes observed, it appears that a mosquito under



these circumstances is much more active if the surface is DDT-treated than if it is untreated. Data on these observations are reflected in the accompanying chart and indicate the progressive effects of exposures to DDT. The studies also showed that DDT deposits may so excite adult mosquitoes that they leave the surface on the average of once every 2 minutes instead of the once every 4 minutes average in the case of untreated surface. Since actual contact with the treated surface of 20 to 28 minutes is necessary to produce 50 percent mortality, this excitation increases the chances of mosquitoes escaping from a treated room before absorbing a lethal dosage of DDT.

DEVELOPMENT OF A MUTANT STRAIN OF BLOWFLIES. In the course of breeding large numbers of the blowfly *Callitroga macellaria* it was noted that occasionally there emerged a fly having lemon-colored eyes instead of the brown eyes common to the wild type. Some of these flies were isolated and used to develop a strain having this recessive eye color. Flies from this colony were used in field dispersion studies, since the marking does not wash off. Flies released on the city dump were recovered 2½ miles away in residential areas. Those released in residential areas were recovered at least a mile away in all directions, and in one direction 1½ miles, within 7 hours from the time of release.

HOOKWORM CONTROL INVESTIGATIONS. An interesting disclosure in this field was the observation that larvae of *Ancylostoma braziliense* apparently have a high tolerance for beach conditions. In the course of random sampling, infective stage larvae of unidentified worms, presumably *Ancylostoma braziliense* or the related species *A. caninum*, were repeatedly found in dry sand on the beach just above the high-tide level at 1-inch depths in temperature as high as 119° F.

CONTROL METHODS AND EVALUATION BRANCH

ADULT MOSQUITO CONTROL STUDIES. The question has been raised as to whether mosquitoes that are not confined to a sprayed room will remain in contact with the deposit long enough to obtain a lethal dose, or whether they may be irritated sufficiently by preliminary contacts to leave the treated room and thereby win survival. In an effort to answer this question, bait traps were constructed in which a calf was used as bait. Mosquitoes were allowed to enter through a narrow opening under a long steep eave and trapped at the window if they attempted to leave. One such building was treated with 200 mg. DDT per square foot and another left untreated. It was found that during the first 4 months after treatment, approximately 22 percent of the total number of *Anopheles quadrimaculatus* collected from the treated building succeeded in escaping and surviving for 24 hours, that 67 percent of those entering the building obtained a blood meal, and that approximately 15.4 percent of the total number entering the building succeeded in obtaining a blood meal from the calf, leaving the room to enter the window trap, and surviving for 24 hours.

ANOPHELINE LARVICIDE INVESTIGATIONS. Continued investigations on the effect of routine larviciding with DDT at the rate of 0.1 pound per acre when applied by airplane, and 0.05 pound when applied by hand, have verified previous conclusions that no catastrophic effect upon wildlife should be expected. Where wildlife is not important, experiments have indicated the possibilities of obtaining residual effectiveness against both anopheline and culicine larvae for as long as 8 to 16 weeks by using an emulsion containing 3 pounds of DDT per acre. Dosages of 1 pound of DDT per acre gave from 3 to 5 weeks control. One pound of technical grade benzene hexachloride

(10 percent gamma isomer) per acre applied as an emulsion was effective for 5 weeks, and 4 pounds per acre of water wettable powder containing 25 percent gamma isomer of benzene hexachloride gave control for 8 to 12 weeks.

ENVIRONMENTAL SANITATION STUDIES. A survey of fly breeding sources in the city of Savannah, Ga., has indicated that the city dump is the single most important source of houseflies and blowflies. The second principal source is garbage cans, 60 percent of which were found to be active breeding places. The percentage of premises containing dog stools that were breeding flies ranged from 41 percent in the better residential areas to 7 percent in the tenement area. Privies (not numerous in Savannah) are important fly breeding sources. Abattoirs, poultry houses, and stables produce flies. Grocery stores, feed stores, chicken yards, creameries, and fertilizer plants were found of minor importance as a source of flies. In one section of the city garbage cans were examined, cleaned, and kept clean during the survey period. Semiweekly grill counts made in 10 blocks in the center of the 90-block sanitized area were consistently lower than the counts in a similar check area in an adjoining section of the city. It was concluded that each town should be the subject of an individual survey before fly control activities are inaugurated, but that good sanitation practices constitute the most important, effective, and economical means of fly control.

CHEMISTRY BRANCH

Efforts of the Chemical Investigations Branch during 1948 were centered around the procurement and checking of materials utilized in CDC activities throughout the operational area. A series of tests on emulsion stability under field conditions established the superiority of certain emulsifiers and the checking of samples of materials necessitated the rejection of some shipments. These findings resulted in an improvement in procurement practices and in the recommendation that concentrates be formulated in the field rather than purchased commercially-prepared.

Investigations on the factors involved in the loss of DDT applied as a residual spray showed that evaporation of the DDT was important, amounting to approximately 25 percent of the original application within a period of 8 months under laboratory conditions.

RODENT AND ECTOPARASITE CONTROL BRANCH

INSECTICIDE STUDIES. The search for a good acaricide was continued during the year. Laboratory tests were perfected and utilized in testing over 200 materials in connection with the search for a compound for use in the control of rat mites. Two were against *Echnolaelaps echidninus* in artifically infested buildings, and two others against *Liponyssus bacoti* under actual field conditions. None proved entirely satisfactory.

RODENTICIDE STUDIES. Laboratory investigations in which caged Norway rats were offered a choice of poisoned or unpoisoned baits produced 90 percent or greater mortality when the poisoned bait contained 0.3 to 1.5 percent of thallium sulfate. At the higher dosages, a smaller amount of the poisoned bait was consumed but the killing time was shortened. Similar tests with 1080 on Norway rats offered a choice of poisoned or unpoisoned water and indicated that 12 grams of 1080 per gallon of water is a practicable dosage for obtaining satisfactory results.

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ANOPHELINE LARVICIDE INVESTIGATIONS. Continued investigations on the effect of routine larviciding with DDT at the rate of 0.1 pound per acre when applied by airplane, and 0.05 pound when applied by hand, have verified previous conclusions that no catastrophic effect upon wildlife should be expected. Where wildlife is not important, experiments have indicated the possibilities of obtaining residual effectiveness against both anopheline and culicine larvae for as long as 8 to 16 weeks by using an emulsion containing 3 pounds of DDT per acre. Dosages of 1 pound of DDT per acre gave from 3 to 5 weeks control. One pound of technical grade benzene hexachloride

(10 percent gamma isomer) per acre applied as an emulsion was effective for 5 weeks, and 4 pounds per acre of water wettable powder containing 25 percent gamma isomer of benzene hexachloride gave control for 8 to 12 weeks.

ENVIRONMENTAL SANITATION STUDIES. A survey of fly breeding sources in the city of Savannah, Ga., has indicated that the city dump is the single most important source of houseflies and blowflies. The second principal source is garbage cans, 60 percent of which were found to be active breeding places. The percentage of premises containing dog stools that were breeding flies ranged from 41 percent in the better residential areas to 7 percent in the tenement area. Privies (not numerous in Savannah) are important fly breeding sources. Abattoirs, poultry houses, and stables produce flies. Grocery stores, feed stores, chicken yards, creameries, and fertilizer plants were found of minor importance as a source of flies. In one section of the city garbage cans were examined, cleaned, and kept clean during the survey period. Semiweekly grill counts made in 10 blocks in the center of the 90-block sanitized area were consistently lower than the counts in a similar check area in an adjoining section of the city. It was concluded that each town should be the subject of an individual survey before fly control activities are inaugurated, but that good sanitation practices constitute the most important, effective, and economical means of fly control.

CHEMISTRY BRANCH

Efforts of the Chemical Investigations Branch during 1948 were centered around the procurement and checking of materials utilized in CDC activities throughout the operational area. A series of tests on emulsion stability under field conditions established the superiority of certain emulsifiers and the checking of samples of materials necessitated the rejection of some shipments. These findings resulted in an improvement in procurement practices and in the recommendation that concentrates be formulated in the field rather than purchased commercially-prepared.

Investigations on the factors involved in the loss of DDT applied as a residual spray showed that evaporation of the DDT was important, amounting to approximately 25 percent of the original application within a period of 8 months under laboratory conditions.

RODENT AND ECTOPARASITE CONTROL BRANCH

INSECTICIDE STUDIES. The search for a good acaricide was continued during the year. Laboratory tests were perfected and utilized in testing over 200 materials in connection with the search for a compound for use in the control of rat mites. Two were against *Echnolaelaps echidninus* in artifically infested buildings, and two others against *Liponyssus bacoti* under actual field conditions. None proved entirely satisfactory.

RODENTICIDE STUDIES. Laboratory investigations in which caged Norway rats were offered a choice of poisoned or unpoisoned baits produced 90 percent or greater mortality when the poisoned bait contained 0.3 to 1.5 percent of thallium sulfate. At the higher dosages, a smaller amount of the poisoned bait was consumed but the killing time was shortened. Similar tests with 1080 on Norway rats offered a choice of poisoned or unpoisoned water and indicated that 12 grams of 1080 per gallon of water is a practicable dosage for obtaining satisfactory results.

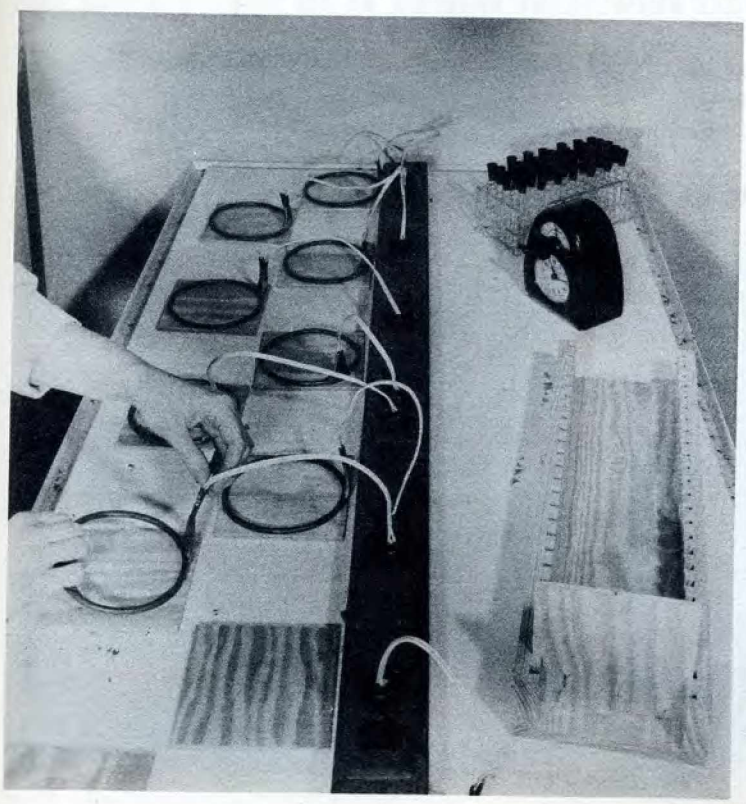
RATPROOFING STUDIES. Laboratory tests in this field were continued to determine the relative resistance of various materials to the gnawing of wild rats. It was concluded that although some materials are more resistant than others, the effectiveness of any material depends in considerable degree upon how it is used.

VECTOR TRANSMISSION BRANCH

During the past year major consideration was given to the broad problem of evaluating the secondary modes of transmission of murine typhus in the animal reservoir. A survey of the literature and measurement of logical considerations evolved the conclusion that the possibilities for secondary modes of transmission fall into the following groups: (1) transmission by rat mites (2) transmission by rat lice (3) transmission by dust containing old dried rat urine and feces and old feces of infected fleas (4) transmission by "direct contact," including not only droplet infection and the contact of mucous membranes but also the contamination of food by fresh and old urine and feces (5) transmission by any capable ectoparasite, including fleas, infected from a rat that has harbored the infection for a long period — problem of duration of infectiousness of the rat.

Repeated attempts to transmit murine typhus by various routes with *Liponyssus bacoti* of the Savannah strain have resulted in failure, and it has not been possible to infect the mite. Limited tests with *Echinolaelaps echidninus* also have failed. Nineteen samples of *L. bacoti*, 14 samples of *Atricholaelaps* sp., and 9 samples of *E. echidninus*, a total of 357 mites, yielded no strain of typhus when injected intraperitoneally into laboratory animals, although 16 collections of *Xenopsylla cheopis* (94 fleas) and 30 collections of *Leptopsylla segnis* (147 fleas) yielded 5 strains of typhus from each species. All of the specimens were taken from rats and their nests on neighboring farms near Valdosta, Ga. Although this negative result with mites corresponds with some reports in the literature, it contradicts others and also contradicts certain theoretical considerations; it may be due to strain difference.

Earlier findings that the rat louse *Polyplax spinulosa* is able to transmit murine typhus by various routes was confirmed. Tests now under way seem to indicate that



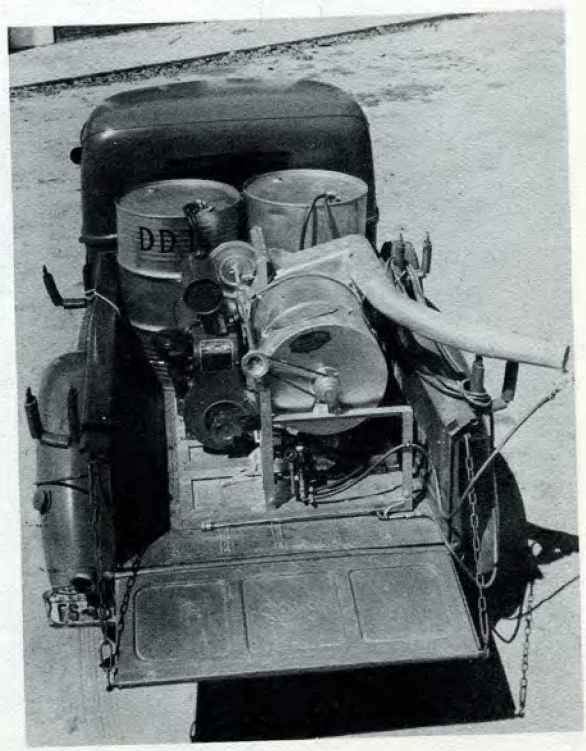
Electrically heated rings used to restrict movement of ectoparasites while being counted.

the transmission efficiency of the louse is less than that of the flea largely because of the more sedentary habits of the louse. It may be these same habits which make the louse less readily controlled by DDT and give it some importance in the epidemiology of typhus. Infected flea feces stored at 25° C. and 47 percent relative humidity have been found infective for 9 days but not longer. No dust taken from rat runs or harborages at the same collecting stations where fleas proved infective has given positive results. Transmission of murine typhus by "direct contact" as it occurs in rats and in the total absence of ectoparasites appears to be of a very low degree. A small number of carefully conducted tests show that rats injected intraperitoneally may become infectious to fleas in the first 24 hours and remain so for at least 23 days though apparently never for as long as 2 months. Rats infected by natural infestation with infected fleas may become infectious for fleas as early as the 5th to the 8th day and remain so as late as the 30th day.

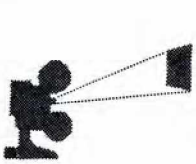
EQUIPMENT DEVELOPMENT BRANCH

Improvements in existing operational equipment received highest priority in activities of this Branch during 1948. However, attention was given to the development of new types of equipment. A portable power sprayer suitable for treatment of hospitals, warehouses, and hotels with DDT-xylene aqueous emulsion or other insecticides was developed and tested. Another piece of equipment which offers wide possibilities is a multipurpose insecticide dispersing machine capable of power spraying, misting, dusting, dusting and misting simultaneously, and transferring liquids between containers. It is relatively light but sturdy.

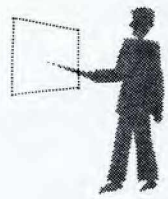
Multipurpose insecticide dispersing machine capable of power spraying, misting, and dusting. ⇨



⇦ Portable power sprayer suitable for hospitals and hotels.



TRAINING DIVISION



Activities of the Training Division are designed to provide facilities for, and to direct field training of public health workers concerned with the control of communicable diseases. Extensive utilization is made of the training facilities by State and local health departments, universities, national foundations, and other units of the U. S. Public Health Service. Emphasis is placed upon the cooperative approach and upon the practical on-the-job type of training which supplements academic training in educational institutions. Constant evaluative studies are carried on so as to permit flexibility and adjustments in curricula to meet the needs of trainees of different educational background and experience. Division activities were expanded during the fiscal year, especially in the Field Training Station category. However, requests for training services from the several agencies continued to increase and many requests could not be answered due to staff and budget limitations.

Divisional operations in 1948 were centered in three principal areas of activity: (1) field training, (2) headquarters training, and (3) other headquarters activities.

FIELD TRAINING

During 1948, training activities were carried on through the following field stations: Savannah, Albany, and Columbus, Ga.; Topeka, Kans.; Troy, N. Y.; and Cincinnati, Ohio. In keeping with the trend toward decentralized training, steps were taken to establish field training facilities in Denver, Colo., and in cooperation with the University of North Carolina, Chapel Hill, N. C. Cooperative agreements conducive to the further expansion of field training were worked out with national foundations (Kellogg Foundation and the Commonwealth Fund), State health agencies, and educational institutions.

The Savannah Field Training Station conducted three types of programs during the year: (1) public health education field training, (2) practical health department records training, and (3) orientation in public health nursing. Two 12-week training courses in public health education were completed during the year, and a third started. These courses were designed to give recent public health school graduates field experience under supervision. A 6-week course in health department records was offered to personnel engaged in this type of work and a 6-week course in public health nursing was conducted for nurses associated with the Savannah Health Department.

The Columbus station conducted four 12-week courses, two in environmental sanitation and two in sanitary engineering. Twenty-nine sanitarians from the United States and two foreign countries attended the environmental sanitation course and 28 trainees

Training class inspecting dairy.

Discussing sanitary aspects of milk processing equipment.

participated in the sanitary engineering course, including 14 from foreign countries.

The Topeka station, operated in cooperation with the Kansas State Board of Health and the Topeka-Shawnee County Health Department, expanded facilities and activities during the year. Larger quarters were procured and the training staff was augmented. Nearly every State in the U.S.P.H.S. District 7 enrolled trainees in the environmental sanitation course held September 6 – November 29. Six trainees from the United States and one from Venezuela attended the second course. Each course extended over a 12-week period. A 2-week course in milk sanitation, consisting of field trips and seminars, was conducted in cooperation with the District staff for selected representatives of the Kansas State Board of Health and the Milk Control Division of the Kansas Board of Agriculture. Staff personnel of the Topeka Training Center assisted in conducting a short course in dairy and food sanitation sponsored by the Missouri State Board of Health at the University of Missouri.

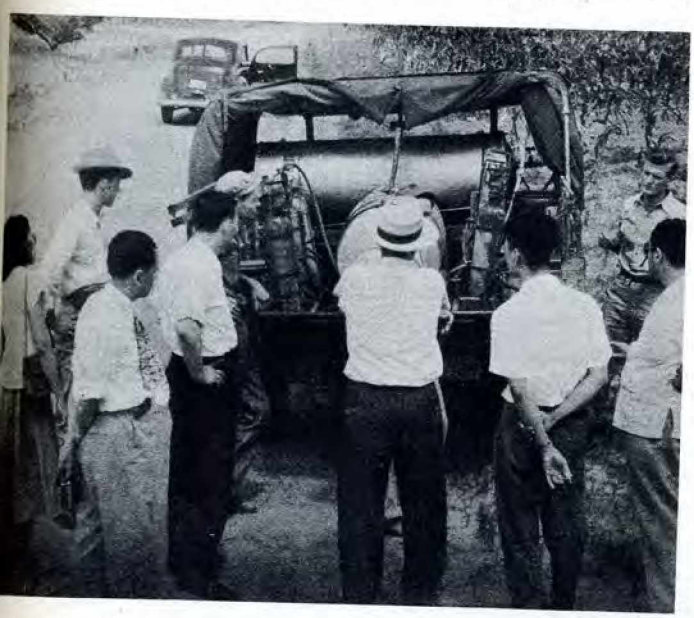
The Troy, N. Y., station, a joint undertaking with the New York State and Rensselaer County Health Departments, was activated during the year and offered a 12-week course in environmental sanitation in January. Attendance was restricted to 10 representatives from health departments in New York State. A second course was conducted in May-June. Plans were made for the enlargement of the facilities and capacity of this station, a decision which elicited the enthusiastic cooperation of members of the staff of the New York State Department of Health and the Rensselaer County Department of Health, and District 1 U.S.P.H.S. staff members. At a conference participated in by representatives of Yale University, University of Massachusetts, New York State Department of Health, and Massachusetts State Department of Health, it was agreed that 4-year graduates of classes in environmental sanitation at the University of Massachusetts would utilize the Troy station during the summer months. It was agreed also that District staff members would offer in-service training assistance to other

cities within District 1.

During the year, two field training programs were conducted at the Water and Sanitation Investigations Station at Cincinnati in cooperation with the director and staff of that station. The first course was a 3-week practical training course for sanitary engineers or their principal assistants charged with the over-all organization and/or operation of stream pollution abatement programs. The second course was for bacteriologists in charge of milk analysis and food utensil examinations for State health departments. This course extended over a 2-week period and was attended by 18 representatives from 16 States.

The Albany, Ga., station was used extensively during the year for the training of sanitary engineers who attended the sanitary engineering training programs at the Columbus station, and for the training of public health personnel from foreign countries. This station was especially useful in courses in malaria control for foreign visitors. In view of the excellent malaria control operations in Dougherty County, consisting of well drilling, privy installation, and septic tank construction in addition to standard antimalaria activities, it has been decided to expand utilization of this facility for training purposes. A portion of the new health center in Albany has been secured for this purpose and an experienced sanitary engineer has been detailed to the project. It is contemplated that this expanded facility will enable the Training Division to accommodate the increasingly large number of foreign visitors requesting training in malaria and typhus control work.

Efforts to strengthen and expand cooperative relations with State health departments, especially in the training sphere, were intensified during the year. At New Orleans, La., three courses in insect and rodent control were conducted by Training Division personnel at the training station of the State Health Department of Louisiana. Preliminary plans were made to cooperate in establishing and operating a public health nurse training center in North Dakota and South Dakota. Cooperative relationships were established with the Texas State Health Department and the Kellogg Foundation in anticipation of joint training activities at the State Field Training Station at Austin.

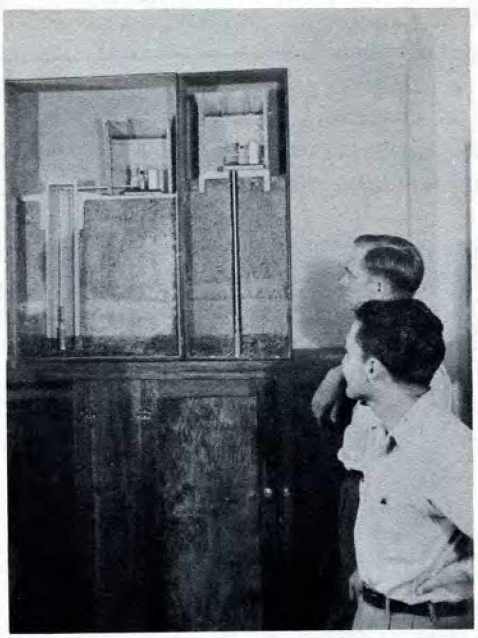


A group of foreign trainees being instructed in spraying homes for malaria content.

Health educator and community leaders discuss health education.

Model of rural sewage disposal system.

Training in rural water supply sanitation.



Septic tank model used in sanitation training course.

HEADQUARTERS TRAINING

The primary objective of activities carried on in this sphere is to provide training opportunities suitable to the needs of persons engaged in the several areas and levels of public health work. Trainees served include employees of the Communicable Disease Center and other Public Health Service units, personnel of State and local health departments, and visitors from foreign countries. Training activities include regularly scheduled courses concerning different areas of public health work and special courses to accommodate trainees unable to attend regularly scheduled courses.

Two 4-week courses on rat-borne disease prevention and control were presented in Atlanta during the year. Trainees attending numbered 39 and came from State and local health departments, the U. S. Fish and Wildlife Service, and foreign countries. Members of the Training Division staff participated in training courses in insect and rodent control held in the following places: Greenwood and Hattiesburg, Miss.; Clarksburg and Beckley, W. Va.; and two in Columbia, S. C. These courses, carried on in cooperation with the respective State health departments, included lectures and discussions using films and demonstrations on rat control, rat ectoparasites, mosquitoes, flies, and other insects of public health importance. Enrollment in these courses exceeded 300. Individual training opportunities of from 1 to 10 weeks' duration were arranged to accommodate 32 persons unable to attend the scheduled courses. Training offered in these individual courses was patterned to fit the needs of the particular individuals.

During the year, more than a hundred public health workers from 32 foreign countries were given training in one or more phases of public health work. Although foreign visitors were permitted to attend regularly scheduled training courses and many were able to do so, it was necessary to provide special courses to meet the particular

needs and time limitations of these trainees. The majority of foreign visitors during 1948 were interested in malaria and typhus control training. However, some were interested in the field training of public health personnel, public health administration, and in the over-all activities of the Communicable Disease Center. Nineteen foreign trainees attended a 1-week orientation course for public health personnel conducted in June 1948. A special 1-week course in insect control was arranged for seven Chinese visitors in March 1948. This course included field work on DDT residual spraying and mist larviciding, and identification and control of mosquitoes, flies, lice, ticks, mites, and sandflies.

Two 5-day orientation courses for new CDC personnel were organized and conducted during the year. In these courses trainees were afforded an opportunity to become familiar with CDC operations through conferences, films, lectures, and tours of the respective Divisions. In cooperation with the Division of Industrial Hygiene of the Georgia Department of Public Health, and the Georgia Institute of Technology, a field training course in industrial hygiene was conducted. Supervised field trips were made in industrial plants in Atlanta and other Georgia cities. Thirteen trainees from eight health departments participated in this course.

OTHER ACTIVITIES

Several manuals for use at headquarters and in the field were completed during the year, including an orientation and training manual entitled ".....for the Nation's Health." The Topeka Field Training Center completed and issued a manual for sanitarian instructors. Work continued on the projected "Rat-Borne Disease Prevention and Control" manual. A program for training persons interested in learning housing evaluation techniques was inaugurated in December. Two members of the A.P.H.A. Committee on Hygiene of Housing were selected to serve as consultants in this program. A Special Services Branch was activated within the Training Division during the year and assigned the mission of handling special training and public relation activities, especially in connection with foreign visitors.

The Division chief represented the U. S. Public Health Service and the A.P.H.A. as a delegate to the First Inter-American Congress of Sanitary Engineering, held in Santiago, Chile. Other Division personnel participated in a variety of conferences, seminars, and conventions during the year. In all divisional activities, emphasis was upon closer and more extensive cooperation among agencies dedicated to the common task of improving the nation's health.

New CDC personnel in attendance of orientation course conducted by the Training Division.

The Veterinary Public Health Division was activated September 1, 1947, when the functions of the Veterinary Public Health Section of the States Relations Division of the U. S. Public Health Service were transferred to the Communicable Disease Center. This transfer provided opportunities for an expansion of activities in this field and their integration into the over-all approach to the communicable disease problem. During the year considerable time of the headquarters staff was consumed in assisting States inaugurate new or in expanding existing veterinary programs. Six States inaugurated new programs. Requests were received from Japan, Korea, and Cuba for assistance in planning veterinary programs in the respective countries. Information applicable was forwarded in each instance. The Pan American Sanitary Bureau was assisted in establishing a Veterinary Public Health Division to be activated in 1949. Cooperation was maintained with the Veterinary Corps of the Department of the Army in developing training programs for veterinarians in public health, food sanitation, and radiological safety. Division personnel engaged in the preparation of reports of studies and the writing of papers for publication and/or presentation at meetings of professional groups.

INVESTIGATIONS BRANCH

This Branch carried on salmonellosis, brucellosis, and taeniasis studies in cooperation with State health departments, State universities, State veterinarians, and the U. S. Bureau of Animal Industry.

SALMONELLOSIS. Studies involving 100 dogs revealed that 19 percent were infected with 16 *Salmonella* types. It was revealed also that dogs could be subclinical carriers of *S. typhimurium* and *S. Oranienburg* which would become acute in the presence of secondary invaders. Investigations of food products of animal origin pointed to dried egg powder as a common source of *Salmonella* organisms and cause of outbreaks.

BRUCELLOSIS. The study in Indiana continued to yield data emphasizing the importance of this infection as an occupational disease among rural residents, although the number of blood agglutination reactors was not as high as some authorities had supposed. The determination of the best method of isolating the *Brucellae* remains a problem. For the present it is recommended that both guinea pig inoculation and culture methods be used. The Utah brucellosis studies revealed that the epidemiology of undulant fever was different from that in the Midwest. Most cases in Utah and

Arizona could be traced to family cows or suburban milk supplies that did not come under supervision. Although state-wide milk pasteurization programs will reduce this source of infection, the regulation of the sale of milk cows is necessary to obtain satisfactory control.

TAENIASIS (Beef tapeworm). Investigations in Arizona showed how effectively the prevalence of animal infection can be reduced by the treatment of human carriers and the development of rural sanitary practices. In order to continue the control of tapeworm diseases it is necessary to maintain adequate sanitary facilities for transient labor.

Q FEVER. Assistance was rendered in investigations of outbreaks of this disease in man and cattle in California and other western States. Studies in this field are being pursued in collaboration with the California Health Department.

In Colorado, a state-wide plan for the control of meat and poultry products is under test. It is a voluntary plan, but the benefits are such that all areas have requested the privilege of participating in order to enjoy certification rights. In addition, a program of veterinary disease reporting by the State health department has been inaugurated. Cooperative investigations were continued with the Public Health Service Tuberculosis Division and the State health department in the study of histoplasmosis in animals in Kansas. The similarity of the rate of skin reactors in cattle and children up to 5 years of age indicates a common source.

RABIES CONTROL BRANCH

A number of States inaugurated rabies eradication campaigns during the year. Sixteen States now operate organized eradication programs. The Rabies Control Branch assisted these States through technical consultation, filmstrips, and educational materials. Foreign quarantine regulations on rabies were extended through the adoption of such measures by additional nations. The Pan American Sanitary Bureau approved plans for a Veterinary Public Health (Zoonosis) Division which should facilitate the eradication of rabies.

Studies on the efficacy of standard and experimental rabies vaccine were completed during the year. All the vaccines were found to be effective in preventing canine rabies except a mustard gas attenuated agent. A new study was instituted to determine the duration of immunity. The rabies laboratory developed an accurate method for differentiating pseudo rabies (Aujeszky's disease) from rabies which has eliminated many troublesome diagnostic problems. Considerable assistance was extended State health departments in the diagnosis of typical rabies and in combating epizootics of rabies. In Memphis, Tenn., 24,000 dogs were immunized during an 8-day period. Six weeks after the immunization campaign the incidence of rabies had declined from 50 to 1 per week, and in another month all rabies had disappeared. A check 6 months later disclosed that no case of rabies had been reported.

Rabies control by animal immunization.

PLAGUE SUPPRESSIVE LABORATORY

The Plague Suppressive Laboratory, San Francisco, Calif., became a unit of the Communicable Disease Center on October 1, 1947. Direction of activities of the unit was assumed by Medical Director C. R. Eskey on August 1, 1947, upon the retirement of Medical Director N. E. Wayson. In April 1948, certain administrative functions in connection with CDC activities in Hawaii and California were placed under the supervision of the director of the Plague Suppressive Laboratory. Activities involved include plague and typhus programs in Hawaii and the encephalitis and malaria programs in California.

Most of the plague work in the United States is done by this laboratory, which consists of field and laboratory activities and experimental research. Accompanying tables indicate the scope and character of activities carried on during the fiscal year 1948. California conducts its own plague surveys and laboratory work. The State health department in Texas is conducting an intensive study of a plague area in the western part of that State. Washington and Oregon operate their own survey units but send all specimens to the San Francisco Laboratory for examination.

Table 1

FIELD AND LABORATORY ACTIVITIES DURING FISCAL YEAR 1948

	Rodents Examined		Specimens Inoculated		Bacteriological Examinations				
	In Lab.	In Field	Parasites	Tis.	Plague	Typhus	"Salmonella"	Water	Misc.
July	2,240	15,204	845	77	10	—	—	31	1
August	1,632	11,084	599	19	4	—	—	28	3
September	1,484	—	222	4	—	—	—	31	4
October	1,109	—	236	—	389	100	—	16	3
November	1,510	—	188	—	978	108	—	30	2
December	1,390	—	186	—	772	147	—	9	26
January	1,507	—	135	2	553	109	—	24	34
February	1,013	—	153	—	432	46	243	17	33
March	1,501	—	182	—	249	78	206	6	10
April	1,283	10,559	859	12	65	52	275	12	36
May	1,861	10,804	851	26	19	54	309	10	31
June	1,764	8,505	936	14	6	—	6	13	88
Total	18,294	56,156	5,392	154	3,477	694	1,039	227	271
	74,450		5,546		5,708				

Table 2

DISTRIBUTION OF PLAGUE AS DISCLOSED BY LABORATORY EXAMINATION OF SUBMITTED SPECIMENS

State	County	No. Pos.	Type of Specimen
Arizona	Apache	2	fleas, ticks
Arizona	Navajo	1	fleas
California*	El Dorado	2	tissue
California	Kern	3	fleas
California	Mono	3	fleas
California	Placer	2	fleas
California	San Luis Obispo	10	fleas
California	Siskiyou	3	fleas
Colorado	Custer**	1	tissue
Colorado	La Plata**	2	fleas
Colorado	Park**	11	fleas (9), tissue (1), fleas and ticks (1)
Kansas	Logan**	2	fleas
Kansas	Scott	2	fleas, lice
New Mexico	Catron	2	fleas
New Mexico	Guadalupe**	2	fleas
New Mexico	Lincoln	1	fleas
New Mexico	Rio Arriba**	14	fleas (9), tissue (3)
New Mexico	Socorro**	1	fleas
Oregon	Lake	1	fleas
Texas	Dawson	1	fleas
Washington	Douglas**	2	fleas
Washington	Kittitas	4	fleas
Total 8	22	72	fleas (62), tissue (7) lice (1), ticks (1) fleas and tick (1)

* All positive specimens from California were reported by the California State Department of Health.

**Counties positive for first time.

FIELD ACTIVITIES

In the fiscal year 1947, 14 field survey units were maintained. This number was reduced to eight in the spring of 1948. During the fiscal year 1948, these eight units operated in 11 States: Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming. Field surveys were made during the months of July and August, 1947, and in April, May, and June in 1948. The survey units obtained and examined 56,156 animals and sent specimens of ectoparasites and tissues to the laboratory for examination. Plague was demonstrated in 22 counties of eight States on 72 occasions. Eight of these counties were shown to be plague infected for the first time. Sixty-two of the positives were obtained from fleas, seven from tissues, one from lice, one from ticks, and one from a combination of fleas and ticks. Animal hosts included prairie dogs, squirrels, grasshopper mice, wood rats, cotton rats, meadow mice, chipmunks, and whitefooted mice.

At the end of the field survey season in the fall, those employees not required for

Inoculating test animal with parasites.

Segregation of parasites combed from rats.

work in the laboratory during the winter season were separated until the start of the spring season. Only six field employees were retained during the 1947-48 winter months.

LABORATORY ACTIVITIES

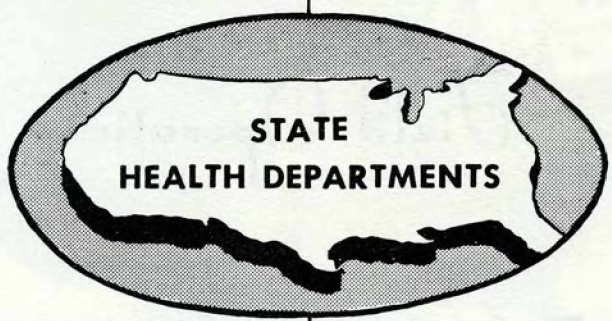
During the year, 18,294 animals were autopsied in the laboratory. A majority of these were rats from rodent control programs conducted in cooperation with the San Francisco City Health Department. The remainder were rats removed from vessels in quarantine. One hundred and fifty-four specimens of tissue and 5,392 pools of ectoparasites from animals obtained in the field were injected into susceptible laboratory animals to determine the presence of plague. Nearly 6,000 bacteriological examinations were made. Of these, 3,477 were for plague, 694 were complement fixations for endemic typhus, 1,039 were for *Salmonella* infections found in the mouse colony, and 227 were water samples. Miscellaneous bacteriological work, done principally for the U. S. Marine Hospital, included tests for leptospirosis, diphtheria, leprosy, tuberculosis, tularemia, pseudo-tuberculosis, pregnancy, and complement fixations for plague. Blood specimens taken from 501 domestic rats trapped in San Francisco were subjected to typhus complement fixation tests with negative results.

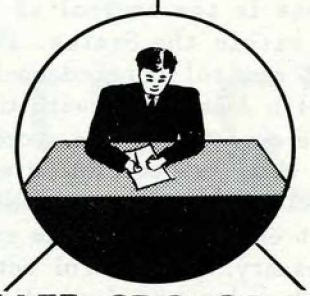
RESEARCH ACTIVITIES

Experimental transmission studies were carried on during the months of September to March inclusive. It was demonstrated that the common rat flea, *Xenopsylla cheopis,* is the best known transmitter of plague. All efforts to transmit plague with the common mouse flea, *Leptosylla segnis,* resulted in failure. Experimental work was undertaken which demonstrated that more fleas could be recovered from rats trapped alive than from those killed in trapping. In one experiment, 7 fleas out of 10 were recovered from rats trapped alive, while only 3 fleas out of 10 were recaptured from rats killed in trapping.

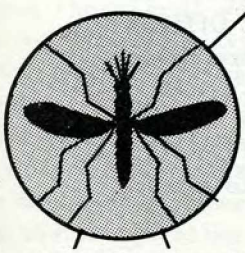
USPHS DISTRICT OFFICES
CDC REPRESENTATIVES

FIELD ORGANIZATION

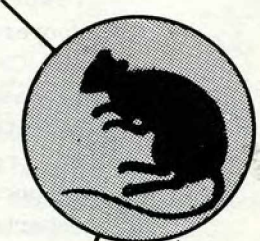




STATE CDC OFFICE



MOSQUITO CONTROL ACTIVITIES



TYPHUS CONTROL ACTIVITIES

AREA PROJECTS

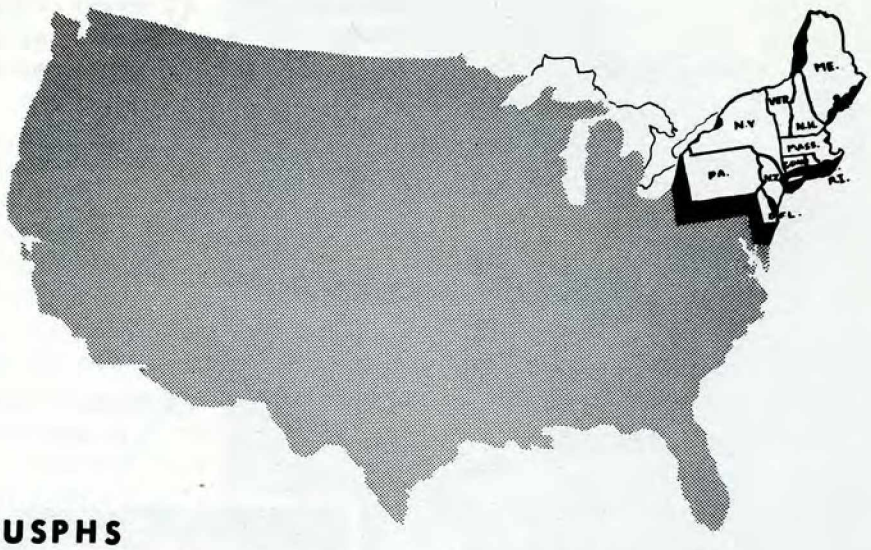
MOBILE UNITS

AREA PROJECTS

MOBILE UNITS

Field Operations

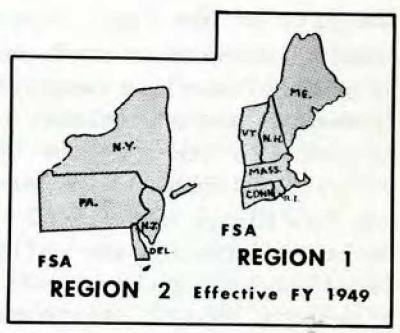
The Communicable Disease Center is responsible for assisting State and local health departments in the control of communicable diseases within the States. The types and extent of control carried on by State and local health departments with the assistance of CDC are depicted in the succeeding pages. In States where communicable diseases such as malaria, typhus, and encephalitis are of sufficient endemicity to make extensive control necessary, CDC control activities were conducted under the jurisdiction of the respective State health departments, in cooperation with U.S.P.H.S. District Offices and CDC Headquarters. In States where these diseases were not endemic but constituted a potential hazard, CDC activities were carried on from U.S.P.H.S. District Offices in cooperation with the respective State health departments.



USPHS

DISTRICT 1

Headquarters: New York, N. Y.

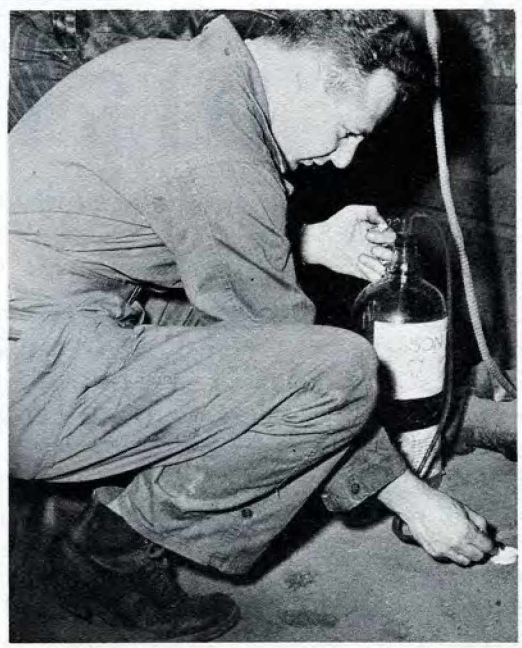


The Communicable Disease Center activities of District 1 during the fiscal year 1948 continued to offer a wide variety of services to the 10 Northeastern States comprising the District. The unit functioned for the purpose of aiding in the problems of insect and rodent control and the control of insect- and rodent-borne diseases. This multiple objective was achieved, at least in part, through the fostering and the inaugurating of training programs, the conducting of extensive surveys, and through participation in technical consultations with State and local health departments, and with other governmental agencies.

MALARIA CONTROL. During the summer of 1947, the potential hazard of malaria transmission was keenly felt in certain sections of the Northeast. The Veterans Administration, the Army, and the Pittsburgh Engineering District therefore requested that surveys be made at hospitals, installations, and reservoirs under their respective jurisdictions. In each instance surveys were made, technical information assembled, and recommendations submitted. Mosquito reconnaissance inspections were made of Federal Public Housing Authority Projects in New York and appropriate recommendations entered. Advice on mosquito control was given and, where necessary and feasible, equipment was loaned for proper control operations. After surveys, a report was sub-

Preparation of 1080 water for rodent control demonstration.

Demonstration of use of 1080.



mitted embodying recommendations for a mosquito control project along the coastline of New Hampshire. The health department of the city of New York requested and was given advice on salt marsh mosquito control by means of airplane larviciding. Guidance in methods and operational techniques was extended to other groups throughout the District. Pursuant to conferences with the New York District Office of the U. S. Engineers, information was collected and collated concerning the possible existence of a malaria hazard due to water chestnut growth on the Hudson and Mohawk Rivers. Mosquito light traps were operated at Army installations and Veterans Administration hospitals in order to ascertain the mosquito populations in the respective areas.

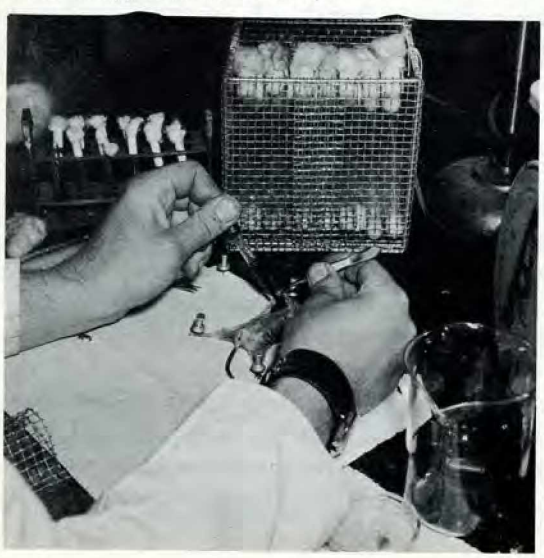
RODENT CONTROL. The growing interest of the citizenry in the problems concerned with rodent control led to an increased call for the services of CDC personnel. Extensive investigations were conducted for Veterans Administration hospitals under Branch Office No. 2, and local health and sanitation departments in New York, New Jersey, and Massachusetts. Recommendations covering both temporary and permanent rodent control measures were submitted. Plans for implementing the National Rodent Control Program in District 1 were mapped in cooperation with the U. S. Fish and Wildlife Service. Four regional conferences for local health officials were organized in connection with

this program. It is the continuing objective of the District personnel to bring to the local health officials in the area the wealth of collated information and experience accumulated by and available through the Communicable Disease Center.

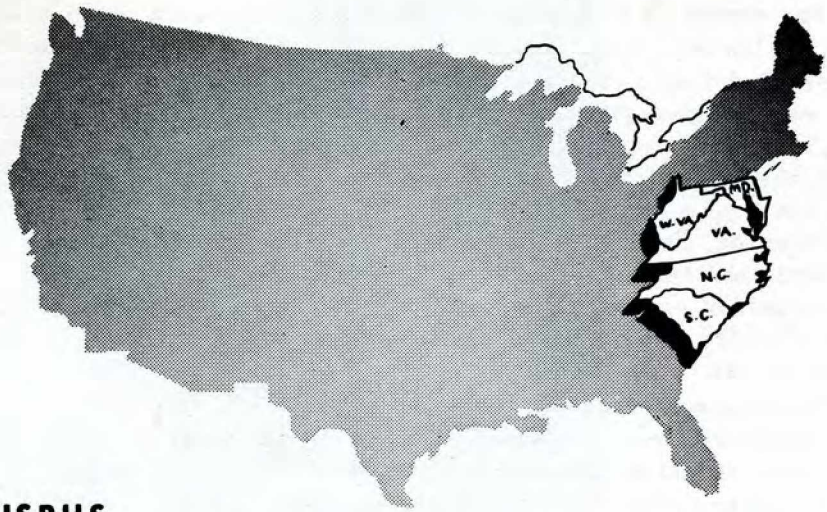
RICKETTSIALPOX SURVEY. A cooperative agreement between CDCA in District 1 and the New York City Health Department for the study of the mouse-borne rickettsialpox was organized in 1947 and activated in July of that year. The program, covering a 12-month period, was designed primarily to determine the extent of rickettsialpox infection in mice, and secondarily to determine the possible reservoir in rats and if vectors other than *Allodermanyssus sanguineus* figure in the transmission of the disease. The survey, a cooperative enterprise of the Directors of the Bureau of Sanitary Engineering, Preventable Diseases, and Laboratories of the New York City Health Department, and the CDC representative in District 1, was executed by personnel from the participating agencies in accordance with agreed techniques and methods. New York City was divided into a series of zones in each of which a weekly intensive trapping campaign was conducted. Collections from traps were made daily, and rodents were bled and ectoparasites collected upon return to the laboratory. Ten species of mites, four species of fleas, and one species of louse, totaling 12,816 ectoparasites in all, were recovered from 982 mice and 128 rats. Of 701 complement fixation blood tests run, 57 rodents were designated as positive. Publication of comprehensive findings of the survey is planned for the ensuing fiscal year.

OTHER ACTIVITIES. Preliminary steps were taken toward the establishment of Troy, N. Y., as the northeastern city in which the CDC Fly Control Branch will operate one of its fly control projects. Conferences were held with New York State, Rensselaer County, and Troy Health Departments in this matter. On the basis of observations of the New York City ragweed control program, consultant service in ragweed control was extended to other cities and States in the District. Conferences with visiting representatives from foreign countries and private institutions, and with State health department officials continued to be a major activity. Problems dealt with included fly, mosquito, and roach control, insecticides, and aquatic plant and ragweed control.

Mouse being bled — Rickettsialpox Survey, New York City.



Communicable Disease Center personnel organized and presented lectures and exhibits on insect and rodent control for sanitary inspectors operating within the area, for pest control operators, and for commissary personnel of private institutions. Appropriate training and demonstration activities were organized and carried on in connection with the Field Training Station, Troy, N. Y.; at marine hospitals in Massachusetts, Maine, and Pennsylvania; at Veterans Administration hospitals; and for university classes in sanitary science. The CDC film library was extensively utilized by Federal, State, and local organizations, and by District personnel. Promotional and recruiting activities were conducted in the District for the CDC Laboratory and Training Divisions and for the New York Field Training Station, Troy, N.Y.



USPHS

DISTRICT 2

Headquarters: Richmond, Va.

FSA
REGION 3
Effective FY 1949

Communicable Disease Center activities during the fiscal year 1948 claiming the attention of District personnel consisted of consultative and supervisory services to the three States, North Carolina, South Carolina, and Virginia, having operational programs and training and educational work in the remaining States, West Virginia, Maryland, and the District of Columbia. Activities in the operational States are covered in reports submitted by the respective States. Stimulated interest in insect and rodent control, engendered by District promotional work, precipitated requests for training schools in these activities for State and local health department personnel. Decentralized training privileges were made available in each State and in the District. These courses included practical training in insect and rodent control, and demonstrations in the handling and application of DDT and other insecticides and in the use of tested techniques. Three rodent control and one insect control schools were conducted in the District; two insect and rodent control schools in West Virginia and South Carolina; and one each in Maryland and Virginia. Other activities included assistance in malaria control to Federal agencies, and surveys on malaria, fly, and rodent control problems in those States without operating programs.

North Carolina

CARL V. REYNOLDS, M. D. State Health Officer

Programs of greater magnitude than in any previous year were conducted during the fiscal year 1948 in malaria control residual spraying, typhus control, supervision of impounded waters, and fly control. In DDT residual house spraying, CDC funds were used for materials, equipment, transportation, and supervision. Labor and maintenance of equipment were financed by local units. Fly control operations were financed by local units, other than technical supervision by the State CDC office. Larviciding, as in 1947, was financed wholly by local units. Typhus control activities were joint enterprises of the State board of health and the local units involved.

MALARIA CONTROL. Thirty-six of the 100 counties in the State participated in the DDT residual house spraying program. In five counties (Craven, Gates, Pasquotank, Washington, and Tyrrell) spraying was on a county-wide basis, while in the other 31 the program was limited to areas previously shown to be malarious, or potentially so. A single application was sprayed to 58,431 houses during the year, with an average of 1.03 man-hours and 0.91 pound of DDT per treatment. In most instances, spray crews consisted of two men, one leader and one laborer. Each crew was equipped with a truck, three spray cans, and incidental equipment. Material was mixed at a central plant and delivered to field stations.

The residual house spraying program operated in the following counties: Beaufort, Bertie, Bladen, Chowan, Columbus, Craven, Cumberland, Duplin, Edgecombe, Gates, Greene, Halifax, Harnett, Hertford, Hoke, Hyde, Johnston, Lenoir, Moore, Nash, New Hanover, Northhampton, Onslow, Pasquotank, Pender, Perquimans, Person, Pitt, Richmond, Robeson, Sampson, Scotland, Tyrrell, Washington, Wayne, and Wilson.

Large scale construction of new water impoundments continued during the year. The U. S. Soil Conservation Service cooperates with the State board of health in water impoundment operations by requiring that each citizen soliciting the Service's aid in building a pond to first obtain a permit from the health department. During the fiscal year, 737 ponds were inspected and permits issued for 312 new ponds.

Morbidity and mortality statistics show a continuance of the downward trend in malaria. Two deaths from malaria were reported to the Division of Vital Statistics, while the Division of Epidemiology received reports of only 127 cases during the

A pond in Nash County built in accordance with regulations. The upright pipe is attached to the under drain with a swivel joint. When the basin is filled, the elevation of the water can be regulated by leaning the pipe.

year. The Diagnostic Department of the State Laboratory of Hygiene continues to find an occasional positive blood smear. During the 1947 calendar year, 33 such slides were found among those submitted by practicing physicians. Since only a small percent of physicians submit slides, it is believed that the number of positive slides, though small, signifies the existence of a substantial amount of malaria within the State.

FLY CONTROL. The State board of health promotes fly control activities on the part of local units by purchasing DDT powder and allied chemicals in large quantities, mixing the concentrates, and selling to local units at cost. The State board of health also furnishes personnel to train local health department employees in the execution of fly control work. General consultation services are provided throughout the fly control year. It is estimated that approximately 75,000 premises were sprayed for fly control during the fiscal year.

Edgecombe County family awaiting arrival of DDT spray crew, having been notified by the advance contact man.

TYPHUS CONTROL. Typhus control activities pursued during the year included ratproofing, DDT dusting, and rat poisoning.

Ratproofing projects, as in previous years, were set up with the city involved furnishing supervisors, a secretary, a revolving fund, a crew of carpenters and masons, office and storage space; and the State board of health furnishing technical supervision, trained personnel detailed to each project, and some automotive equipment. Estimates of the costs of materials and labor were obtained by surveying establishments in the area to be treated in advance of operations. Property owners were contacted by city personnel to obtain appropriate ratproofing agreements. Bills for ratproofing work were submitted to property owners and funds thus received remitted to the city. Ratproofing operations are summarized in table 1. In addition, 20 garbage houses were constructed of ratproof material at an average cost of $100. Poisoning and trapping activities were carried on in conjunction with the ratproofing projects.

Dusting projects were set up in much the same manner as those covering ratproofing. Dust was applied to rat runs, harborages, and rat burrows using Dobbins and Handiman dusters, foot pumps, hand shakers, and rotary dusters. The evaluation work, consisting of trapping, bleeding, and combing of rats, indicated that the dusting projects were effective. Dusting operations during the year are summarized in table 2.

Nineteen towns (nine rural) in nine counties operated rat-poisoning programs during the year. The towns supplied the bait, as well as the transportation and labor for its distribution. The State board of health provided technical supervision in the preparation and distribution of the bait. Table 3 reflects poisoning activities for the year.

Table 1

RATPROOFING

County	City	Establishments Ratproofed	Man-Hours per Establishment
Catawba	Hickory	217	57
Cleveland	Shelby	160	65
Durham	Durham	375	50
Forsyth	Winston Salem	107	136
Mecklenburg	Charlotte	236	62
Wayne	Goldsboro	61	136
Total	6	1,156	84.33

Table 2

DDT DUSTING

County	City	Rural Town	Establishments Dusted	Man-Hours per Establishment
Cleveland	Shelby	—	3,715	0.25
Craven	New Bern	—	1,170	0.26
Granville	Oxford	—	1,304	0.32
Harnett	Dunn	1	4,586	0.40
Lenoir	Kinston	—	7,749	0.20
Mecklenburg	Charlotte	—	2,105	0.21
New Hanover	Wilmington	—	14,485	0.22
Sampson	Clinton	—	3,350	—
Wilson	Wilson	—	7,994	0.24
Total	9	1	46,458	0.26

Table 3

RAT POISONING

County	City	Rural Towns	Establishments Poisoned	Amount and Type of Poison	Man-Hours per Establishment
Beaufort	Belhaven	—	560	70# Red Squill	0.2
Bladen	Elizabethtown	—	400	25# Red Squill	0.5
Burke	Morganton	—	2,000	200# Red Squill	0.6
Gaston	Cherryville	—	1,500	100# Red Squill	0.2
Halifax	Roanoke Rapids	—	1,800	160# Red Squill	0.2
Hertford	Ahoskie	—	500	50# Red Squill	0.9
Nash	Bailey	—	300	15# Red Squill	0.2
Pitt	Greenville	—	1,800	60# Red Squill	0.1
Randolph	Asheboro	9	4,000	290# Red Squill	0.2
	Liberty	—	250	40# Red Squill	0.6
Total	10	9	13,110	1,010# Red Squill	0.35

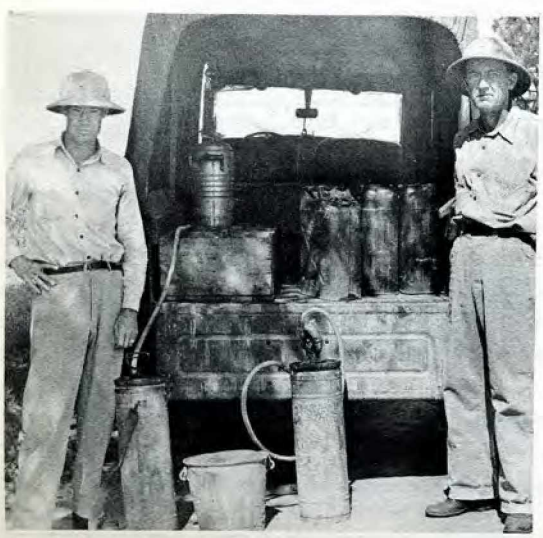
South Carolina

BEN F. WYMAN, M. D. State Health Officer

Malaria and typhus control programs constituted the principal Communicable Disease Center activities in South Carolina during the fiscal year 1948. As in previous years, control operations were carried on under the direction of the Division of Preventable Diseases of the State board of health. The State legislature appropriated funds to cover the cost of labor and some of the equipment and supplies employed in the residual house spraying program. Cities and towns provided funds for labor to assist in DDT dusting in connection with typhus control activities. Investigational projects were carried on to determine the effectiveness of operational measures.

MALARIA CONTROL. In malaria control activities this year, as in the past, chief reliance was upon the DDT residual house spraying program. During the year, 189,359 houses in 41 counties were sprayed at an average expenditure of 1.3 man-hours and 0.93 pound of DDT per application. This compares with 127,273 spray applications in the fiscal year 1947 at an expenditure of 1.62 man-hours and 0.93 pound of DDT per application. The State and local units furnished 68 percent of the cost of the house residual spray program. In line with the recommendation of CDC headquarters, during 1948 operations a single application of 5 percent DDT was substituted for the previously used two applications per year procedure.

In 24 counties (Aiken, Allendale, Bamberg, Barnwell, Beaufort, Berkeley, Calhoun, Charleston, Clarendon, Colleton, Darlington, Dillion, Dorchester, Florence, Georgetown, Hampton, Horry, Jasper, Lee, Marion, Marlboro, Orangeburg, Sumter, Williamsburg) spraying was conducted on a county-wide basis. Rural homes were included in the program and towns of 2,500 and less were treated as rural areas. A supervisor was employed for each county and all activities operated through the health department of the respective counties. Four mobile crews, provided from State funds, were used to spray homes in recently malarious areas in the following up-State counties; Anderson, Chester, Cherokee, Edgefield, Fairfield, Greenwood, Greenville, Laurens, Lancaster, Lexington, Newberry, Oconee, Spartanburg, and Saluda. In addition, crews assigned to the county health departments carried on spraying in rural sections of Chesterfield, Kershaw, and Richland Counties. In these operations, spraying was limited to areas of known malarious tendencies. The State board of health furnished equipment, materials, and supervision for spraying unscreened houses in outlying areas



Residual spray crew and equipment.

upon the request of certain towns and smaller cities adjacent to the treated areas. The communities requesting the assistance furnished the labor and transportation necessary to these operations.

On the basis of surveys conducted by county supervisors, effective control of mosquitoes in houses was obtained in all sprayed areas. The general public expressed satisfaction with the degree of fly control obtained, although no direct effort toward fly control was made. Investigations conducted by the State board of health to determine the most desirable DDT strength for spraying purposes indicated that increasingly better results accrue up to 5 percent strength. Six and 7 percent strength appeared no more effective than 5 percent, and 10 percent seemed less effective.

Other malaria control activities during the year included the cleaning of ditches in the Fort Jackson area near Columbia, and a small amount of larviciding. The malaria investigation station at Manning was operated on a somewhat reduced level due to personnel and budget limitations. Mosquito density and activity studies were continued. Monthly blood films were collected from approximately 2,000 persons. A few positive blood films and positive mosquito glands continued to be found.

TYPHUS CONTROL. Federal allocations for typhus control during 1948 were reduced from the 1947 level, necessitating a curtailment in activities in this field. Curtailment in DDT-dusting operations was accomplished by the substitution of selective dusting for the previous procedure of dusting all establishments in the operational area. Towns in operational areas provided labor to assist in dusting and trapping operations. The only permanent typhus control personnel utilized in 1948 on the dusting program were supervisors who operated as mobile crews. This enabled the supervisors to cover assigned areas but not, of course, as satisfactorily as under the policy of trained permanent crewmen. Dusting activities during the year consisted of the application of 10,520 pounds of dust to 3,382 premises.

Ratproofing operations were carried on in Anderson, Charleston, Conway, St. Matthews, and Lancaster. The programs in Anderson, Conway, and St. Matthews were completed. In these operations, the State and CDC furnished supervision, and local contributions amounted to $18,231.87. During the year, 408 establishments were ratproofed. Eradication and rat trapping activities were carried on in conjunction with ratproofing and dusting programs. A total of 1,152 rats were trapped and examined. Twenty-eight of the 1,152 showed positive Weil-Felix reaction.

Neglected alley with rat runs and harborages present.

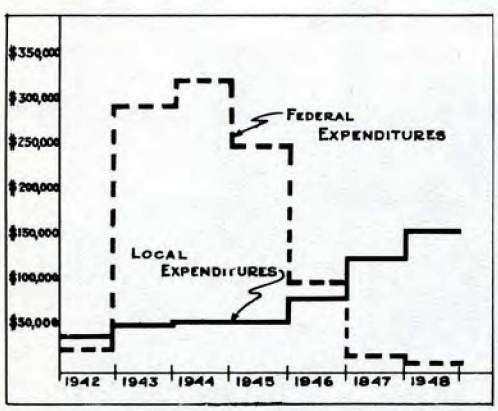
Virginia

L. J. ROPER, M. D. State Health Commissioner

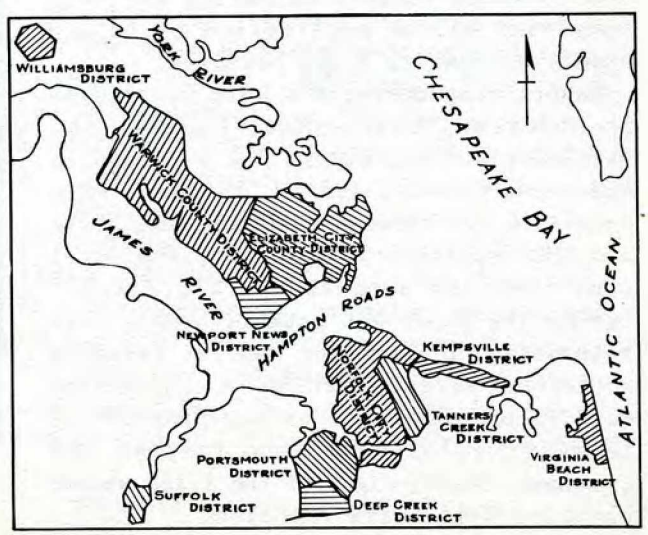
Communicable Disease Center activities in Virginia during the fiscal year 1948 consisted of limited malaria control operations through mosquito control districts and typhus control operations in some of the larger cities. Since the termination of the Malaria Control in War Areas program and the resultant reduction in Federal allocations, every effort has been made to induce local communities to assume responsibility for financing mosquito control operations. Eleven control districts have been organized and the State lends encouragement by appropriating up to 25 percent (not to exceed $10,000) of the outlay of the respective districts. Typhus control operations during the year consisted of DDT dusting and rat surveys.

MOSQUITO CONTROL. Four new mosquito control districts were created during the year, bringing the total to 11. The 1948 legislature appropriated $70,000 in State aid to the districts, and the Bureau of Insect and Rodent Control of the State health department, in collaboration with CDC, provided supervision and technical services. Malaria, a major health problem in Virginia some years ago, has decreased to the point where a locally transmitted case is a rarity.

Control activities around military establishments, reduced somewhat during 1948, included larviciding, ditch cleaning, clearing of potential breeding areas, and general surveillance. Operations in this sphere included: (1) application of 770 gallons of oil to 138,500 linear feet of ditches (under 10 feet) and application of 310 gallons of oil to 12 acres (ditches over 10 feet); (2) clearing of 454,450 square feet; (3) cleaning 844 linear feet of ditches; (4) dusting of 68 acres with 210 pounds



Trend of Federal and local expenditures for mosquito control in Virginia.



Mosquito control districts established in Hampton Roads section of the State.

of paris green. Operations in connection with Federal Public Housing Authority projects included: (1) clearing 501,408 square feet; (2) cleaning 30,577 linear feet of ditches; (3) larviciding 2,055,400 linear feet of ditches (under 10 feet) with 7,481 gallons of oil; (4) spreading 66,424 square feet of ditch bank; and (5) miscellaneous cleaning and larviciding activities.

Special mosquito surveys were made in three communities and recommendations submitted to appropriate authorities. The final malaria control report on the Buggs Island Reservoir was reviewed and submitted, in collaboration with the North Carolina Board of Health and the Impounded Water Unit of CDC.

The type of spray unit used by local health commission.

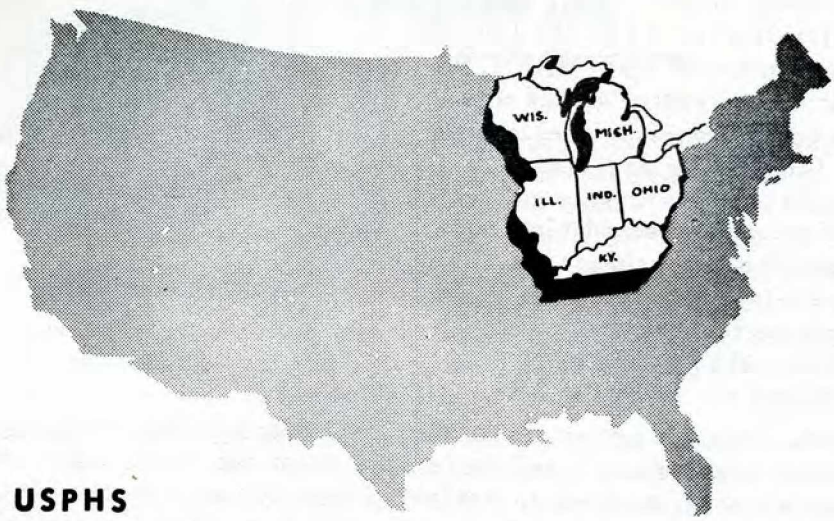
TYPHUS CONTROL. Control activities in this field during 1948 centered in the more densely populated areas where local units shouldered the major share of the costs. Organized programs were operated in Norfolk, Richmond, and Roanoke. Evaluation rat trapping activities also were carried on in Newport News, Franklin, Suffolk, Norfolk, and Smithfield. Rat surveys were made in Franklin, Charlottesville, Radford, Danville, Suffolk, Smithfield, and Hampton, and recommendations submitted.

The Norfolk DDT dusting program, initiated by CDC, has been in operation a number of years and has eliminated human typhus and reduced the positive rats to approximately 8 percent. Ten cases of typhus were reported in Richmond during 1947. Areas surrounding the premises where the cases occurred were dusted with DDT. Rats were trapped, ectoparasites collected and identified, and blood sera tests run. These data provided a guide for expanding or contracting dusting operations. Trapping, combing, and bleeding before and after dusting supplied information on the effectiveness of control operations. This procedure is now recommended to all local health departments immediately upon the report of a case of human typhus.

Dusting operations in Norfolk included the treatment of 5,062 premises with 13,908 pounds of dust at an expenditure of 8,918 man-hours. In the Richmond program, 2,447 pounds of dust were applied to 689 premises at an expenditure of 1,198 local man-hours. Rat trapping for evaluation in Franklin, Newport News, Norfolk, Smithfield, and Suffolk entailed the placing of 1,932 traps in 438 premises at an expenditure of 1,407 CDC man-hours and 1,363 local man-hours.

A special plague survey project was operated in Norfolk and Portsmouth. Five hundred and fifty-three rats were trapped and combed. No positives were reported from tests on 2,387 fleas sent to the Plague Suppressive Laboratory in California.

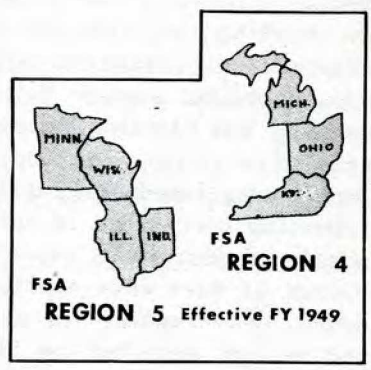
OTHER ACTIVITIES. Special investigations relative to fly control were made in three localities during the year. A DDT spraying program was inaugurated in one of the localities. Citizens provided the funds, a local agency handled the spraying, and CDC furnished technical advice and trained spray crews. Exhibits were prepared and displayed in connection with professional meetings, fairs, and lay gatherings. During the year, 60 meetings were held in order to conduct the business of the various mosquito control districts. Papers were prepared and published. Talks were delivered to civic groups and clubs, and seven training schools in insect and rodent control procedures were conducted for public health personnel.



USPHS

DISTRICT 3

Headquarters: Chicago, Ill.



Since actual communicable disease control activities are more or less limited to those Southern States having fixed incidence rate, the actual operational activities conducted within District 3 are somewhat limited. Kentucky is the only State in the District in which an operating program is conducted. The activities of the CDC office in Chicago were carried on the greater part of the year by an engineer and a secretary. An entomologist was assigned to the District for the summer months of 1947 but left early in September and was not replaced until May of 1948. CDC activities in the District included: serving as consultant to the various States in the field of environmental sanitation; doing promotional and educational work in the various fields of public health; conducting training schools in communicable disease control; providing technical assistance and information in connection with State and local operations; supplying technical supervision and direction to the operating program in Kentucky; and participating in conferences, studies, and meetings throughout the District. In addition, the CDC representative cooperated with the District office in its activities insofar as Communicable Disease Center operations were concerned. This included assisting in sanitary surveys of marine hospitals, Federal prisons, Indian reservations, and other Public Health Service beneficiaries.

ILLINOIS. A sample demonstration unit on insect and rodent control was developed

in Illinois. The CDC cooperated to the extent of subsidizing the cost of the unit by the loan of trucks and equipment, the State supplying the necessary personnel for operation and assuming the cost of operations. Consultant services were furnished the State in several communities on CDC activities as well as development of rodent control programs for several communities, assistance in airplane spraying along the Mississippi River, and general consultative services to the State as a whole.

INDIANA. Public interest in fly control, particularly in its somewhat misunderstood relationship to poliomyelitis, prompted numerous requests for assistance in developing community-wide fly control programs. Literature and descriptive information concerning such a program were furnished a considerable number of towns. A full scale program was developed for Gary, and technical guidance and assistance continually furnished that city throughout the first part of the fly breeding season.

KENTUCKY. A malaria control program, the only one in District 3, was operated in southwest Kentucky under CDC supervision. The program, administered out of headquarters in Paducah, embraced 10 counties. Field direction was by an engineer and an entomologist assigned to Kentucky for that purpose. During the fiscal year, DDT residual spray operations included the spraying of 15,818 units.

MICHIGAN. The activities in Michigan were very similar to those in Illinois, that is, furnishing consultative services to those communities requesting them. In addition, considerable time was spent with the city of Detroit, helping to organize and develop a large scale city-wide rodent control program. Several lectures on insect and rodent control were delivered to various communities in Michigan.

OHIO. The State health commissioner requested the assistance of CDC personnel in exploring public demands for community-wide fly control in association with rising poliomyelitis incidence. Numerous conferences and public meetings were held which culminated in the initiation of full scale fly control programs in Columbus, Chillicothe, Norwalk, Bowling Green, and Akron.

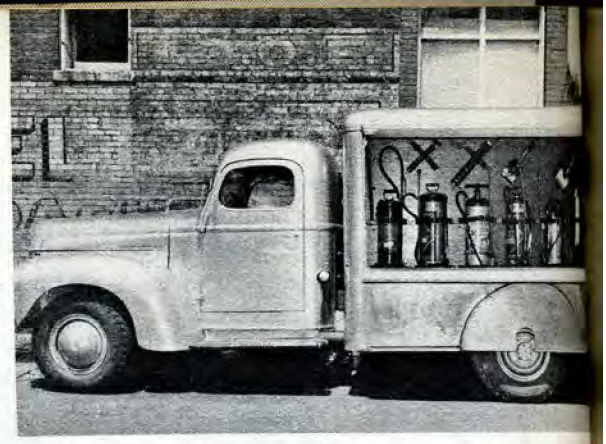
WISCONSIN. The activities in Wisconsin paralleled those in Illinois. In addition, the CDC District representative served as chairman of the insect and rodent control panel at a national meeting on public health. Consultative services were furnished many communities at the request of the State board of health.

Kentucky

BRUCE UNDERWOOD, M. D. State Health Commissioner

Activities during the year included residual spraying, typhus surveys, Rocky Mountain spotted fever survey, a cooperative enterprise in connection with an outbreak of anthrax, and surveillance inspections of military and Veterans Administration installations. The 1948 program followed the pattern of previous years with continued emphasis on expansion of local participation. One of the long-range objectives is to assist local communities in developing their own programs and to assume full responsibility for continuing them. Some progress has been made in this direction through

the media of demonstrations, seminars, films, and other educational activities. The mobile demonstration unit, developed in cooperation with the Chicago District office, elicited considerable interest and has been of value in stimulating local participation in health activities.



Mobile unit rebuilt in Paducah for use in the District.

RESIDUAL SPRAY. During the first half of the fiscal year, nine counties were covered on a county-wide basis by residual spray operations. A total of 4,599 houses were sprayed during this period using an average of 1.17 pounds of DDT and 2.23 man-hours per house. Two counties, Trigg and Lyon, were added with the beginning of the 1948 spray season, bringing the coverage of county-wide operations to 11 counties. Also, with the beginning of the 1948 season, spray operations were switched from the house to the premises basis; and during the fiscal year, 11,219 premises were treated under this formula with an expenditure of 2.01 pounds of DDT and 3.11 man-hours per premises. Spray crews consisted of a foreman and one or two laborers. It was found that the two-man crew (foreman and one laborer) resulted in a lower man-hour per premises rate, but a shortage of vehicles required the employment of three-man crews in most instances, in order to complete the work by July 1. Local contributions to the program (financial) consisted of fees collected from householders receiving the spray service. Initially, the fee was three dollars ($3.00) per home (house and privy); but with the switch to the premises basis, an additional charge of one dollar ($1.00) was made for each three outbuildings treated. Funds thus derived were used to pay contact men, laborers, and incidental expenses. Continuing the institutional spray program previously started, a limited number of State institutions were sprayed. It was noted that many institutions previously included in the program were carrying on their own pest control programs in line with instructions received in training clinics and demonstrations. Entomological inspections were made in selected houses in each county for evaluation purposes. These inspections indicated good control of mosquitoes but a somewhat reduced effectiveness of DDT spraying as a fly control measure.

MILITARY, VETERANS ADMINISTRATION, AND OTHER ANOPHELINE INSPECTIONS. Entomological inspections or surveillance was maintained throughout the warm months of the year around important military and Veterans Administration installations in the State. Inspections for the year in this field totaled 1,316, including multiple inspections of many stations. Although present in limited numbers in all zones, *A. quadrimaculatus* were numerous and a potential malaria hazard only in parts of two zones in the Fort Knox area. Ditch cleaning and maintenance were indicated in some cases. No control was done during the year except limited larviciding in a few cases. Routine surveillance was maintained in Paducah during the first half of the year. Because of a relatively high malaria incidence in recent years, a survey was conducted in Frankfort (Franklin County) in July and August 1947. The results showed no serious threat at present. A survey in a region of artificial lakes in Davies County disclosed a high count of *A. quadrimaculatus*, and recommendations for control measures were submitted to local authorities.

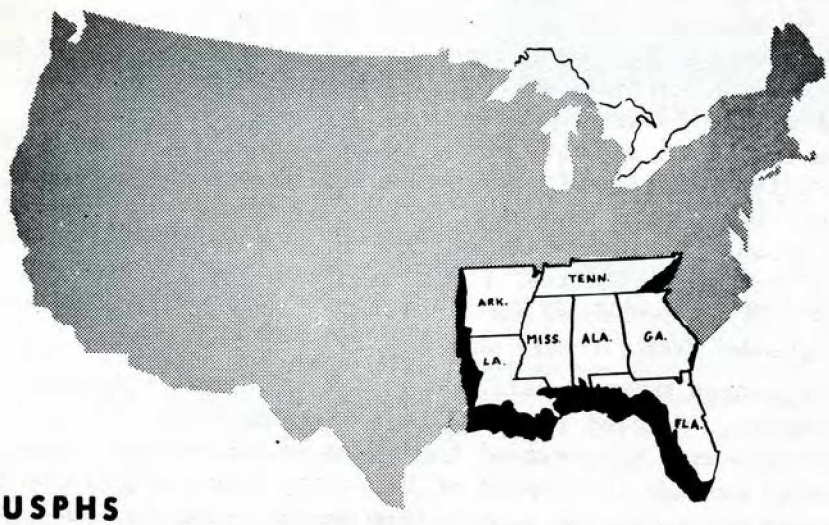
TYPHUS CONTROL. Typhus control activities during the year centered around surveys in Bowling Green and Louisville. Two limited surveys were made in Bowling Green, in

July and December 1947, following a preliminary survey during the latter half of the fiscal year 1947. During these two surveys, 113 rats were trapped and examined for ectoparasites, and 83 rat sera submitted to the Laboratory Division, CDC, for murine typhus tests. Of these, 5 were found positive and 69 negative. Since in a prior survey 13 positive and 17 negative rats were recorded, the count for Bowling Green totaled 18 positive and 86 negative rat sera. Three foci of infection have been located. The *X. cheopis* index was 3.7 in July and 1.6 in December. Eight human cases of murine typhus occurred in Warren County (Bowling Green) during the fiscal year 1948, four less than during 1947. The Louisville survey, undertaken jointly by the several health agencies in the city, was designed to determine the incidence of murine typhus, both human and rodent, in the area. Sera were sent to the Laboratory Division, CDC, for testing. Three human sera were found positive in very low titres, while 790 were negative. Of 377 rat sera submitted, 1 was found positive and 350 negative. An *X. cheopis* index of 0.34 was determined for rats in the Louisville area during the survey period, which extended from February into May 1948.

ROCKY MOUNTAIN SPOTTED FEVER. Several cases of Rocky Mountain spotted fever, with a very high mortality, occurred in a section of Fleming County during the past few years. A small valley area had recorded four cases of the disease, three deaths and one suspected fatal case. At the request of the county health officer, an entomological and epidemiological survey was made in this county during June 1948. Ticks, *Dermacentor variabilis*, were found to be very numerous in one area — the small valley which had recorded four cases and three deaths. Specimens were collected from dogs and other animals, identified and forwarded to the Rocky Mountain Laboratory to be tested. Several preventive measures were recommended, including routine vaccination of the population of the highly endemic area.

ANTHRAX. At the request of the U. S. Department of Agriculture and the State department of health, CDC personnel from the State and District office cooperated in devising measures for dealing with an outbreak of anthrax in the Hickman area. The outbreak occurred just prior to the opening of the State Fair in Louisville and officials were concerned over the possibility of anthrax-infected animals being shipped across the State to Fair exhibits. The Department of Agriculture embargoed the shipment of cattle across the State line from Missouri. CDC furnished trucks, spraying equipment, and DDT for use by farmers in spraying their facilities. A regular spraying program was decided against due to the danger of transmission of the anthrax bacillus from one farm to another by means of mud clinging to vehicles, equipment, and personnel. Each farmer was provided equipment and materials for treating his own installations.

EDUCATIONAL ACTIVITIES. It has been the objective of the educational and promotional program to accomplish three concurrent results: first, to show the people that an actually important health problem affecting each and every citizen definitely exists in western Kentucky; second, to create a desirable attitude and reaction to the problem by the dissemination of accurate information concerning the problem; and third, to obtain the active participation in the CDC program of as many people as possible in as many ways as possible. Action taken during the year to realize this multiple objective included preparation and distribution of applicable literature, the presentation of many talks before diversified groups, newspaper and radio programs, demonstrations, and health educational films. An outline for classroom use in the study of communicable diseases was developed in the Paducah office and approved by the Kentucky State Department of Health and by Murray State Teachers College. It is being used widely.



USPHS

DISTRICT 4

Headquarters: New Orleans, La.

FSA
REGION 6
Effective FY 1949

The programs sponsored by CDC Activities in District 4 this fiscal year have expanded until more people are now receiving public health benefits than ever before. The chief factor in this expansion has been the increase of funds supplied by local participation and not an increase of funds from CDC; in fact, funds from CDC were reduced. The District has strongly supported the CDC control programs, malaria and typhus projects, and has helped where possible such experimental programs as the polio-fly projects, the encephalitis investigations, and the water-hyacinth survey work.

MALARIA CONTROL. It was recorded in the District 1947 annual report that malaria control methods had changed within the past 2 years. The basic change has been from a two cycle residual spraying program, applied at any time during the malaria season, to a one cycle residual spraying program, applied early in the season prior to the upward trend of the malaria incidence curve. Further refinements have been introduced to bring the per capita cost of malaria control for the fiscal year 1948 to the lowest level in its history. A slightly larger amount of DDT is used under the new procedure but a very great saving results through a reduction in labor costs.

The residual spraying program is conducted in the less populated areas where larvicidal control would be very expensive. Larviciding and drainage, supported by residual spraying of substandard houses and houses on the outer edge of the control area, are

conducted in towns. All of the States within the District conducted malaria control in a greater number of counties during 1948. The number of rural area houses treated increased from 544,800 in 1947 to approximately 650,000 in 1948. This represents an increase of 20 percent in the number of houses protected, exclusive of many more in towns and cities which receive malaria protection through larviciding and drainage operations. Records show that (1) during 1948 more people received malaria control than ever before and at a lower cost, (2) that the number of cases of malaria reported was at an all-time low, and (3) that houses treated with DDT residual spray were 98 percent free of the malaria vector, the *Anopheles quadrimaculatus*.

The Communicable Disease Center continued to assign an engineer and an entomologist to the District office to serve as coordinators and consultants to the several State health departments in malaria control activities.

TYPHUS CONTROL. There was a reduction during the year in the number of cases of murine typhus fever reported by the States that comprise the District. Last year there were 102 approved counties within the District, and at the end of this year there were 76 approved counties. The records show that there were more counties doing "rat control" than there are approved counties, which indicates that a well conducted typhus-rat control program can be made popular. Control operations consisted of the regularly approved methods: ratproofing, poisoning, maintenance work, and DDT dusting or spraying. The effect of the control work on the amount of typhus present in the rat population was checked by taking rat bloods for complement fixation tests and by combing the rats to determine the flea reduction due to the use of DDT. Two members of the District office staff assigned from CDC acted as coordinators and consultants to the State health departments of this District during typhus control operations.

Typical mobile unit used throughout the District.

FLY CONTROL. A member of the District staff provided by CDC was assigned to an experimental project at Wilmington, Del., to act as Chief Entomologist, on the "fly-polio" program. This program started in August and closed in September 1947. District personnel often have been called upon by the State health departments to help in setting up fly control programs in the cities in the various States. In some States most of the cities with a population above 10,000 have a fly-pest-mosquito control program. These programs are proving to be very popular and are financed entirely by local funds.

Alabama

D. G GILL, M. D. State Health Officer

Noteworthy occurrences during the year included a substantial increase in local participation resulting in an expansion of malaria and typhus control activities, and the development of considerable concern over the relative effectiveness of the DDT used during the insect season. Residual spray coverage was increased from all or part of 22 counties to all or part of 31 counties. War malaria operations centered around surveillance at military installations. Drainage operations were activated in a malarious sector of Colbert County. Typhus control activities were carried on in 23 counties as compared with 18 during the previous year.

MALARIA CONTROL. During the fiscal year, 113,546 houses were sprayed by CDC crews, 44,381 by county-financed crews, and 19,849 by municipal crews. Basically, CDC spray operations are carried on only in malarious areas of preapproved counties. Areas to be treated are selected through studies of morbidity and mortality records, and in consultation with county health officers. Urban areas are not included in CDC projects. For purposes of supervision and administration, operations were set up under an area headquarters system as follows: Clarke Area (Jackson), including Choctaw, Washington, and Clarke Counties; Colbert Area (Tuscumbia), including Colbert, Limestone, Lawrence, and Madison Counties; Dallas Area (Selma), including Bibb, Lowndes, Dallas, and Perry Counties; Geneva Area (Geneva), including Covington, Houston, and Geneva Counties; Greene Area (Eutaw), including Greene, Marengo, Hale, Sumter, Lamar, and Tuscaloosa Counties; Mobile Area (Monroeville), including Baldwin, Monroe, Escambia, and Wilcox Counties; Montgomery Area (Montgomery), including Autauga, Bullock, Montgomery, Butler, Crenshaw, Russell, and Elmore Counties.

During the 1947 spray season all houses were treated twice. However, with the beginning of the 1948 season, plans were made to inaugurate a single application policy, except in five counties (Autauga, Dallas, Lowndes, Lamar, and Wilcox). In these five counties local appropriations provided a two application treatment and it was felt that CDC operations should conform to this pattern. In seven other counties

Table 1

RESIDUAL HOUSE SPRAYING ACTIVITIES IN ALABAMA
Fiscal Year — 1948

Spraying Agency	1947 Spray Season		1948 Spray Season		No. Houses Sprayed Fiscal Year
	Counties/Cities	No. Houses	Counties/Cities	No. Houses	
CDC Crews	*20 Counties	41,326	32 Counties	72,220	113,546
County Crews	11 Counties	16,586	13 Counties	27,795	44,381
City Crews	—	—	40 Cities	19,849	19,849
Total	31	57,912	85	119,864	177,776

*No second application in two counties — Elmore and Macon
1947 spray season: Average man-hours, 1:3; average DDT per house .93 pound
1948 spray season: Average man-hours per house, 1:25; average DDT per house .96 pound

local funds were provided to cover a single county-wide treatment. Although CDC, county, and municipal crews operated more or less separately, all used comparable techniques, materials, and equipment. CDC area supervisors, and State and local health department personnel provided training, consultation, and other assistance to locally financed crews. No charge was made to householders for spray service. In operations during the 1947 spray season, the aim was to apply 200 mg. of DDT per square foot. In 1948, where areas were treated under the single application policy, the aim was to apply 300 mg. per square foot during the first 6 weeks of operation and 200 mg. of DDT the remainder of the season. Table 1 and figure A summarize residual spray operations during fiscal year 1948.

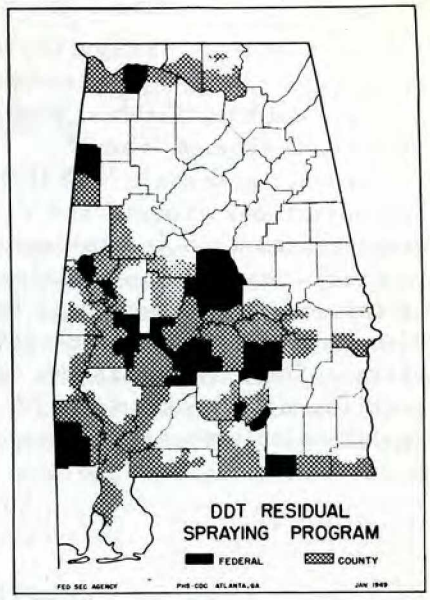


Figure A.

Inspection activities were divided into two phases. One was the inspection of a representative number of premises sprayed in the residual house spraying program, plus a smaller number of unsprayed control area premises. The other phase of the inspection program dealt with periodic reinspections of selected premises in four cities, two of which were sprayed. In all inspections, records were made of the number of mosquitoes and flies observed. Inspection of 1,429 sprayed houses, during the period June 1 to October 15, disclosed only one *A. quadrimaculatus*. On the basis of inspections of 1,429 sprayed and 269 unsprayed houses, the fly count showed 58 percent of the sprayed houses had 10 flies or less at the time of inspection, while only 8.2 percent of the unsprayed houses fell in this group. Eighty-four percent of the sprayed houses had 30 flies or less and 92.9 percent had less than 50 flies. Of the unsprayed houses, 31.7 percent had less than 30 flies and 54.7 percent had less than 50 flies. Periodic reinspections of selected premises were made in two large cities, one sprayed (Selma) and one unsprayed (Tuscaloosa), and in two small cities, one sprayed (Tuskegee) and one unsprayed (Greenville). In the sprayed large city, the average number of flies per high count room was 12. In the unsprayed large city, the average number of flies in the high count room was 51.8. In the small city comparison, in the sprayed city the average fly count was 10.5 and in the unsprayed 102.6. In Tuskegee the 1947 fly count was 5.3 PER HOUSE and 10.5 per high room count in 1948, which supports the widely held thesis that flies were more abundant in 1948 than in 1947. This appreciable rise in fly population is believed to account for much of

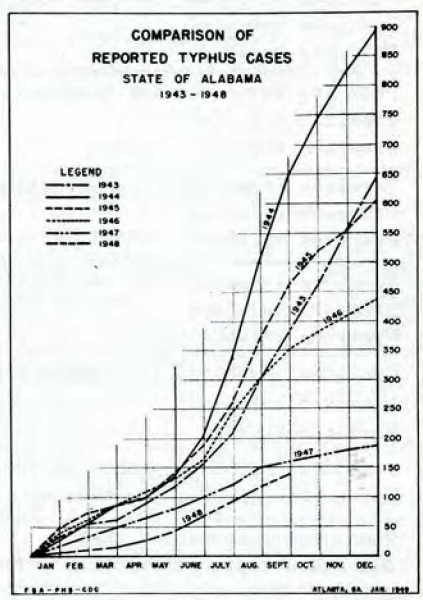


Figure B.

the complaint in Alabama about the effectiveness of DDT used in 1948.

TYPHUS CONTROL. During the fiscal year 1948, activities in connection with the CDC typhus control program were conducted in 23 of 27 approved counties, to wit: Autauga, Baldwin, Barbour, Blount, Butler, Calhoun, Chilton, Clarke, Cleburne, Coffee, Colbert, Covington, Crenshaw, Dale, Dallas, Escambia, Geneva, Hale, Henry, Houston, Jefferson, Lauderdale, Mobile, Montgomery, Pike, Talladega, and Tallapoosa. Local appropriations, county and city, permitted an expansion of activities to cover a greater area than in previous years. County-wide programs were carried on in five counties. Seventy-three cities in approved counties received one or more coverages of DDT dust and poison bait. Table 2, "Recapitulation of Typhus Activities FY-1948," gives a break-down of each activity. Rat stoppage projects were carried on in the cities of Mobile, Anniston, and Eufaula. Evaluation of the composite program was made through the trapping of rats for ectoparasites and blood examinations. The incidence of typhus continues to decline as indicated in figure B.

Table 2

RECAPITULATION OF TYPHUS ACTIVITIES
Fiscal Year 1948

Premises inspected for rat trapping evaluation	1,810
Premises infested	998
Premises treated	982
Premises inspected for treatment with arsenic water	66,685
Premises infested	45,718
Premises treated	15,587
Premises inspected for DDT dusting	103,769
Premises infested	85,318
Premises treated	87,430
Premises inspected for rat poisoning	80,535
Premises infested	58,013
Premises treated	50,004
Premises inspected for cyanogas treatment	65,101
Premises infested	42,261
Premises treated	6,833
Pounds of DDT dust used — 5%-232,809; 10%-180,815	413,624
Man-hours expended for this activity — CDC-11,059; Local-25,776	36,835
Pounds of poison bait used	52,286
Man-hours expended for this activity — CDC-7,218; Local-18,765	25,983
Pounds of cyanogas used	8,468
Man-hours expended for this activity — CDC-3,224; Local-7,083	10,307
Gallons of arsenic water used	3,744
Man-hours expended for this activity — CDC-3,206; Local-6,959	10,165
Man-hours expended ratproofing — CDC-388; Local-414	802
Premises ratproofed	16
Man-hours expended for rat-trapping evaluation — CDC-5,527; Local-1,317	6,844
Man-hours expended miscellaneous activities CDC-2,525; Local-1,676	4,201
Man-hours expended all activities — CDC-33,165; Local-61,990	95,155

Arkansas

T. T. ROSS, M. D. State Health Officer

Twin hallmarks of CDC activities in Arkansas during the year were expansion of area covered and reduction in Federal funds allocated. Four new counties — Faulkner, Pope, Conway, and Yell — were added to the 38 already participating in the residual spray program, bringing the total 1948 participating counties to 42. Spraying was conducted on a county-wide basis in 30 counties and in malarious sections of 12. Larviciding was carried on in 14 zones this year with cities bearing most of the cost. The enlarged scope of the program was made possible by the increase of local financial participation, most of which was derived from fees collected from householders receiving the spray service. Throughout the control area, county courts appropriated funds to pay a portion of the fee of recipients who were financially unable to meet the levy.

MALARIA CONTROL. A statistical summary of residual spraying activities is presented in table 1. The two application policy prevailed during the first part of the fiscal year, with a switch to a single (300 mg. per square foot) application policy at the beginning of the 1948 spray season. As table 1 indicates, applications for the fiscal year totaled 178,380. Of this number 71,569 (1947 spray season) were second applications, 5,319 were "pick-ups," and 101,492 were single 300 mg. (1948 spray season) applications.

Prior to this year, field operations were on the three-man crew basis. This year the two-man crew, one leadman and one sprayer, method was adopted. Although some ready-mixed concentrate was used, a mixing plant was maintained in the State warehouse and most of the spray material was mixed there. Trucks and equipment used conformed to standards of the previous year.

Larvicide operations, other than those by the Arkansas Power and Light Co. and the Corps of Engineers, are summarized in table 2. Inspections were carried on in the 12 regular CDC larvicidal zones and also in connection with control programs of several towns and the Lake Catherine project of the Arkansas Power and Light Co. The accompanying graph shows the relationship between the average of the highest "A" stations in each zone as compared with the average of the highest station in each zone, which

Table 1

RESIDUAL SPRAY STATISTICS

Number counties in operation	42
Number of people protected	480,650
Number houses sprayed	106,811
Number spray applications, 200 mg.	76,888
Number spray applications, 300 mg.	101,492
Total number applications	178,380
Percent accepting spray	77.7
Local man-hours used - 193,136 1.07 per application	
Pounds of DDT used - 207,596 1.16 pounds per application	

Table 2

LARVICIDE STATISTICS

Number zones	14
Number acres treated	46,271
Number linear feet treated	7,432,896
Type chemicals used — DDT spray, isomer, oil, paris green, dusting, Velsicol	
Number linear feet ditch cleaning	249,051

represents the natural mosquito population as nearly as practicable. Although the average high "A" station count on the graph continuously remained above the accepted standard of 10 (average 13.8) from June 14 through August 16, 2 of the 12 regular zones did not have counts above 10 in any station, 2 others did not have counts above 10 for more than two consecutive weeks during the season, and 3 were not out of control for more than three consecutive weeks. Of the five zones that were out of control for the season, three are river towns. The enormous numbers of *Anopheles quadrimaculatus* coincided with high water on the Mississippi and L'Anguille Rivers from April 12 to July 23. Airplane larviciding with 20 percent DDT in Velsicol was used, but no practical reduction in adult mosquito population was evident until several weeks after the water receded from the flat wooded areas.

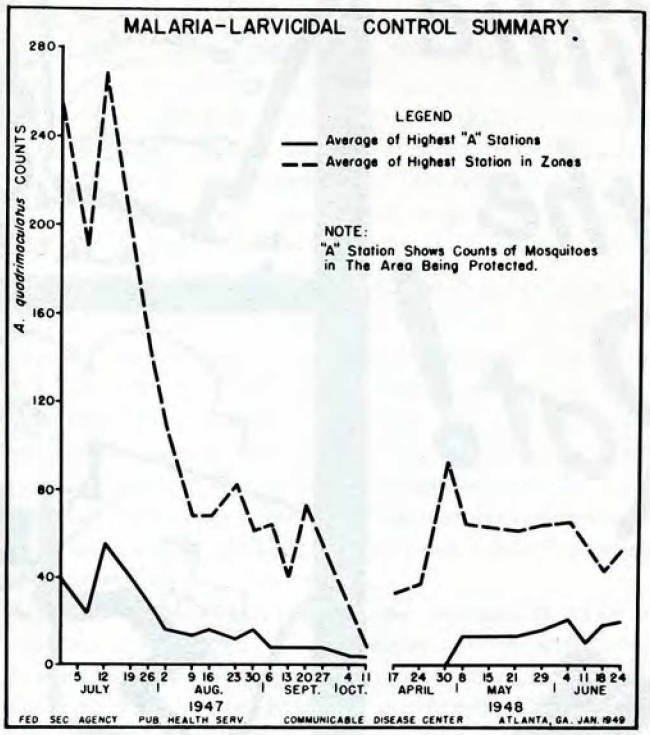
Entomological evaluations of DDT spraying results are summarized in table 3 (based on spray-inspection time intervals) and table 4 (based on *A. quadrimaculatus* density groups). As indicated in table 3, of 601 houses inspected in the 200 mg. area up to 1 month after spraying, only nine or 1.5 percent contained *A. quadrimaculatus* in the afternoon. Of 232 houses inspected in the 300 mg. area after the same elapse of time, none contained *A. quadrimaculatus* in the afternoon. Of 1,637 houses inspected in the 200 mg. area between 1 and 2 months after spraying, 1.3 percent contained *A. quadrimaculatus* in the afternoon. Of 399 houses inspected in the 300 mg. area during the same interval, 1.3 percent contained *A. quadrimaculatus* in the afternoon. However, from this point on, inspections in the 200 mg. area showed a decrease in killing efficiency; while in the 300 mg. area, killing efficiency increased. This apparent increase in effectiveness of the single 300 mg. application after 2 months may have been due to an insufficient number of inspections for this period. For comparison, the percentages of *A. quadrimaculatus* houses at similar intervals after spraying during 1945 and 1946 are shown in the table. This comparison indicates that the effectiveness of the 200 mg. rate in 1947 was not as great as in 1946. However, the methods of inspection varied during the 2 years, which may account for the difference. The data reflected in table 4 clearly indicate the effectiveness of the spray in keeping premises free of resting mosquitoes. For the sprayed areas, houses were considered

Table 3

HOUSE INSPECTIONS ON RESIDUAL SPRAY PROGRAM

Total Treated Houses Inspected and Percent Free of "A. quadrimaculatus" in Afternoon (Based on Spray-Inspection Time Intervals)

Weeks after Spray	1947						1946	1945
	200 mg. DDT/square foot			300 mg. DDT/square foot			200 mg.	100 mg.
	No. Houses Insp.	Houses free of "A. quad." No.	Percent	No. Houses Insp.	Houses free of "A. quad." No.	Percent	Percent houses free of "quads."	Percent houses free of "quads."
0-4	601	592	98.5	232	232	100	99.4	98.6
5-8	1,637	1,615	98.7	399	394	98.7	99.3	96.3
9-12	1,831	1,799	98.3	282	281	99.6	99.2	92.5
13-16	1,084	1,071	97.8	272	271	99.6	98.9	91.7
17-	263	254	96.6	207	207	100	98.6	77.0
Total	5,416	5,331	—	1,392	1,385	—	—	—
Percent	—	—	98.4	—	—	99.5	99.2	94.1



positive when mosquitoes were found in them during the afternoon. In unsprayed houses, a house was considered positive if mosquitoes were found in it any time during the day. Houses found negative in the morning have been presumed to be negative in the afternoon also.

The average number of flies found in the sprayed houses in the 200 mg. region was 0.85. In unsprayed houses in the same region an average of 4.61 flies per house was found, or a reduction of 81.6 percent in 200 mg. sprayed houses. In the 300 mg. region, the average number of flies found was 1.51 per house as against 7.04 in unsprayed houses, or a reduction of 78.6 percent.

EDUCATION AND PROMOTION. Inasmuch as the local participation feature of the program is contingent upon the collection of fees from householders, it has been found advantageous to emphasize educational and promotional programs. Activities in this field during the year included the holding of six workshops at

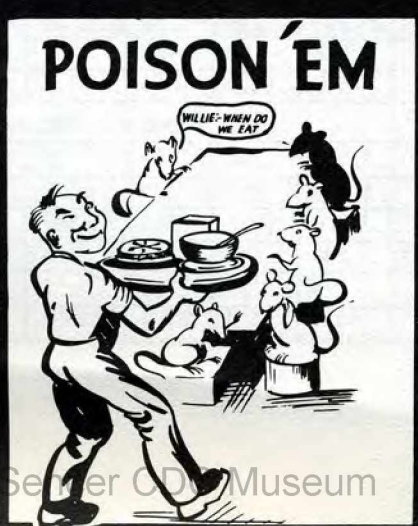
Table 4

HOUSE INSPECTIONS ON RESIDUAL SPRAY PROGRAM

Total Treated and Untreated Houses Inspected and Percent Free of "A. quadrimaculatus" in Afternoon (Based on "A. quadrimaculatus" Density Groups)

	200 mg. DDT/square foot						
	0-10	11-30	31-50	51-100	101-200	over 200	Total
No. houses inspected	2,875	1,035	376	376	231	523	5,416
No. free of quads.	2,866	1,011	376	369	227	491	5,331
Percent free of quads.	99.7	97.7	97.6	98.1	98.3	93.9	98.4
No. houses inspected (unsprayed)	324	148	45	54	34	62	667
No. free of quads.	243	93	25	31	20	28	440
Percent free of quads.	75.0	62.8	55.6	57.4	58.8	45.2	66.0
	300 mg. DDT/square foot						
No. houses inspected	1,092	206	39	29	10	16	1,392
No. free of quads.	1,088	204	39	29	10	15	1,385
Percent free of quads.	99.6	99.0	100	100	100	93.8	99.5
No. houses inspected (unsprayed)	233	47	14	4	1	2	301
No. free of quads.	194	26	8	1	1	0	230
Percent free of quads.	83.3	55.3	57.1	25.0	100	00.0	76.4

EXIT... Willie the Rat!



four State institutions, the organization of 28 health groups in 26 counties with an aggregate membership of 5,201, the sponsoring of an essay contest on the subject "Malaria and Its Control" in the schools, the making of resources surveys in 38 counties, and the preparing of exhibits for display at 22 county and district fairs. In addition, 70,890 students were given formal instruction in schools; 411 meetings and 853 film showings were arranged; 46,440 public relations contacts were made; 228,840 pieces of literature were distributed; and liberal use was made of newspaper and radio publicity.

TYPHUS CONTROL. Activities in this sphere were aimed at freeing the areas involved of rats through coordinated programs of garbage control, general environmental sanitation, ratproofing, and rat poisoning. The basic formula employed was that of denying rats access to food by garbage control and ratproofing, and the eliminating of rat breeding and living capacities through general sanitation and rat poisoning. This was predicated upon the thesis that effective garbage control restricts the rats' food supply, that efficient premises sanitation destroys rat harborages, that ratproofing prevents the rat from entering establishments which offer food and harborage, and that rat poisoning yields effective control when food is denied and harborages are eliminated.

Supported by continuous and community-wide cooperation, which is essential to rat control operations, 29 Arkansas cities inaugurated effective garbage control programs. One sanitary land fill project was started. Clean-up programs were initiated to further frustrate rats by destroying their harborages in ill-kept premises and to clear the way for ratproofing and rat-poisoning operations. Two cities operated ratproofing programs. CDC furnished 3,189 man-hours and localities furnished 18,065, or 85 percent of the total. Property owners invested $63.41 per establishment in ratproofing 389 buildings. In conjunction with ratproofing, eradication programs were operated in 1,028 establishments at a cost of $3.80 per establishment, paid by the tenants. These eradication operations consumed 1,289 man-hours furnished by CDC and 5,580 furnished locally. In eight other cities, 72,418 red squill rat poison torpedoes were distributed at a cost of $2,114.18. Evaluation activities carried on in connection with two ratproofing programs showed a great reduction of the typhus vector in the rat population. Of 98 rat blood specimens forwarded for complement fixation tests, 6 showed positive, 91 negative, and 1 unsatisfactory for testing.

Florida

WILSON T. SOWDER, M. D. State Health Officer

Communicable Disease Center activities in Florida during the fiscal year 1948 centered around malaria and typhus control operations carried on under the supervision of the Division of Entomology of the State board of health. Public recognition of the value of communicable disease control resulted in an increase in local contributions which made it possible to expand operations despite a continued decrease in Federal allocations. Eleven more counties were included in the residual house spraying program than in 1947. In typhus control operations, no new counties were added but the over-

all area dusted was expanded considerably.

RESIDUAL HOUSE SPRAYING. Thirty-five counties (Alachua, Baker, Bay, Calhoun, Charlotte, Citrus, Clay, Dixie, Escambia, Franklin, Gadsden, Glades, Gilchrist, Gulf, Hamilton, Hendry, Hernando, Holmes, Jackson, Jefferson, Lafayette, Lake, Leon, Levy, Liberty, Madison, Okaloosa, Okeechobee, Pasco, Sumter, Suwanee, Taylor, Wakulla, Walton, and Washington) participated in the residual house spraying program during 1948. The respective counties supplied labor, storage space, and incidentals. A single application of 7½ percent DDT emulsion was used throughout the year. A total of 95,039 homes were sprayed with an average expenditure of 1.1 pounds of DDT and 1.3 man-hours. Forty-two and one-tenth percent of the total cost was contributed by the State, county, and local agencies.

During the 1947 spray season the program was administered through a 4-district set-up. With the beginning of the 1948 spray season, the State was divided into eight areas, each having about the same number of houses. In 1947, each operating county was supplied with one or more spray units consisting of one contact man (State), two spray leaders (county), four spray assistants (county), two spray trucks, one contact truck, and one reserve truck. In 1948, the county-level organization was revised to one contact man (county), two to four spray crews of two men each (county), one county supervisor (State), one contact truck, two to four spray trucks, one supervisor's truck, and one or more reserve trucks. Under the revised system, the county supervisor was able to devote his time to direction of laborers and the repair of equipment in the field. All area or district supervisors were controlled by the Director of CDCA, Division of Entomology. Spraying equipment consisted of modified 4-gallon cans, compressed air tanks, and hand tools. Concentrate was purchased from commercial establishments and shipped direct from factory to warehouse points in the operating areas. Evaluation of the effectiveness of the residual DDT applications revealed that a high degree of protection was obtained. Of 859 inspections in sprayed houses, *A. quadrimaculatus* was present in only 6.5 percent as compared with 62.7 percent in unsprayed houses.

Larviciding, ditching, and clearing projects were operated by the cities of Gainesville, Tallahassee, Apalachicola, Monticello, Chipley, Leesburg, and DeFuniak Springs. Vehicles and other equipment provided by the State helped the communities execute these programs.

Entomological surveillance was continued during the year to determine the density, distribution, and biology of *Anopheles albimanus* in the Florida Keys and on the extreme southern tip of the mainland. Adults of this species were taken in light traps at Fisher Island on Miami Beach, Lower Matecumbe Key, Vaca Key, Big Pine Key, and Stock Island at Key West. No indication was found that an increase in malaria could be attributed to this species. However, nearly 1,000 larvae and 20 adults have been furnished the Malaria Investigations Laboratory for malaria transmission studies. Laboratory determinations of 450,167 mosquitoes were made in connection with special surveys and in evaluating specific control methods.

TYPHUS CONTROL. Activities in this sphere during the year included DDT dusting, ratproofing, rat poisoning, garbage disposal and harborage removal, and ectoparasite control through trapping. Projects were operated in six counties: Dade, Escambia, Hillsborough, Pinellas, Polk, and Duval (Jacksonville). Operations during the year were comparable to those of the previous year. There was a reduction in the number of times areas were dusted, but an expansion in the over-all area covered. From 1945 to 1947, a majority of areas treated were dusted three times per year, some of them

four times. This fiscal year the number of applications ranged from a maximum of three down to one, due to restricted manpower and funds. It is planned to adopt the two application system next year, as it is believed that two applications will produce good control. The down-trend in typhus incidence continues. During the calendar year 1947, reported cases totaled 344. For the first half of 1948 only 71 cases were reported.

A summary of typhus control activities is found in table 1. As indicated, 49,878 premises (in nine cities) were dusted at an expenditure of 23,316 man-hours and 166,451 pounds of DDT powder, or an average of 3.34 pounds of DDT and 28.5 minutes per premises. Dust was applied with various types of hand equipment. However, for dusting inside of buildings, the rectangular 5-pound capacity metal shaker was generally used. Emphasis was placed on the observance of adequate precautions when 1080 was used.

Dusting attic through louvre, Tampa, Fla.

Table 2 presents a comparative summary of the results of rat trapping carried on in connection with all projects. Results included in the table are for the period July 1, 1947, to March 31, 1948 (9 months). Identification of all ectoparasites recovered during the entire fiscal year has not been completed. Blood sera were obtained by the CDC Laboratory.

PLAGUE SURVEY TRAPPING. The trapping of rats in connection with the plague survey of the U. S. Public Health Service was carried on in Pensacola for a period of 6 months. Fleas recovered from 100 rats were sent to the Plague Laboratory in San Francisco for examination. Not all of the laboratory findings have been received; but of those received, all fleas examined were found negative. Since the rats were to be taken from the undusted area, suitable trapping stations were difficult to locate and the program was terminated in December 1947.

AEDES AEGYPTI. Inspection of premises and treatment for the control of the yellow fever vector was continued in Dade and Monroe Counties. There were 41,510 premises

Table 1
SUMMARY OF TYPHUS CONTROL ACTIVITIES IN FLORIDA
June 22, 1947, to July 3, 1948

County	Premises Dustings	Trapping* No. Estab.	Ratproofing No. Estab.	Inspections No. Estab.	Poisoning** No. Estab.	Man-Hours CDC	Man-Hours Local	Man-Hours Total
Dade	7,177	374	122	14,901	7,755	4,860	12,104	16,964
Duval	10,080	700	173	—	12,773	5,351	20,776	26,127
Escambia	14,184	1,030	47	—	21	7,858	14,346	22,204
Hillsborough	11,826	1,384	73	1,746	505	5,200	14,495	19,695
Pinellas	6,611	1,123	—	—	1	6,865	3,140	10,005
Polk	—	30	52	1,104	21	56	1,338	1,394
Total	49,878	4,641	467	17,751	21,096	30,190	66,199	96,389***

* For evaluation, eradication, and plague survey
** 1080 (bait and water); red squill
*** Includes 661 man-hours expended on leak repairs, "A" dusting.

Table 2

RATS TRAPPED ON CDC TYPHUS CONTROL PROGRAM — COMPARATIVE SUMMARY ALL PROGRAMS
July 1, 1947, through March 31, 1948

County	Rats Trapped					Number Ectoparasites					Blood Determinations		
	No.	Live	Dead	Combed	With Ectoparasites	Fleas All Kinds	Others All Kinds	Total All Kinds	"Cheopis" Only	Average "Cheopis" per Rat	No. Sera Sent in	Percent Pos.	Percent Neg.
Alachua													
Post Dusting	NONE												
Control	46	30	16	17	17	27	247	274	24	1.41	29	16.67	83.33
Dade													
Post Dusting	413	317	96	312	272	122	2,975	3,097	121	0.387	146	13.19	86.81
Control	53	43	10	43	43	457	769	1,226	454	10.56	31	29.03	70.97
Duval													
Post Dusting	485	440	45	439	96	452	3,615	4,067	23	0.052	428	5.60	94.40
Control	219	191	28	191	166	3,821	4,848	8,669	401	2.10	182	34.47	65.53
Escambia													
Post Dusting	519	454	65	454	140	272	1,357	1,629	32	0.070	439	10.37	89.63
Control	140	121	19	121	92	1,434	231	1,665	881	7.28	113	27.43	72.57
Hillsborough													
Post Dusting	185	147	38	145	87	178	969	1,147	13	0.090	139	4.00	96.00
Control	113	93	20	90	75	630	1,927	2,557	276	3.07	91	31.33	68.67
Pinellas													
Post Dusting	410	317	93	315	239	70	2,846	2,916	65	0.206	303	5.48	94.52
Control	277	314	63	314	298	2,370	7,067	9,437	2,131	6.79	297	19.86	80.14
Polk													
Post Dusting	NONE												
Control	8	8	0	8	8	49	101	150	48	6.00	6	33.33	66.67
Totals													
Post Dusting	2,012	1,675	337	1,665	834	1,094	11,762	12,856	254	0.152	1,455	7.71	92.29
Control	956	800	156	784	699	8,788	15,190	23,978	4,215	5.38	749	26.95	73.05

inspections during the 1947-48 season at an expenditure of 5,152 man-hours. These programs were financed locally. CDC participation was limited to the loan of vehicles and other equipment.

EDUCATION ACTIVITIES. Information regarding operating programs was disseminated through newspaper articles, radio talks, discussions before civic groups, exhibits, films, and pamphlets. Each 3-month period a short course for sanitarians is held at Gainesville. This is conducted jointly by the Alachua County Health Unit, The Commonwealth Fund, the University of Florida, and the State board of health. Training is given in many phases of sanitation work as the limited time permits. A representative of the CDC Typhus Control Unit, upon invitation of the directors of the course, conducted classes and held field demonstrations on typhus and rodent control in connection with this activity. This program helps to improve the efficiency of personnel associated with the several county health units.

Georgia

T. F. SELLERS, M. D. Director of Public Health

Communicable Disease Center activities in Georgia in the fiscal year 1948 followed the general pattern developed during the preceding year. Malaria control through DDT residual spraying and typhus control through DDT dusting and rat eradication constituted major operational activities. In malaria control, State and local participation accounted for 36 percent of the cost and CDC contributed 64 percent. In typhus control activities, CDC contributed approximately 50 percent and State and local communities 50 percent of the aggregate costs.

Malaria control operations were reduced somewhat from the 1947 level, due to the decrease in available funds, but refinement of procedures permitted effective control. The typhus control program was streamlined in all phases of field operations with little or no sacrifice in effectiveness.

MALARIA CONTROL. The DDT residual house spraying program was offered on a county-wide basis to all counties with significant malaria histories and to a few continguous counties. A total of 53 counties participated in the program during the year with operations as follows: Participating in operations during both halves of the fiscal year (33) were Baker, Bleckley, Brantley, Bryan, Bulloch, Burke, Calhoun, Clay, Colquitt, Crawford, Crisp, Decatur, Doughtery, Echols, Effingham, Emanuel, Jefferson, Jenkins, Laurens, Lee, Miller, Montgomery, Peach, Quitman, Screven, Seminole, Sumter, Terrell, Toombs, Turner, Wayne, Webster, Worth; participating in the first half only (16) were Bacon, Ben Hill, Camden, Candler, Early, Evans, Jeff Davis, Johnson, Liberty, McIntosh, Pulaski, Tattnall, Tift, Treutlen, Washington, and Wilcox; participating in the second half only (4) were Dooly, Macon, Mitchell, and Stewart.

During the fiscal year, 114,000 individual houses were sprayed and approximately 81,000 of that number received two applications. Unit application costs were as follows: State and local, $0.86 (FY-1947, $0.90); CDC, $1.51 (FY-1947, $1.79); total costs, $2.37 (FY-1947, $2.69). In 95 to 98 percent of houses sprayed, emulsion was applied at the rate of 100 to 104 mg. DDT per square foot with an over-all average of about 0.78 pound per unit. Gross man-hours per unit averaged 0.55 as compared with 0.67 in 1947. Spray applications during the fiscal year totaled 195,026: 97,984 in the first half and 97,042 in the second half. In each calendar year, all inhabited homes in the operating areas were offered two rounds of spray.

For the residual house spraying program, the State health department provided general supervisory services; mapping, drafting, and reproduction services; State office facilities and supplies; incidental travel costs; and telegraph and telephone tolls. County authorities (from tax funds) provided contact and spray crew personnel and transportation of same; office and warehouse facilities; and funds for minor items, averaging around $10 per month per spray crewman. CDC allocations provided salaries for State office, warehouse and shop, and field supervisory personnel; automotive purchases and repairs; spray and shop equipment; and warehouse rent and utilities. All CDC personnel served as State health department and/or local health

department representatives under the technical supervision of the Engineering Division of the State health department.

One supervisor was employed for each county, area, and district. Three to four counties comprised an area and three to four areas comprised a district. The number of spray crew personnel varied from two to eight persons per county according to the number of houses to be sprayed in each round. These were organized in two-man or three-man crews as circumstances demanded. Basic equipment included regulated pressure sprayers (described in April, May, June 1948 CDC BULLETIN) designed and constructed by Georgia Extended Program personnel.

Vehicles and spraying equipment were inspected and repaired at the State warehouse during the nonspraying season. Concentrate, other than 11,000 gallons of WAA 25 percent furnished by CDC headquarters, was mixed at the State warehouse in Macon, insuring known quality at lower costs. Forty-two of fifty-two field supervisory workers employed in 1948 were experienced. In all instances, district and area supervisors trained county supervisors and spray crew personnel in proper spraying techniques prior to assignment to field operations. The training of personnel on CDC malaria control operations has been of considerable benefit to the State health department in this respect.

While no comprehensive larviciding program was pursued, cooperation was extended to the Richmond County Health Department in larvicidal operations, including those in flight range of Oliver General Hospital. In association with the Crisp County Health Department, similar activities were conducted in connection with the county-owned hydroelectric development reservoir. Assistance in the form of loaned equipment, vehicles, and other apparatus was extended to the health departments of Bulloch, Colquitt, Crisp, and Doughtery Counties.

During the fiscal year toxicity tests were made on surfaces sprayed at different rates and at varying times after application, in order to determine comparative durations of toxicity. Houseflies were used as test insects in all of these tests. Results to date indicate that relatively little extension of duration of toxicity is gained by utilizing application rates in excess of 100 mg. per square foot, and that a single application, regardless of strength, generally will not provide satisfactory toxicity in inhabited houses for periods of 5 to 6 months. Accordingly, Georgia operations continue to conform to the general pattern of two 100 mg. applications in each season of operations.

Malaria mortality in Georgia during 1947 remained at the 1946 level of 0.4 per 100,000 population, which is an all-time low. Reported morbidity during the first 6 months of 1948 was lower than for any similar period.

As in other jurisdictions, complaints were registered during the year as to the effectiveness of the spraying program with respect to fly control. Each complaint was investigated, and in approximately 98 percent of the instances, it was demonstrated to the satisfaction of the complainant that lack of fly control was due to the heavy breeding occurring on the premises and not to lack of toxicity of the spray residue. In this connection, the educational program was devised so as to place emphasis on informing the public that the prime objective of DDT residual spraying operations is malaria control and that the degree of fly control is dependent upon the cooperation of householders in limiting the areas conducive to fly breeding and feeding around and in the home.

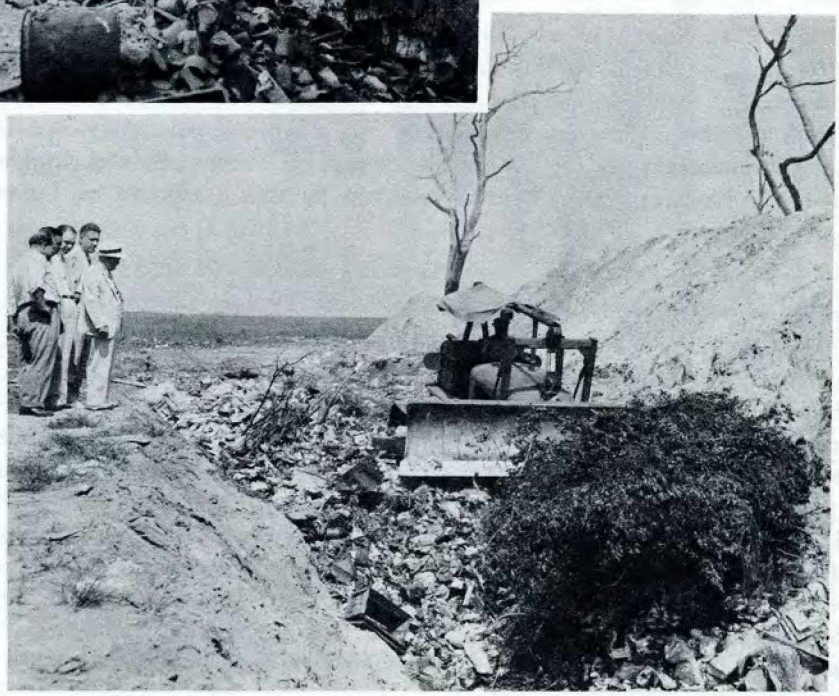
TYPHUS CONTROL. Typhus control measures in Georgia during 1948 consisted of DDT dusting for rat ectoparasite control, rat eradication, ratproofing of buildings,

epidemiological and rodent investigations, and refuse collection and disposal advisory services. The program was operated under the general supervision of the Typhus Control Service of the State health department through the financial participation of CDC (50 percent), the State, and local health departments.

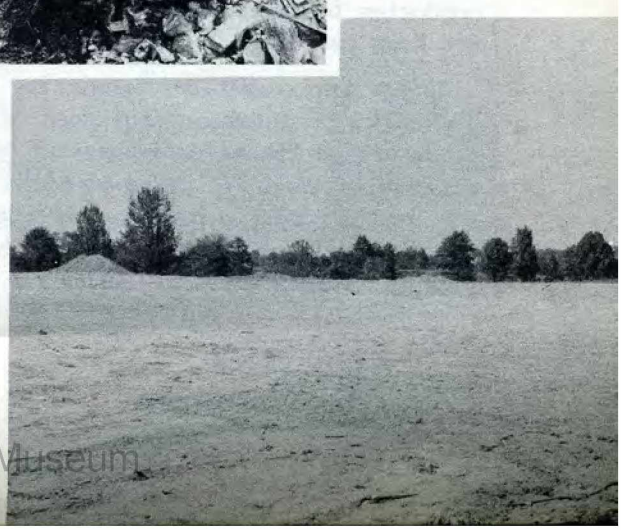
DDT Dusting and Rat Eradication. In conducting DDT dusting and rat eradication services, the Typhus Control Service supplied supervisory personnel, 5 percent DDT dust, rodenticides such as 1080, motor vehicles, small equipment, and miscellaneous

Typical scene of the open dump method of municipal refuse disposal.

Sanitary land fill in operation – Savannah, Ga.



Land reclaimed by the sanitary land fill method of refuse disposal — Monroe, Ga.



items. Local participation included labor for applying dust, rodenticides other than 1080, rat bait, office space, and office supplies.

Full time DDT dusting and rat eradication services were provided during part or all of the fiscal year in 34 counties. These services consisted of the treating of urban and rural business and residential premises on a county-wide basis. In 53 counties partial dusting and eradication services were provided through mobile units operating out of the Macon field office. These services were provided on the basis of predetermined needs and requests by the respective communities.

During the fiscal year, 152,098 premises (36,486 business and 115,612 residential) were treated with 5 percent DDT dust at the rate of 3.16 pounds per premises. Rat eradication activities included the use of 43,202 pounds of red squill bait, 261 gallons of 1080 poison, 98 pounds of ANTU, 462 pounds of calcium cyanide, and 6 gallons of arsenic water, in treating 69,894 premises (13,969 business and 55,880 residential).

During the fiscal year, 425 business establishments were ratproofed. The Cordele project was completed, the Atlanta and Fulton County projects continued in operation, and a new project was inaugurated in Tifton. Preliminary arrangements were completed for the inaugurating of projects in Waycross and Jesup. The cost of local ratproofing projects, involving labor, materials, and equipment, was defrayed out of a revolving fund established by the respective communities. The revolving fund was reimbursed out of payments made by building owners or occupants for ratproofing work performed.

Sanitary Land Fill Operations. At the end of the fiscal year sanitary land fill projects were in operation in Muscogee County and the cities of Macon, Valdosta, Monroe, Thomasville, and Manchester. Other communities were in the process of inaugurating such projects. Refuse collection and disposal advisory services were made available to all communities in the State desiring technical aid in the elimination of insect- and rodent-propagated health hazards by the planning of controlled refuse collection and disposal.

Investigations. A program of investigating the epidemiological aspects of all reported cases of typhus was inaugurated by the Typhus Control Service during the year 1948. This activity was based on cases reported by practicing physicians. During the year, 31 reported cases were investigated and all premises implicated in the possible foci of infection treated with DDT dust. This new service, made by non-medical personnel, has been received enthusiastically and has engendered a closer liaison between local health officers, practicing physicians, and patients.

An investigative program to determine the extent of human typhus infection as compared with reported cases was carried on during 1947 and 1948 in conjunction with the State department of health VD-TB survey. During this fiscal year, 32,947 bloods were collected in Lowndes and Floyd counties. Serological tests for typhus were conducted by the Laboratory Division of CDC. The composite picture on this work has not been completed because resulting data have not been assembled.

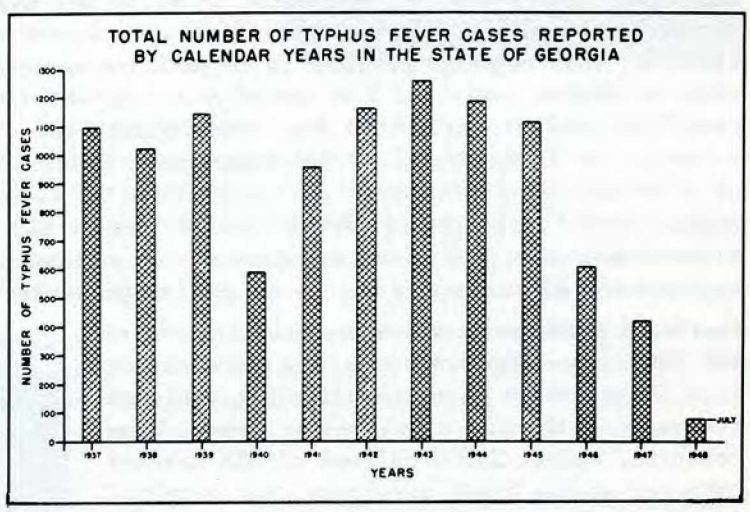
Rodent investigations consisting of biological and entomological studies were conducted to predetermine the need of extended DDT dusting for typhus prevention, and to determine the effectiveness of DDT dust in the control of rat ectoparasites. These activities were evaluated by the rat ectoparasite indices and the typhus infection rate in the rodent population, as determined by the laboratory complement fixation test.

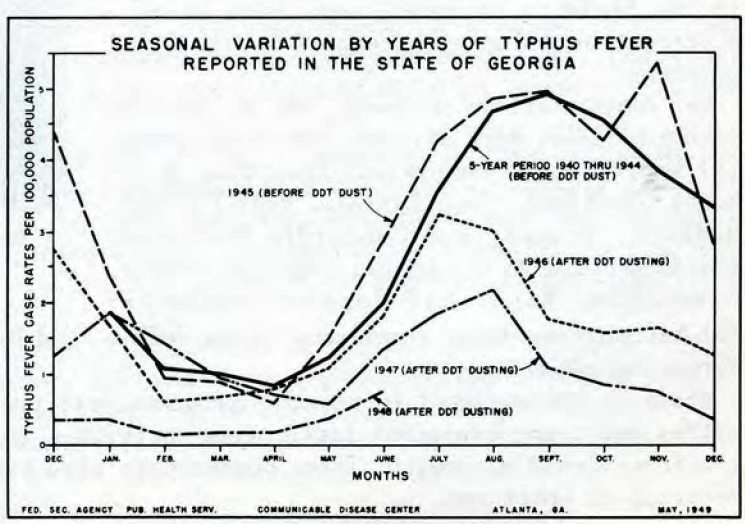
Biological activities included the preparation of maps showing the amount of trapping in various areas including the number of rats trapped, rate of infection, and the

rat ectoparasite picture. These maps aided in predetermining which particular section or area should be considered first for applying control measures and in eliminating sources of error in operations which were formerly encountered in routine cycle dusting. Trapping was conducted on a cross-sectional plan in each participating county, so that a more complete picture could be obtained of rat infestation and rat ectoparasite population. Observations of this work indicate that one cycle DDT dusting of all premises throughout the county in the spring, and possibly one cycle of dusting in the fall for some counties, should suffice as a typhus preventive measure.

During the fiscal year, 4,765 rats were trapped and examined for ectoparasites. Of this number, 2,478 were caught in dusted areas and 2,287 in undusted areas. A total of 68,562 ectoparasites were identified, including 1,450 fleas from DDT dusted areas and 7,138 fleas from undusted areas. This yielded a flea index of 0.585 in the dusted areas compared with 3.121 in undusted areas (all types of fleas), or a reduction through dusting of 81.25 percent. Complement fixation tests run on blood sera from 4,141 rats gave 688 positive reactions. The percentage of rat blood specimens positive to typhus was 16.6 percent for 1948 compared with 26 percent for 1947.

For the fiscal year 1948, the incidence of murine typhus for Georgia dropped to 285 reported cases as compared with 606 reported cases in 1947, a decrease of 53 percent. Mortality dropped from 29 in 1947 to 27 in 1948, a decrease of 6.9 percent. A comparative analysis in the incidence of murine typhus for the period 1937 through June 1948 is presented in the accompanying graph. The seasonal variation for the period 1945 through June 1948 is also depicted.





Throughout the year educational activities were a continuous assignment of regional and county health department personnel. The program was directed through adult groups for the promotion of city and county typhus control programs. Information on the control and prevention of typhus was disseminated through a variety of media including posters, booklets, newspapers, motion pictures, filmstrips, meetings, teachers, officials, and others.

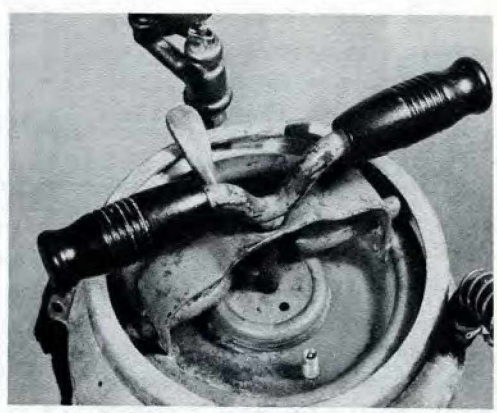
Louisiana

W. L. TREUTING, M. D., M. P. H. State Health Officer

Communicable Disease Center activities in Louisiana during the fiscal year 1948 followed the general pattern established in 1947. Principal activities consisted of malaria control DDT residual house spraying, and typhus control through DDT dusting and rat poisoning. Ratproofing was restricted due to labor and material costs. A serious outbreak of equine encephalomyelitis in Iberia Parish received special attention during the first half of the fiscal year.

MALARIA CONTROL. Spraying programs were carried out in 18 of the preapproved parishes in the State. During the 1947 spray season, 12 parishes participated to the extent of contributing $0.30 per available house. A detailed cost study indicated that local participation equivalent to $1.00 per available house was necessary to operate the spraying program, and efforts to increase local contributions were instituted. This campaign resulted in 18 parishes agreeing to cooperate in the spraying program. Police juries of four parishes appropriated tax funds, while in 16 parishes contributions were solicited from householders receiving the spray service.

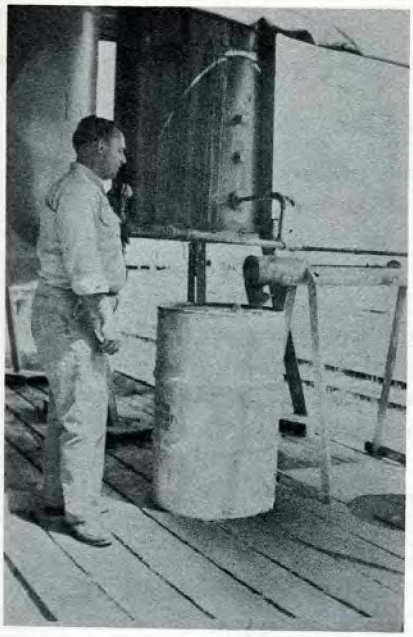
During the fiscal year, 64,900 houses were treated with 5 percent DDT at the rate of 1.20 pounds per house at an expenditure of 1.30 man-hours per house. Of this number, 9,600 were sprayed during the 1947 season and 55,300 during the 1948 season. A few trucks equipped with compressors and pressure tanks were used but the main application of the spray was by 2½-gallon pressure type hand spray cans. In some instances a Schraeder valve was substituted for the hand pump. Two-man crews were used except in a few parishes where insufficient vehicles recommended the use of three-man crews. Concentrate, except 2,500 gallons of 32½ percent prepared at the State warehouse, was supplied to the field in original containers where a 5 percent emulsion was prepared by the using personnel.



Modified hand spray can equipped with Schraeder valve.

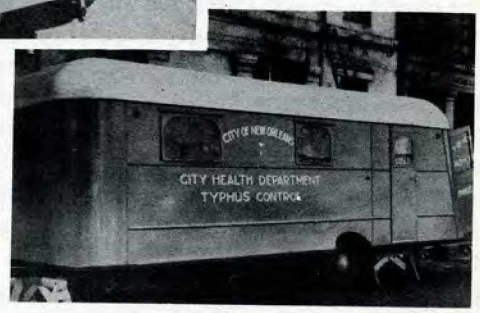
For administrative purposes, the 18 participating parishes were divided into three areas: (1) Monroe Area, comprising Ouachita, Morehouse, Richland, East Carroll, West Carroll, Madison, Tensas, and Concordia Parishes; (2) Winnfield Area, comprising Clairborne, Bienville, Winn, and Bossier Parishes; (3) Natchitoches Area, comprising Caddo, DeSoto, Red River, Natchitoches, Sabine, and Vernon Parishes.

While no CDC-assisted larviciding projects were operated during the year, some 20 cities and towns conducted larviciding activities under the general supervision of the State board of health. Three communities also carried on DDT premises spraying entirely on their own.



Jeep converted into an effective mobile spray unit.

Trailer adapted for typhus control work.



Unit of central DDT mixing plant.

ENCEPHALOMYELITIS OPERATIONS. During the summer and early fall of 1947, a serious epidemic of equine encephalomyelitis developed in several parishes in the southwestern part of the State, particularly in Iberia Parish. Six human cases were diagnosed and three deaths were recorded. At the request of parish authorities, 15,000 outbuildings in Iberia Parish and 300 in Lafourche Parish were sprayed with a kerosene solution of DDT isomer. CDC personnel and equipment were made available for this work.

STATE WAREHOUSE. Centrally located warehouse and automotive shop facilities were obtained during the year through the cooperation of the city of Monroe and the War Assets Administration. Installations at Selman Field were acquired by the city of Monroe and three buildings there were made available to CDCA for automotive shop space and warehouse use.

TYPHUS CONTROL. Fifty-two confirmed cases of typhus were recorded in 1948 compared with 70 cases reported in 1947 and 463 in 1945. This record was achieved through more effective supervision from local, regional, and State personnel, and through the application of improved techniques in the application of DDT dust in connection with rat eradication campaigns.

Parish-wide dusting projects were carried out in Orleans, Iberia, Calcasieu, St. Martin, Lafourche, St. Landry, and Tangipahoa Parishes. The *X. cheopis* index was reduced approximately 85 percent in these parishes. Evaluation work was carried on in all parishes with blood and ectoparasite specimens being forwarded to the laboratory on a weekly basis. A total of 62,418 man-hours was expended in applying 120,000 pounds of 5 percent DDT dust.

Rat poisoning was conducted in 52 cities located in 28 parishes. The program covered 58,000 residences and 4,000 business establishments. Red squill and 1080 were used and in all instances U.S.P.H.S. standard methods of application were practiced.

Three ratproofing projects inaugurated in 1945 were completed and maintenance work was continued during the year. Due to the excessive costs of labor and materials, no new projects were undertaken during the year.

Mississippi

FELIX J. UNDERWOOD, M. D. State Health Officer

Communicable Disease Center activities in Mississippi are administered by the Division of Sanitary Engineering, State board of health. The State Sanitary Engineer, designated State Director of CDCA, formulates policies and exercises supervisory control over the program. Field operations are organized and conducted as an integral part of the activities of local health departments. Malaria and typhus control, as in 1947, were the basic activities during the fiscal year 1948. Malaria control spray operations were established on a single application of 7½ percent DDT emulsion spray basis with the opening of the 1948 spray season. Typhus control measures, including rat eradication, State typhus survey, and ratproofing were carried on in 72 of the 82 counties of the State. Expanded activities in the pest control field were recorded during the period. Special projects undertaken during 1948 included cooperation with instructors of Veterans Farm Training classes in Scott County in spraying premises of trainees, and in collaboration with the Corps of Engineers in malaria control work in the Sardis Reservoir.

MALARIA CONTROL. The application of a 2½ percent DDT spray to 53,996 houses, previously treated with a 5 percent spray, concluded the 1947 spray season and also the use of the two application spray procedure. On the basis of the evaluation of experimental projects, with the beginning of the 1948 spray season a single application of 7½ percent DDT spray was substituted for the old method of one 5 percent application and one 2½ percent application. The change-over resulted in a saving in costs with no noticeable reduction in effectiveness. In implementing the change, two plans were offered local appropriating bodies. One plan covered the application of 7½ percent spray to all houses and outdoor toilets, and the other covered application of the same treatment to all houses, outdoor toilets, and animal-housing barns at a small additional cost. Seventeen counties adopted the plan including animal-housing barns, and one county the other plan. Crews consisting of a working foreman and two laborers started spray operations in March 1948. Crews were based in strategic locations in the respective counties, which proved more economical than the old system of basing all crews in a county at a single location. During the 1948 spray season, 107,460 complete premises and 13,421 houses were sprayed with 7½ percent DDT emulsion. For the fiscal year, 174,877 houses, 38,679 barns, and 92,823 other outbuildings were sprayed. Spray

Typical DDT residual spray crew and truck.

Auxiliary compressed air tank used for spraying barns and outbuildings.

Table 1

RESIDUAL SPRAYING BY COUNTIES

COUNTY	No. Houses Sprayed		No. Premises Sprayed
	2½% DDT	7½% DDT	7½% DDT
Quitman	2,885	—	5,978
Tunica	3,117	—	5,391
Coahoma	5,113	—	8,794
Bolivar	7,831	—	13,450
Washington	334	13,421	—
Sunflower	6,000	—	11,194
Leflore	4,999	—	8,672
Tallahatchie	3,946	—	6,646
Humphreys	2,776	—	5,371
Sharkey	1,681	—	3,038
Issaquena	414	—	1,342
DeSoto	—	—	6,113
Panola	3,387	—	6,792
Holmes	4,265	—	7,230
Yazoo	3,980	—	7,252
Carroll	1,605	—	3,618
Grenada	1,663	—	3,484
Webster	—	—	3,095
Total	53,996	13,421	107,460*

*Coverage included 131,592 outbuildings in addition to houses.

operations during the year are summarized in table 1.

During the period May through September 1947, entomological inspections were made of 2,521 sprayed houses and their unsprayed stations. In addition, 218 unsprayed houses and their check stations within sprayed counties were inspected. Inspections were carried out in the usual manner and concerned mosquitoes and house-frequenting flies. Inspection results may be summarized as follows:

1. Comparing total sprayed houses with unsprayed houses (houses sprayed in 1946 considered unsprayed), the control indicated was 87.2 percent for *quads*, 73.3 percent for flies.

2. Comparing total sprayed houses with houses in the sprayed area which had never been sprayed, the control indicated was 92.6 percent for *quads*, 88.2 percent for flies.

3. Comparing total sprayed houses with unsprayed houses in a county which had never been sprayed, control indicated was 96.3 percent for *quads*, 88.2 percent for flies.

4. A difference of 18.7 percent for *quad*-positive among houses sprayed in 1946 and unsprayed houses in the same area was believed due to the residual toxicity of the DDT applied during the previous year.

5. Afternoon reinspections of 54 houses found *quad*-positive in the morning showed that 7 remained positive.

6. Outside of houses, a total reduction of 20.6 percent in flies was indicated on premises with sprayed houses, as compared with premises with unsprayed houses.

7. The number of *quad*-positive sprayed houses did not vary directly with the age of the spray deposit over the 5-month period, possibly due to the effectiveness of the spray throughout the period.

8. Unsprayed natural resting places station counts of over 30 *quads* per station did not cause a corresponding rise in the number of *quad*-positive in sprayed houses nearby.

It was concluded that the control of *Anopheles quadrimaculatus* in sprayed houses was excellent, and that continuation of such a program was justified as a malaria control measure.

An investigational project was undertaken in Warren County (previously unsprayed) to test the effectiveness of one annual spray of houses with 200 mg. per square foot and

300 mg. per square foot treatments applied in April 1947. Ninety-six houses in one part of the county received the heavier treatment and 83 in another part the lighter treatment. During the period May-September, 50 entomological inspections were made in each of the treated areas. Only one house in each area was found *quad*-positive. It was concluded that the treatments (200 mg., 300 mg.) were effective equally during the 5-month period considered. Muscoid fly reduction in the 200 mg. area indicated was 68.3 percent, while in the 300 mg. area it was 40.5 percent. The larger reduction in the 200 mg. area possibly was due to the fact that more flies could be found per unsprayed house in that area for purposes of comparison.

During June 1948, entomological inspections were made of 255 houses in 18 EPS counties and 10 in 2 previously unsprayed counties. Of houses sprayed in 1948 (EPS counties), one was *quad*-positive; and of previously unsprayed houses, 60 percent were *quad*-positive. The average number of muscoid flies in 1948 sprayed houses was 0.9 per room; in houses sprayed in 1947, the average was 3.5 per room; and in houses previously unsprayed, the average was 41.1 per room. It was concluded that DDT deposited at the rate of 300 mg. per square foot was effective equally at monthly periods up to 4 months after the time of application. Sprayed resting places were 20.3 percent *quad*-positive as compared with 83.3 percent *quad*-positive in unsprayed natural resting places in nearby sprayed counties.

Special projects implemented during the fiscal year included aid in relief work in the hurricane-flood devastated area along the Gulf Coast. State office personnel and three area supervisors assisted in the spraying of the entire coastal area. The CDC furnished supervision and the State board of health provided operational personnel in the application of 7½ percent DDT spray to a high *Anopheles* incident area of the Sardis Reservoir. The Corps of Engineers, responsible for the area, furnished the funds for the project. In Scott County, instructors of Veterans Farm Training classes were provided technical information and other assistance in the spraying of 700 premises of veteran trainees.

TYPHUS CONTROL. Cooperative typhus control measures were carried on in 72 of the 82 counties in the State. Rat eradication operations were the more extensive, with 175 communities in 70 counties participating. This program was conducted jointly by the State board of health, State Plant Board, and the U. S. Wildlife Service. In business establishments, 1080 was used; and in residential programs, red squill. Local units provided the larger share of the $25,000 expended in rat eradication activities.

The State typhus survey, started in November 1946, was completed during the fiscal year 1948. Rats were trapped in the larger towns in 67 counties. Live rats trapped numbered 3,548 from which 46,105 ectoparasites were combed and identified. Blood serum was obtained from 3,234 rats, with 7 percent registering positive for murine typhus, 91 percent negative, and 2 percent unsatisfactory for testing. Cities and towns found to have more than 4 percent typhus-positive rats were approached with the proposition

Combing a rat for collection of ectoparasites. (State Typhus Survey.)

Steel traps were used to take live rats for ectoparasites and bleeding.

that DDT dust and 1080 poisoned water would be furnished if the local units would supply red squill for residential programs and labor for application. Fifty communities in 21 counties accepted the offer. The rodent survey cost $20,000 ($11,000 CDC, $9,000 State board of health), and consumed 10,299 man-hours of work. Dusting operations during the fiscal year covered parts of 21 counties, including the treatment of 9,076 premises, at an expenditure of 18,455 pounds of 10 percent DDT dust and 5,995 man-hours of labor. Inspections covered 10,703 premises. Examination of ectoparasites from rats trapped in the dusted area demonstrated that the rat flea index can be kept at around 0.3 per rat or less, and that the residual effect of DDT dust is apparent for several months. In selected establishments in McComb (Pike County), an initial *cheopis* index of 9.3 was reduced to and remained at 0.3 per rat, 213 days after the first application of dust. Thirty-seven days after the second application, no fleas were found on rats from these establishments. Mite and lice indices do not appear to have been reduced by dust application. An experimental project designed to test the effectiveness of 5 percent DDT spray emulsion in reducing the flea index on rats when applied to runs and burrows was carried on in Brookhaven (Lincoln County). Examination of trapped rats indicated no control of fleas, mites, or lice by this treatment. However, ectoparasite counts on rats from undusted areas varied greatly during the period, and it is probable that the number of rats obtained (100) was too small to disclose effectiveness of the treatment.

Ratproofing maintenance activities were launched in three counties and a ratproofing program started in Pike County.

The number of typhus cases reported in the State was reduced from 127 in 1946 to 60 in 1947.

PEST CONTROL. In Hattiesburg (Forrest County), a fly control program was conducted by the application of 5 percent DDT fuel oil solution as a mist to fly-breeding places throughout the city. Entomological evaluation indicated a city fly index of 2.6 flies per square yard grill in the worst congregating areas could be maintained by this treatment within half a day after application, as compared with 52 flies per grill prior to treatment. Public reception of this program set the stage for expansion of activities in this field, which were further encouraged by State health department cooperation through technical assistance and financial aid up to 10 to 20 percent of local budgets.

The CDC warehouse, with repair shop facilities, is located in the Delta Medical Center, Greenwood, which is centrally situated with respect to field operations. Seventy crew vehicles were overhauled during the off-season. Mobile mechanics operated out of the shop, keeping vehicles and equipment in repair.

Tennessee

R. H. HUTCHESON, M. D. Commissioner of Public Health

Malaria control activities were expanded during the year through increased local participation. Thirteen counties in the western part of the State cooperated with CDC in the application of DDT residual spray to 36,469 premises. Public response was less enthusiastic in typhus control operations. However, DDT dusting and/or rat-proofing were carried on in four cities during the year.

MALARIA CONTROL. Inspection records indicate that this was the most successful year of the malaria control program. As in previous years, the approach was to break the chain of malaria transmission by controlling the adult female *Anopheles quadrimaculatus* mosquito through application of DDT to the walls of buildings. The 1947 procedure of spraying the inside walls of all buildings in which malaria vectors were found was continued. Local contributions to the extent of additional costs involved in premises spraying made this possible. The method of application was by mobile air pressure units operated by two-man crews. A contact man functioned as supervisor over two operating crews. A time study conducted for evaluation purposes revealed that two-man crews are desirable, and that by substituting public appropriations for fees from householders, contact personnel can be eliminated with a result of still greater economy. Experience also supported the switch from hand spray methods to the air pressure equipment which is illustrated in the accompanying photograph. This change increased the accuracy of application by 40 percent and the annual average of premises per crew was increased by one per man day. An analysis and summary of spraying activities are reflected in table 1.

Entomological activities were carried on in connection with the residual spray program in 13 west Tennessee counties. Inspections were made throughout the season to determine the effectiveness of the spray program. These inspections were made at approximately 2 percent of sprayed premises, on a random basis, to note the control of *Anopheles quadrimaculatus* and muscoid flies. In one county a detailed study was made to determine the effectiveness of the residual spray over a period of time. Results of these inspections indicate that better than 90 percent control was obtained in houses and approximately 75 percent in barns, and that the residual spray was effective in control at the end of the season.

Veterans Administration hospitals in Memphis and Nashville and the Naval Air Training Station near Millington were protected by larvicidal operations, using a DDT fuel

Two-man crew mobile air pressure spray unit.

Table 1

RESIDUAL SPRAY OPERATIONS — TENNESSEE
Fiscal Year 1948

County	Premises Sprayed	Pounds DDT Used	Man-Hours				Pounds DDT Per Premises	Man-Hours Per Premises	Man-Hours Per Pound DDT
			CDC	Local	Percent Local	Total			
Lake*	1,955	2,854	762	2,698	78.0	3,460	1.46	1.77	1.21
Obion	1,083	2,231	390	1,917	83.1	2,307	2.06	2.13	1.03
Dyer	4,072	8,592	1,507	6,841	81.9	8,348	2.11	2.05	0.97
Lauderdale*	3,891	7,121	973	6,381	86.8	7,354	1.83	1.89	1.03
Tipton*	4,683	8,664	1,218	7,305	85.7	8,523	1.85	1.82	0.98
Crockett	696	1,100	244	1,162	82.6	1,406	1.58	2.02	1.28
Gibson	827	1,555	405	1,489	78.6	1,894	1.88	2.29	1.22
Weakley	1,165	2,015	489	1,981	80.2	2,470	1.73	2.12	1.23
Haywood**	3,981	8,002	1,314	5,494	80.7	6,808	2.01	1.71	0.85
Fayette**	3,942	8,870	1,301	7,332	84.9	8,633	2.25	2.19	0.97
Madison/	892	1,748	357	1,409	79.8	1,766	1.96	1.98	1.01
Hardeman**	3,463	8,554	1,143	5,749	83.4	6,892	2.47	1.99	0.81
Shelby	5,819	12,220	1,688	10,590	86.3	12,278	2.10	2.11	1.00
Total	36,469	73,667	11,670	60,393	83.8	72,063	2.02	1.98	1.04

*County-wide FY 1948
**County-wide calendar year 1948
/New counties 1948 calendar year

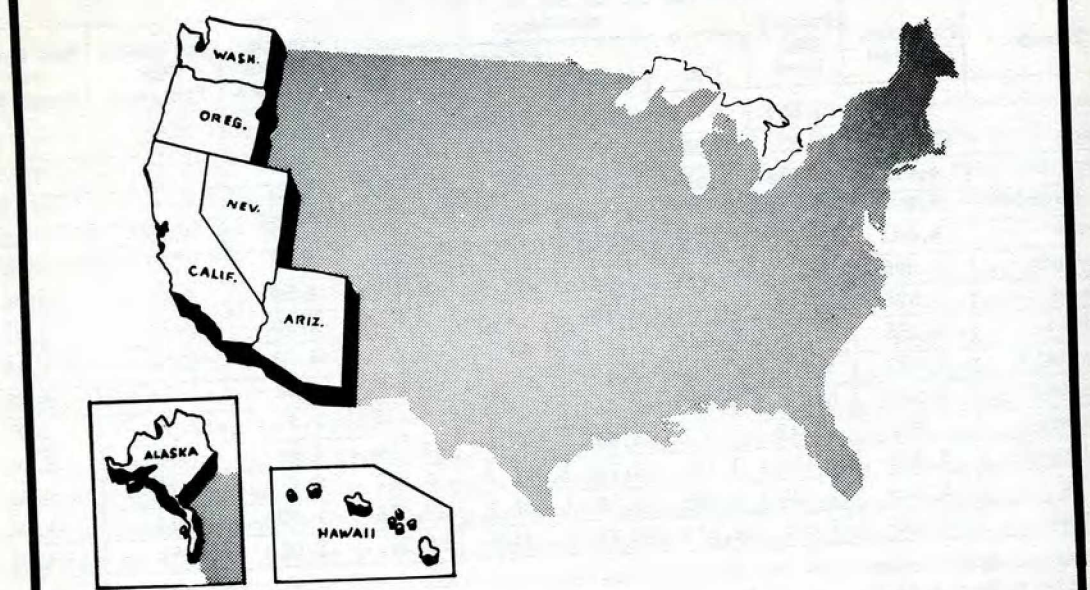
oil mixture. Other larvicidal operations were conducted by local units under the supervision of the State department of public health.

Utilizing a recent legislative act authorizing the prevention of the spread of malaria by controlling the impoundment of waters, the State health department launched an extensive survey in July and August 1947 which resulted in expanded operations in water impoundage control. Recommendations for fish culture and malaria control were jointly formulated by the Department of Public Health and other State and Federal agencies. Further studies of water impoundment were conducted with the U. S. Engineers at Dale Hollow and Center Hill Reservoirs. Inspection stations were located on the Dale Hollow Reservoir by health department personnel and recommendations were made to the U. S. Engineers for control programs. At Center Hill Reservoir all mosquito station location and inspection work has been done by health department personnel.

TYPHUS CONTROL. The Communicable Disease Center cooperated with the State and local health departments in typhus control activities in four municipalities (Nashville, Knoxville, Cleveland, and Chattanooga) during the fiscal year 1948. In Memphis the local health department sponsored a locally-financed ratproofing program.

Control measures consisted of ratproofing and DDT dusting in Nashville and Knoxville and only ratproofing in Chattanooga and Cleveland. Although it is believed that the typhus control program made progress during the year, in most instances difficulty was experienced in obtaining proper manpower. In the main, reliance was upon private contractors and cooperation was not always enthusiastic.

Ratproofing operations included 224 buildings in Nashville, 223 in Knoxville, 127 in Cleveland, and 100 in Chattanooga. Dusting operations included 6,190 buildings in Nashville and 2,168 in Knoxville.

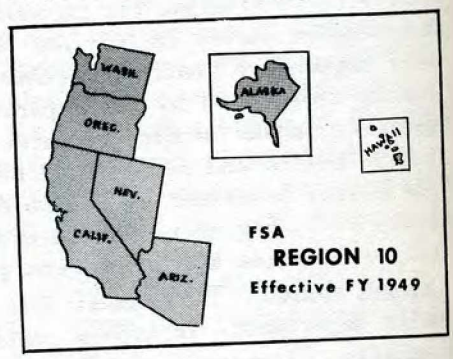


USPHS

DISTRICT 5

Headquarters: San Francisco, Calif.

Operational programs were carried on in California and the Territory of Hawaii during the fiscal year 1948. Consultation services and technical advice were available to State and local health departments through the facilities of the District office.



California

WILTON L. HALVERSON, M. D. Director of Public Health

The fiscal year 1948 marked the beginning of a new period of vector control in California. On July 1, 1947, the State department of public health established the Bureau of Vector Control to direct the study and control of arthropods of health

importance. This reorganization consolidated within the Division of Environmental Sanitation the work of mosquito control and rodent survey previously done by other departmental units.

With the establishment of the new bureau it was necessary to develop a new plan of action. As a first step in this process, a review was made of past vector control activities which revealed the following pertinent facts: (1) More emphasis has been placed on endemic surveys than on control demonstrations or control programs. (2) The greatest amount of endemic survey work has been on the reservoirs and vectors of plague and tularemia. (3) The major emphasis of control demonstrations and control programs has been on the mosquito vectors of encephalitis and malaria. (4) Minimal emphasis of control demonstrations and control programs has been on the rodent reservoirs of plague, typhus, and relapsing fever. (5) On several of the nine diseases considered in the review no work or very little work has been done with respect to endemic surveys, control demonstrations, or control programs.

With this information in hand, vector-borne diseases in California were critically reviewed, and vector diseases having the highest potentials as of July 1947 were analyzed as a basis for planning vector control activities. These diseases were encephalitis, malaria, plague, Q fever, relapsing fever, Rocky Mountain spotted fever, tularemia, typhus, and the group of fly-borne diseases (treated as a single category). Each disease was considered with respect to: (1) problem in the State, (2) the past and future programs in the State, and (3) needed research. An arbitrary A, B, C scale was used to indicate comparative values on points considered in evaluating the problem and past program for each disease, with "A" representing a high value, "B" moderate, and "C" a low value. Application of this evaluating procedure revealed encephalitis and murine typhus are at present the more important vector-borne diseases. This plan of vector problem analysis permits long-range planning and continual revaluation of the entire vector control problem.

Epidemiology

As indicated in last year's report, malaria, once an important disease, has become relatively unimportant in recent years. In 1947 the total number of reported cases of malaria was 110, of which 90 were recorded as not chargeable to California. Human cases of encephalitis reported during the same period (1947) totaled 128. Thirty of these cases showed laboratory evidence of the disease; for the remainder, insufficient specimens were available or no rise in antibody titer was demonstrated. Thirty-five cases of typhus were reported during 1947.

During the year, concern regarding the introduction of Japanese encephalitis and tropical malaria declined somewhat due to the lack of specific evidence of importation or of secondary cases within the State. Concern continued high regarding the endemic encephalitis situation in the State and the State Legislature continued to provide funds for support of local vector mosquito control.

CDC Activities

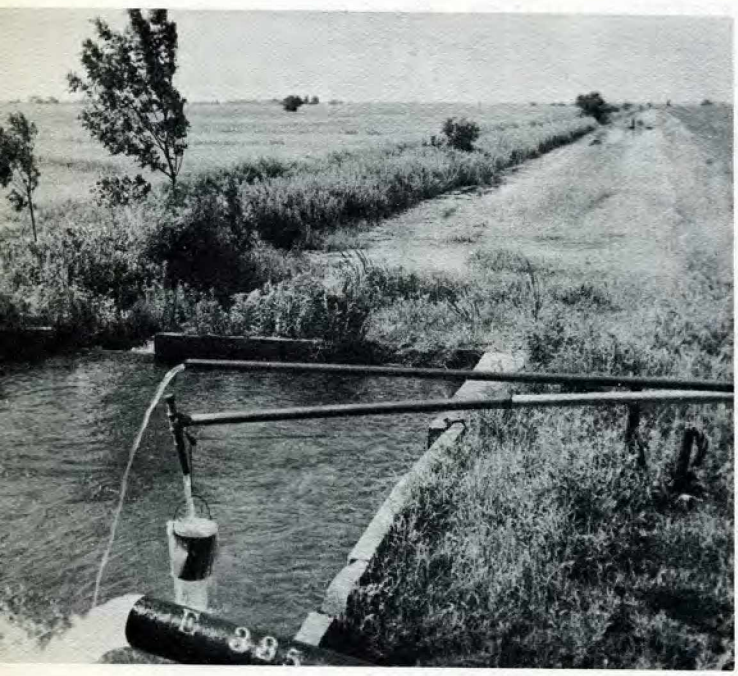
Communicable Disease Center activities have supported the Bureau of Vector Control mosquito vector programs by solving control problems for the benefit of local mosquito control organizations. During the year, CDC personnel were assigned to individual studies in support of the general vector program. Primarily, aid was given in the survey and collection of specimens for encephalitis virus recovery and in contacting Veterans Administration and military authorities concerning mosquito control problems in their respective areas. CDC personnel also assisted in developing a training school

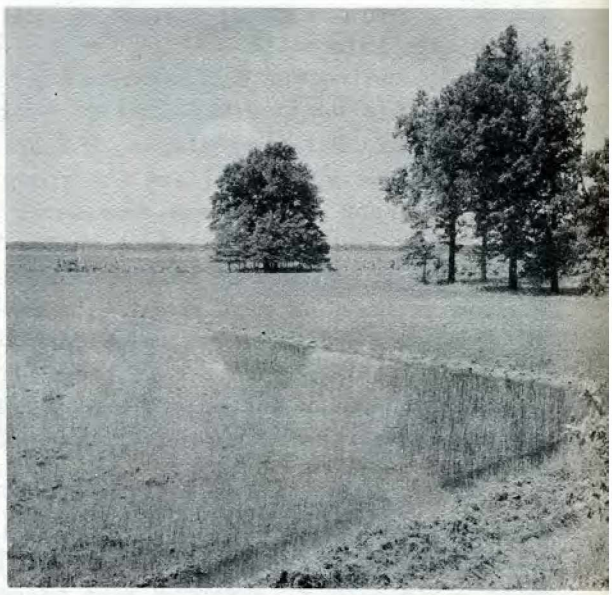
for local mosquito control workers. A pretreatment procedure for control of flood water mosquitoes was investigated.

CDC personnel assigned to California were reassigned to Washington and Oregon during May and June to assist in the flood disaster operations at that time. Equipment and supplies were procured and sent to the disaster area by the CDC unit in California.

RICE FIELD STUDIES. The rice field studies reported in the 1947 annual report were completed during the first half of this fiscal year. The demonstration area was located in a rice field area 5 miles northeast of Modesto, Stanislaus County. Three fields were selected which were in close proximity to each other and divided by levees into rectangular sections or checks of varying sizes. To avoid disturbing the natural habitat, simple plank bridges were constructed from levee to levee, forming three study checks. Dips were taken at uniformly spaced regular stations on each side of

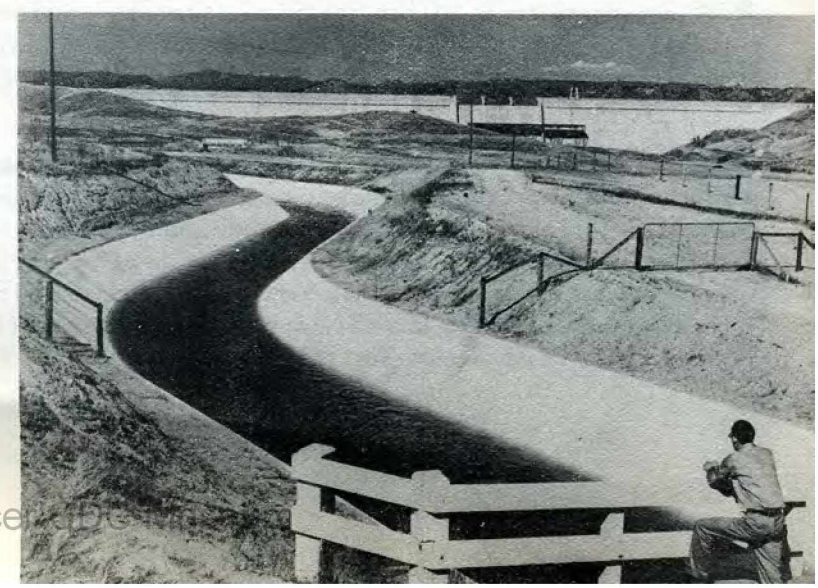
Pumping water into rice field irrigation system.





Typical rice field. Recently concluded studies revealed that rice fields are productive of large numbers of mosquitoes including *Culex tarsalis*, vector of encephalitis.

Canals and other water impoundments require surveillance to control mosquito breeding hazards.



the bridge and from levee dipping stations distributed equally around the perimeter of the check. Observations during the summer of 1947 revealed that in Stanislaus County: (1) Rice fields are productive of large numbers of *Anopheles freeborni* Aitken, and *Culex tarsalis* Coquillett. (2) The centers of the study checks were found to be as productive of significant numbers of mosquito larvae as the levees. Mosquito larvae of the two species named above were found to be well distributed throughout the checks. (3) *Anopheles freeborni* Aitken reached its peak during August and September, and *Culex tarsalis* Coquillett reached its peak during the last week of June and first week of July. (4) In view of the general distribution of mosquito larvae throughout the checks and because of the expansive areas involved, control methods at present are virtually limited to the use of aircraft. (5) Aqueous emulsions of DDT and DDD at the rate of 0.3 pound per acre gave excellent control for periods of from 1 to 2 weeks.

MOSQUITO CONTROL TRAINING PROGRAM. The 1948 training program was designed for the operational personnel of mosquito control agencies of California. Instructional teams, consisting of an operational instructor, an entomological instructor, and an assistant, conducted sessions during February, March, and April in different parts of the State. CDC personnel were concerned, in the main, with the entomological phase of the training. Over 350 persons from 45 agencies attended the several training sessions.

ENCEPHALITIS VECTOR SURVEY. A survey to determine the distribution of species of mosquitoes involved as vectors of encephalitis in California inaugurated in June 1947 was continued during 1948. CDC employees were assigned to collect specimens from areas not covered by the respective mosquito abatement districts. Laboratory tests of specimens submitted during 1947 have been completed. Sixty isolations of encephalitis virus were made from 634 pools, representing 45,000 mosquitoes. Fifty-six of the isolations were Western equine encephalitis and four St. Louis encephalitis. The majority of the isolations were made from pools of *Culex tarsalis* but a few were made from *Culex stigmatasoma* and *Aedes dorsalis*.

PRETREATMENT FOR CONTROL OF FLOOD WATER MOSQUITOES. Pretreatment studies for the control of flood water mosquitoes were inaugurated in Merced and Fresno Counties near the end of the fiscal year. The objective of these studies is to determine the minimum dosage of insecticide required, how long before irrigation an insecticide may be applied by this method, and to ascertain the relationship of dosage to residual or lasting effect.

RODENT STUDIES. County and local governmental agencies have engaged in rural and urban rodent control for the suppression and control of plague for many years. More recently, in Southern California, activities have been directed toward the suppression and control of typhus as well. It appeared desirable to reevaluate field plague activities and so modify and redirect rodent control operations as to make them effective against typhus as well as plague. Rodent control specialists assigned to the State by CDC assisted in developing plans for this reorganization of rodent control activities.

Two of the four active plague survey units continue plague surveillance activities. The other two have been reorganized and operate as rat control study units. The functions of these units in any particular urban area involve: making of sanitary surveys, paying particular attention to the relation of garbage and refuse systems to rats; the inspection of commercial establishments and representative residential areas to determine their relations to rats; and sampling of rats and rat ectoparasite populations for laboratory analysis for typhus, Q fever, bubonic plague, and for taxonomic studies.

Territory of Hawaii

C. L. WILBAR, JR., M. D. President, Board of Health

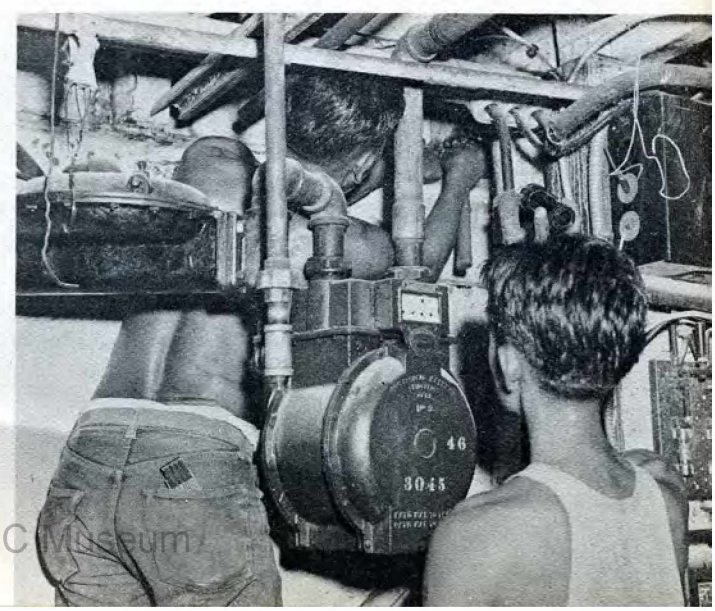
CDC activities in Hawaii during 1948 continued to be directed against rodent-borne diseases, principally typhus fever and plague. Typhus control operations were centered in the city of Honolulu where procedures adopted in 1947 were intensified. Plague control and surveillance activities were carried out on the islands of Hawaii and Maui and plague surveillance activities only were carried out on the islands of Kauai and Oahu. Territorial financial participation amounted to 87 percent of the total cost of rodent control operations, with CDC contributing 13 percent.

TYPHUS CONTROL (Honolulu). Two work crews ratproofed 168 buildings at an average expenditure of $87.28 and 40.24 man-hours per building. Owners and/or occupants ratproofed 817 buildings in accordance with approved procedures. Rat poisoning, 1080, was practiced in 28 establishments. Gassing of burrows and the spreading of red squill, ANTU, and zinc phosphide baits were practiced on a limited scale. Dusting with 10 percent DDT was carried on in 154 buildings ratproofed by the official agency and in 9,368 premises located in selected areas where the incidence of typhus had been high in the past. Dusting operations required an average of 1.8 pounds of dust and 0.34 man-hours per building. No case of typhus was reported from any area which had received intensive dusting, and *X. cheopis* indices were consistently low in these areas. The typhus fever rate in Honolulu showed a marked decrease, declining from 21.9 per 100,000 population for fiscal year 1947 to 5.2 per 100,000 for 1948.

In 155 buildings ratproofed by territorial crews, 565 rats and 196 mice were snap-trapped. An additional 393 rats were trapped in nonratproofed buildings. Plague surveillance crews, working in cooperation with typhus control personnel, trapped 6,477 rats and 8,501 mice. A program for the collection of rat blood sera for complement

Movable dutchman being installed on door of large warehouse.

Ratproofing a bakery by sealing openings about pipes in basement with sheet metal.



fixation tests was inaugurated late in the fiscal year, with all bloods being forwarded to the CDC Laboratory for testing. This project is to be intensified during the ensuing year.

PLAGUE CONTROL AND SURVEILLANCE. During the fiscal year 1948 there was no reported case of human plague in the Territory, marking the third consecutive year that no human case was reported. However, plague infection, which first appeared in the area in 1899, still persists in two endemic areas on the islands of Hawaii and Maui. This year, eight infections in rodents were reported in the Hamakua district on the island of Hawaii and two in the Makawao district on the island of Maui. This total of 10 compares with a total of 6 recorded during the fiscal year 1947.

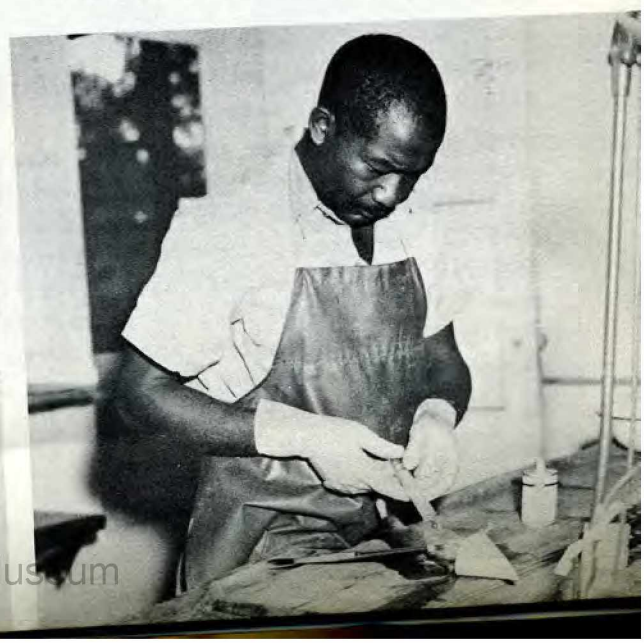
The following basic long term plague control and prevention program is currently in operation on the islands, with the CDC rendering assistance: (1) Surveillance activities are conducted in all areas where plague infection exists or has existed. (2) Laboratory personnel and facilities are maintained for the determination of plague infection. (3) Large scale plague control programs are conducted in known endemic areas, including such activities as trapping, poisoning, gassing, clearing, burning, ratproofing, DDT spraying and dusting, and general sanitation measures. (4) Educational programs are carried on to acquaint the public with the problem and to advise them of necessary procedures.

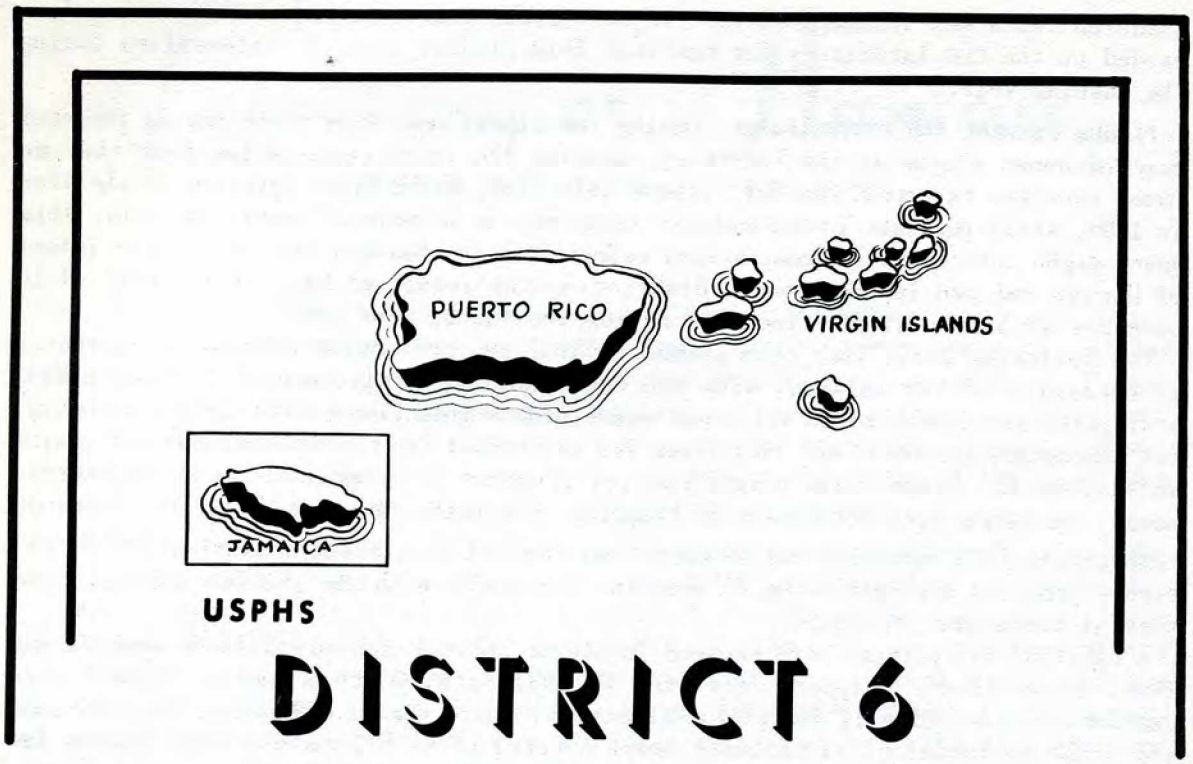
A total of 115 persons were engaged in plague control and surveillance work during 1948. Surveillance trappers retrieved 187,931 rats. Of this number, 93,614 were examined macroscopically for plague infection. There were 1,099 animal inoculations and 1,580 bacteriological cultures made. A total of 61,577 rodents were combed for fleas and 6,226 fleas recovered from them. Only 1,787 of the 61,577 rats combed were infested with fleas. Direct control activities in the endemic areas included the spreading of 7,330 pounds of poison bait, the gassing of 7,758 burrows and 16,571 rock piles, the ratproofing of 72 business establishments, the clearing of 10,700 square feet of brush, the spraying of 15,831 structures with 5 percent DDT kerosene mixture, and the inspection of all populated areas by sanitary inspectors.

Educational activities, both in typhus and plague control, were stressed throughout the year. Lectures were given, films presented, literature distributed, newspaper releases prepared, radio talks delivered, and information disseminated in other ways.

Blood being taken from the heart of a rat caught in a zero steel trap.

Microscopical examination of rat spleen tissue for *Pasteurella pestis*.





USPHS

DISTRICT 6

Headquarters: San Juan, Puerto Rico

The area covered, Puerto Rico and the Virgin Islands, embraces a number of active military installations. During 1948 maintenance of malaria control around military installations continued to be a major activity. Despite reduced CDC allocations, the malaria rate has continued to decline through the coordinated control efforts of the CDCA Office, Army, Navy, Air Forces, and the Insular Government. Other activities during the year included anopheline surveys, surveillance for malaria vectors, filariasis control, residual spray project in St. Croix, V. I., typhus control evaluation, entomological activities, epidemic and disaster service, and diversified educational activities.

THE MALARIA PROBLEM AND CONTROL ACTIVITIES. During the fiscal year the following projects were operated: Fort Buchanan, Losey Field, Fort Bundy, and Salinas Training Area. These projects were operated on a greatly reduced budget compared with 1947. In 1947, for example, average personnel engaged was 99 (annual) and 44 (per diem) compared with 59 (annual) and 42 (per diem) in 1948. A summary of these operations shows: 4,670 gallons of 1.25 percent DDT larvicide distributed over 9,628,000 feet of ditches (under 10 feet) and 595 acres at an expenditure of 7,290 man-hours; 24,928 gallons of 0.625 percent DDT larvicide distributed over 54,593 feet of ditches (less

than 10 feet) and 3,329 acres at an expenditure of 41,268 man-hours*; 800 pounds of 10 percent paris green applied to 800 acres at an expenditure of 512 man-hours**; 3,904 gallons of DDT sprayed to 2,920 premises at an expenditure of 2,423 man-hours**. Supplemental operations on these projects included: cleaning of 509,925 linear feet of ditches (Salinas Training Area not involved) at an expenditure of 23,469 man-hours; clearing 426,159 square feet of ditches (all in Losey Field area) at an expenditure of 1,965 man-hours; construction of 10,940 linear feet of ditches (in Fort Buchanan area) at an expenditure of 725 man-hours; application of 158.1 gallons of 10 percent DDT thermal aerosol spray to 4,025 acres at an expenditure of 82 man-hours (Fort Buchanan and Losey Field). In these operations CDC furnished 87 percent of the man-hours expended.

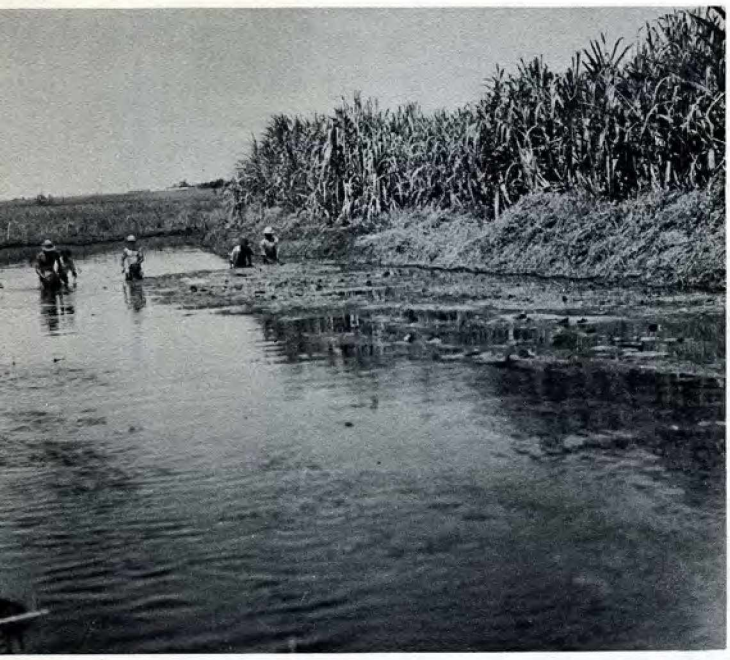
In connection with the Fort Buchanan project, a demonstration and experimental aerosol truck (4x4 Dodge) was equipped and used extensively throughout the area. Similar equipment was utilized by the Army, Navy, and Insular Health Department. Studies to determine the most effective solutions for use with such equipment were initiated during the fiscal year. In cooperation with the Insular Government, a program of spraying houses in the 2-mile control zone around Losey Field was carried on. All houses in the area were sprayed at 4-month intervals during the year. This program in conjunction with larviciding produced a substantial reduction in the malaria incidence within the control area. Anopheline and culicine surveys were made in Puerto Rico, St. Croix, and Jamaica, where it was felt necessary, and upon the request of the Army, Navy, or Insular Government.

Water front settlement showing some of the difficulties encountered in mosquito control operations.

Surveillance for malaria vectors, consisting of light and/or animal bait trap collections and periodic larval and adult mosquito surveys, was maintained in the following areas: Camp Tortuguero, Henry Barracks, Salinas, Amelia, Ursula, Camp O'Reilly, Veterans Administration Hospital at San Particio, P.H.S. Quarantine Station, International Airport, Ponce Demonstration Project, and Vernman Field, Jamaica, B. W. I.

*Salinas Training Area not treated

**Only Losey Field treated

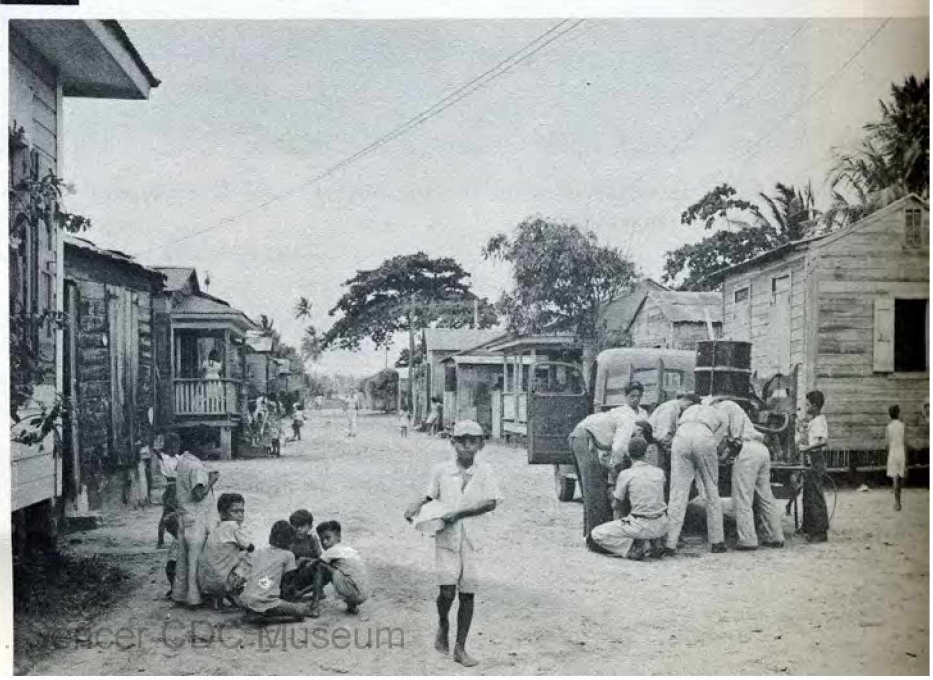


Removing aquatic vegetation from ditches reduces mosquito breeding potential.

Drainage ditch in sugarcane field. Over 500,000 linear feet of drainage ditches were cleaned during 1948.

Crewman adjusting spray nozzle before spraying interior of home.

Spray crew preparing for operations in residential section of native village.



Lining ditches with concrete reduces maintenance costs. Ditch construction exceeded 10,000 feet in 1947-48.

ENTOMOLOGICAL ACTIVITIES. A major objective of activities in this field during the year was the reorganization of projects and improvement of techniques so as to maintain the scope and efficiency of operations on the reduced budget allocations. This resulted in the giving of emphasis to surveys and evaluations calculated to reveal uneconomic practices and produce bases for their elimination. In this connection, a survey of the Fort Bundy Project, Ceiba, Puerto Rico, disclosed that operations were based on the presumption that the control problem centered in the extensive mangrove area between the Post and the sea; whereas, in fact, chief anopheline breeding occurred in ditches and streams in the area. The program was reorganized by the shifting of personnel and a resultant increase in effectiveness with a decrease in expenditures. Introduction of the mist nozzle and proper larviciding techniques resulted in a decrease in oil consumption by 2/3 and an increase in area treated at the same time. Efficiency was further increased by training Post Engineer crews and assigning them larger areas. At Fort Buchanan, entomological surveys around San Particio located troublesome breeding areas of culicines (*Culex quinquefasciatus* and *C. nigripalpus*) which were not included in the normal anopheline control schedule. These areas were eliminated. A survey of Brugal Swamp indicated it was not at that time (early in the year) a major problem and routine larviciding was stopped, but a close entomological check was kept. The Fort Buchanan area had three invasions of *Aedes sollicitans*, salt marsh mosquito; the first two required airplane spraying by the Army to bring relief to military personnel. By carefully checking the rainfall it was possible to anticipate the third outbreak and the control zone was extended to include known breeding places. With hand larviciding and daily operation of thermal aerosol trucks, this breeding was brought under control quickly.

Other activities of the CDCA entomologist during the year included surveys of Camp Tortuguero, Henry Barracks, Sabana Seca, Camp O'Reilly, and Brugal Swamp at the request of the Army and/or Navy. In each instance findings and recommendations were submitted to appropriate authorities. Investigations pursued covered bait trap design, thermal aerosol trucks, larvicide investigations, oil dumping for mosquito control, and crab hole breeding by mosquitoes. Also technical guidance was given in the residual house spraying for filariasis control in St. Croix, V. I.

TYPHUS CONTROL. During the early part of the year this program was assigned the CDCA Office of District 6, and only essential laboratory services were performed by the Parasitological Division. Rats were collected, bled, and ectoparasite samples obtained and identified by the CDC entomologist. During the year 1,117 rats were

trapped, 201 bloods were taken and submitted for serology, and 4,698 ectoparasite samples were identified. This project was terminated with the close of the fiscal year. A continuous effort has been made throughout the year to instill in the minds of health authorities in St. Thomas the desirability of continuing inspection work on ratproofed and rat-freed establishments. The typhus rate in St. Thomas has been reduced from 23 cases in 1944 to no cases in fiscal year 1948.

OTHER ACTIVITIES. The residual spray program set up in St. Croix, V. I., to determine if the incidence of filariasis can be reduced by the use of DDT residual spray continued during the fiscal year. All houses on the Island were included in the program. During the fiscal year of 1948 each house was sprayed at least three times, or once every 4 months. Table 1 summarizes the activities of this project. The program has been operated 2 years in conjunction with Dr. Brown of Columbia University who ran surveys before, during, and at the termination of the project. It had been planned to continue this program a sufficient number of years to determine if it would reduce the incidence of filariasis in the native population. Unforeseen factors intervened and the program was terminated June 30, 1948. However, the Lederle Laboratories have started a mass treatment program of the island population using a new drug "Hertrazan," and should this drug be effective, progress will have been made toward the eradication of filariasis. The District office is cooperating with the Lederle team operating on St. Croix.

Educational and promotional activities during the year consisted of demonstrations in larvicidal techniques, fly control, consultation on drainage problems on St. Croix, dissemination of general information supplied by CDC, showing of films, and presentation of lectures. Virgin Islands officials are being encouraged to inaugurate a DDT spray program on St. Croix. A fly control demonstration project was initiated and is continuing at a local dairy. The Medical Association of Puerto Rico has manifest interest in CDC films and other informational material concerning diseases in the Islands.

CDCA personnel rendered epidemic and disaster service in connection with a large outbreak of malaria in Patillas, Puerto Rico, during the summer of 1947 and in connection with a threatened typhoid outbreak on St. Croix. Comprehensive assistance was supplied in each instance and control measures were applied effectively.

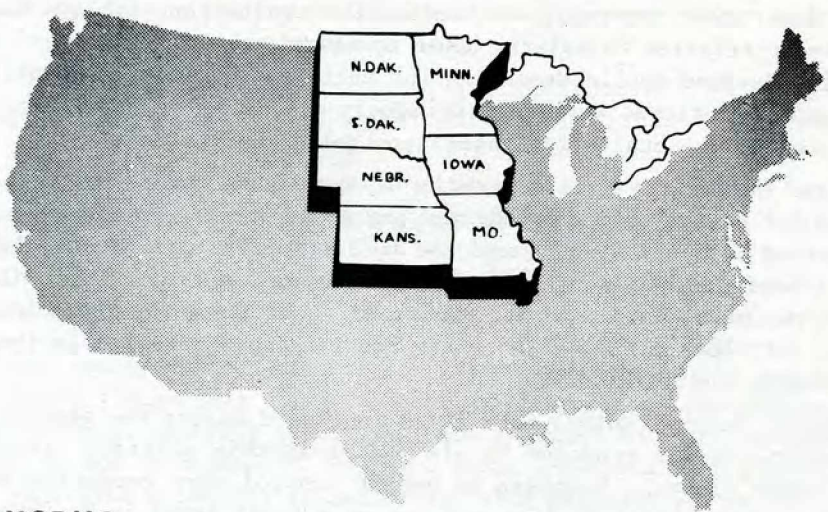
A branch of the CDC Laboratory Division operates in San Juan, Puerto Rico, in conjunction with the Department of Medical Zoology of the School of Tropical Medicine. Activities of this unit are carried on by a parasitologist under the technical supervision of the Laboratory Division and are considered in the report of that Division.

Table 1

FILARIASIS CONTROL — FISCAL YEAR 1948
DDT Residual House Spraying, St. Croix, V. I.

Spray Applications*	No. Houses Sprayed	Lb. DDT Used	Man-hours			Lb. DDT per House	Man-hours per House	Man-hours per Lb. DDT	Avg. Cost per House
			CDC	Local	Total				
2nd	2,512	2,142	4,832	704	5,536	0.85	2.20	2.58	$2.09
3rd	2,730	2,246	3,932	792	4,724	0.82	1.73	2.10	1.44
4th	2,952	2,479	3,142	932	4,074	0.84	1.38	1.64	1.12

* 1st spray application completed previous fiscal year.



USPHS

DISTRICT 7

Headquarters: Kansas City, Mo.

During the 1948 fiscal year, communicable disease activities in the District were very diversified. In addition to the regular malaria control spraying program in Missouri, many States in the District undertook community fly control programs on a more or less state-wide scale and certain municipalities became interested in mosquito control. Rat abatement programs were initiated in parts of each State in the District. An epidemic aid program in the early months of the fiscal year consumed a considerable portion of the resources of CDC in the District, and during the latter months of the year planning for the mosquito investigative projects in connection with the Missouri River Basin development program was a prime activity. The year started with two commissioned officers and a public health specialist assigned to the District. One of the officers was transferred after 8 months, with a replacement being assigned in the last month of the year. At the close of the year, two commissioned officers were engaged in insect control operation and one public health specialist was engaged in rodent control work.

INSECT CONTROL. General activities in insect control included: training of State and local health personnel in the control of insects affecting public health; assistance to State health departments in planning regular insect control programs; assistance to State health departments in planning and putting on insect control demonstrations; assistance to interstate carriers in organizing and initiating regular control

services for dining and maintenance cars; assistance in developing state-wide community fly control programs, especially with respect to Kansas; technical assistance to States and municipalities in connection with mosquito and rat ectoparasite surveys; assistance to the general health program within the District by reviews and audits of State health department programs; and continued consultation with the Missouri State Health Department relative to malaria house spraying and malaria control on impounded water. A fully equipped mobile demonstration unit was maintained and utilized widely in training and promotional work. Approximately 145 drums of DDT isomer concentrate were distributed to the States for insect control demonstrations.

EPIDEMIC AID. During the first 3 months of the fiscal year, CDC personnel in the District engaged in the organization and execution of an emergency insect control program concerned with the areas inundated by flooding rivers in June 1947. The program embraced residual house spraying in approximately 88 localities along the Missouri River from Omaha, Nebr., to St. Louis, Mo., and along the Des Moines River from Des Moines to Fort Madison, Iowa. Airplane spraying was conducted in the vicinity of Omaha, St. Joseph, and Kansas City.

RODENT CONTROL. Rodent control activities increased during the year throughout the District. Assistance was rendered to all States in this activity, according to the operational needs of each. Symposia on rodent control were conducted on two occassions, one on a State level in Iowa and one on a local level in St. Louis. In addition, considerable time was spent with the pest control industry and with individual operators and institutions, including the Haskell Indian School in Lawrence, Kans. More time was spent working in Missouri than any other State in the District. Kansas, where a number of human cases of typhus developed during the year in Douglas and Wichita, received the next greatest attention in rodent control work. Assistance was given Douglas and Wichita in DDT dusting and rodent eradication, including technical assistance in inaugurating plans for a complete rat control program in Wichita. Much progress in rodent control was made in St. Louis and Kansas City. The Kansas City program continued to depend entirely on private industry, while in St. Louis both the size of the city crew and activities of private industry registered an increase. Likewise, control activities at the State level increased in Missouri during the year. Only limited activity was recorded in Nebraska, notably at Columbus and Hastings. In South Dakota, Rapid City and Watertown planned permanent control programs in accordance with their respective needs. Bismarck, N. Dak., started work on its previously planned program. An exploratory visit to Minnesota during the year stimulated interest in rodent control in Rochester, Minneapolis, and Duluth. Minneapolis has operated a limited control program for a number of years. New interest was manifest in Iowa, and Des Moines has employed a rodent control specialist in anticipation of expanded control activities during the ensuing year.

MISSOURI RIVER BASIN DEVELOPMENT PROGRAM. During the last 3 months of the fiscal year much effort was consumed in planning for a program of mosquito and encephalitis investigative projects in connection with the Pick-Sloan Plan of the Missouri River Basin development program. The Basin covers some 530,000 square miles and occupies approximately one-sixth of the land area of the United States. The program contemplates the construction of more than a hundred reservoirs and the development of irrigation systems sufficient to irrigate 5,000,000 acres of new land. The objective of the plan is threefold: flood control, irrigation, and power development. However, it is the intention of those in charge of the program to develop the water resources of the Basin in such a manner that the fullest utilization of water can be achieved. One

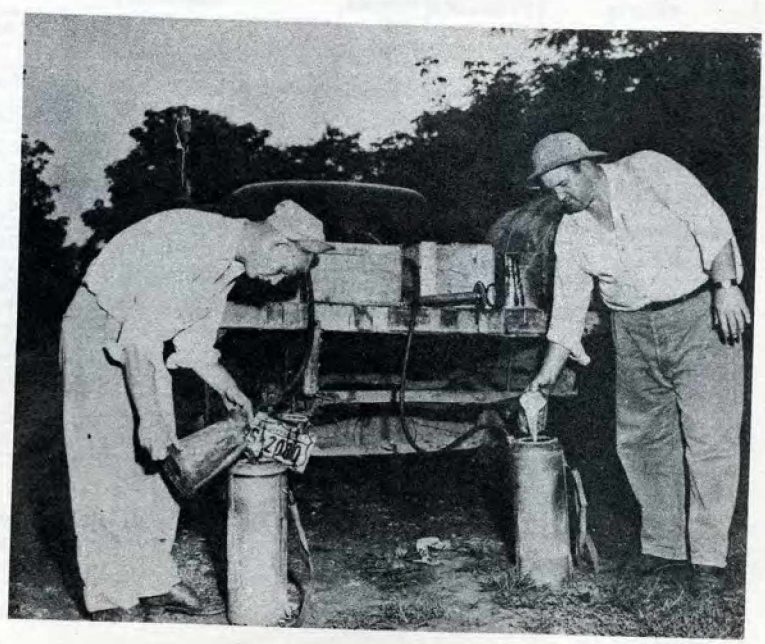
of the important public health aspects of the plan will be the increased populations of vectors of encephalitis resulting from irrigation developments, and to a lesser degree impoundments of water. The CDC program which was planned late in the fiscal year 1948, is designed to minimize mosquito production stimuli resulting from the Basin development program.

Missouri

R. M. JAMES, M. D. Director, Division of Health

As in previous years, malaria control operations constituted the major CDC activity in Missouri during fiscal year 1948 and were concentrated in the southeastern corner of the State. Residual spraying activities were expanded through increased local participation and by the inclusion of four additional counties in the operational area. Larviciding, conducted primarily in connection with war malaria control, was somewhat reduced. Entomological inspections and surveys were conducted as evaluation measures. Continued public interest in fly control resulted in an expansion of community insect control programs, which included added emphasis on environmental sanitation. Health education activities were pursued throughout the year with encouraging results. During July and August 1947, Missouri CDCA personnel and facilities were utilized in an emergency epidemic aid program carried on by the Missouri Division of Health in the flood areas along the Mississippi and Missouri Rivers.

RESIDUAL SPRAYING. The period July-December 1947 marked the second spraying cycle of the 1947 season. The same techniques and procedures obtained as in previous years. Operations during the 1948 season, January-June 1948, differed from those in the 1947 season in three respects: (1) only one spraying application was made; (2) entire premises were sprayed, where possible; (3) four additional counties (Bollinger, Cape Girardeau, Wayne, and Madison) were included, bringing the total coverage to 12 counties. Since only one spray application was to be applied with the beginning of



A two-man crew proved to be most efficient.

the 1948 season the strength of the spray was increased to 7½ percent and householders were urged to have their entire premises thoroughly sprayed. Two-man crews were found to be more efficient. A contact man operated ahead of crews, keeping 1 to 2 days in advance in order to eliminate delay. Tables 1 and 2 indicate the scope of operations in this field during the two spray seasons involved. Local participation during the

Table 1

EXTENDED PROGRAM RESIDUAL SPRAYING
July 1 through December 31, 1947

County	Houses Sprayed	Pounds DDT Used	Man-Hours				Pounds DDT per House	Man-Hours per House	Man-Hours per Pound DDT
			CDC	Local	Percent Local	Total			
Butler	4,080	2,355	4,318	308	6.7	4,626	0.58	1.13	1.96
Dunklin	8,232	3,134	3,432	3,490	50.4	6,922	0.38	0.84	2.21
Mississippi	3,950	2,009	2,010	1,870	48.2	3,880	0.51	0.98	1.93
New Madrid	5,681	4,126	2,605	3,579	57.9	6,184	0,73	1.09	1.50
Pemiscot	7,460	4,135	3,658	3,334	47.7	6,992	0.55	0.94	1.69
Ripley*	808	348	414	280	40.3	694	0.43	0.86	1.99
Scott	4,240	2,329	1,968	1,872	48.8	3,840	0.55	0.91	1.65
Stoddard	4,771	2,883	3,643	1,461	28.6	5,104	0.60	1.07	1.77
Total	39,222	21,319	22,048	16,194	42.3	38,242	0.54	0.98	1.79

*Not County-wide

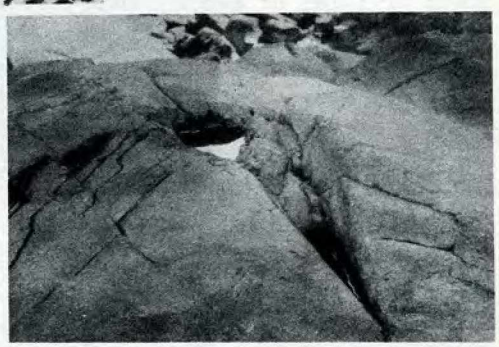
Table 2

EXTENDED PROGRAM RESIDUAL SPRAYING
January 1 through June 30, 1948

County	Premises Sprayed	Pounds DDT Used	Man-Hours				Pounds DDT per Premises	Man-Hours per Premises	Man-Hours per Pound DDT
			CDC	Local	Percent Local	Total			
Bollinger	1,043	1,446	104	1,632	94.0	1,736	1.39	1.66	1.20
Butler	3,340	3,237	1,880	4,346	69.8	6,226	0.97	1.86	1.92
Cape Girardeau*	2,726	2,791	368	3,664	90.9	4,032	1.02	1.48	1.44
Dunklin	7,237	7,427	1,648	9,078	84.6	10,726	1.03	1.48	1.44
Madison	680	619	192	1,380	87.8	1,572	0.91	2.31	2.54
Mississippi	4,739	3,970	416	5,368	93.1	5,784	0.84	1.22	1.46
New Madrid	5,661	5,865	1,336	6,692	83.4	8,028	1.04	1.42	1.37
Pemiscot	5,872	4,978	2,216	6,524	74.6	8,740	0.85	1.49	1.76
Ripley	1,193	1,259	392	1,968	83.4	2,360	1.06	1.98	1.87
Scott	3,500	3,727	616	4,736	88.5	5,352	1.06	1.53	1.44
Stoddard	3,517	3,769	968	4,687	82.9	5,655	1.07	1.61	1.50
Wayne	608	523	-	898	100.0	898	0.86	1.48	1.48
Jefferson Barracks**	769	309	320	270	45.8	590	0.40	0.77	0.77
Total	40,885	39,920	10,456	51,243	83.1	61,699	0.98	1.51	1.54

*Not County-wide
**War Malaria

Mosquito breeding habitat in Dunklin County. About 800 adults of *Anopheles quadrimaculatus* were counted within mid-July, 1948.



Typical breeding habitat of *Aedes atropalus*. Water in holes in porphyry rocks, Stout's Creek, Iron County, Mo.

year (44.3 percent) was very pleasing. As was to be expected, the unit cost was greater during the 1948 season since spraying was on a premises instead of a house basis. Thus, the cost per unit was $2.47 per spray application under the two application (house) policy and $3.10 under the single application (premises) policy. Due to unsegregated overhead and operational costs not weighted for the half year period, it is estimated that the cost of a single application for each of the premises will approximate $4.00. This would result in a savings over the two application house policy, however.

MILITARY MALARIA CONTROL. Table 3 summarizes control activities around military installations and Veterans Administration hospitals. Larviciding operations, using DDT in oil, were conducted July 1 through October 4, 1947, and May 16 through June 30,

Table 3

MALARIA CONTROL AROUND MILITARY INSTALLATIONS

Installation	Type of Activity	Area Covered
Fort Leavenworth and Wadsworth Hospitals, Kans.	Larviciding with .05 Percent DDT in Oil	20 Square Miles
Jefferson Barracks, Mo. Veterans Administration Hospital, Mo.	Surveillance and Spraying of Hospital Housing Area (1,000 Units)	10 Square Miles
O'Reilly General Hospital Springfield, Mo.	Surveillance Only	5 Square Miles
Excelsior Springs Veterans Administration Hospital	Surveillance Only	5 Square Miles

1948. These operations involved the application of 1,143 gallons of larvicide at an expenditure of 2,768 man-hours of labor.

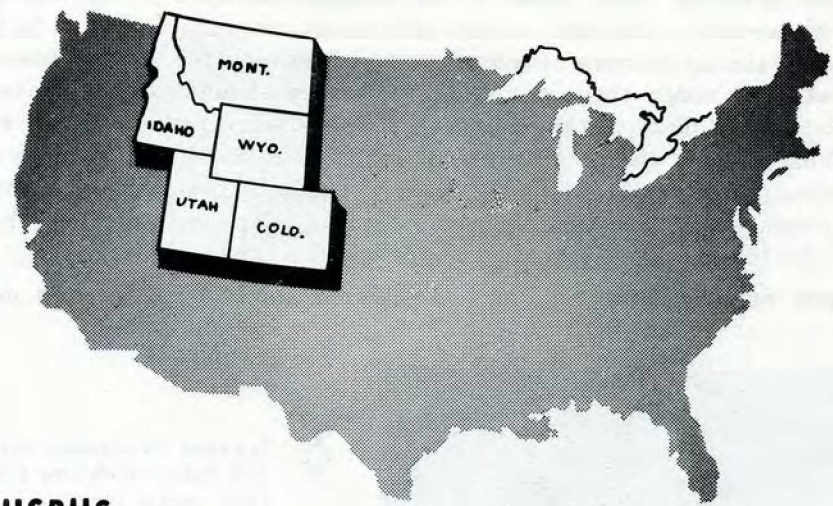
ENTOMOLOGICAL ACTIVITIES. Surveys were made of all military installations, Veterans Administration hospitals, water impoundments and proposed impoundment sites, and all counties in the extended program area. Inspection reports from sprayed areas indicated an increase of flies over the previous season. However, few premises were found to have a count of 10 or more flies. Whether this apparent increase in flies was due to inferior DDT or a more abundant fly population was not determined. Very few mosquitoes were counted. Table 4 indicates the scope of operations in this field.

OTHER ACTIVITIES. Under the direction of the section of Environmental Sanitation, State division of health, CDCA personnel assisted communities in fly control programs. Removal of trash and rubbish, and proper disposal of garbage were included in these programs. The educational program, under the CDC Health Educator, continues to enlist the cooperative support of local officials and civic groups and to bear fruit in the form of organized community interest in and support of public health activities. In connection with the Mississippi flood and resultant epidemic threat, Missouri CDCA personnel cooperated with the State division of health in spraying operations in the flood area. During July and August, 9,917 units in 24 counties adjacent to the flooding Mississippi and Missouri Rivers were sprayed.

Table 4

INSPECTIONS (INSIDE COUNTS) RESIDUAL SPRAYING PROGRAM
Fiscal Year 1948

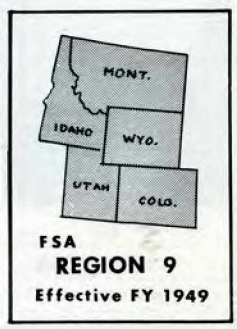
County	Flies Counted - Premises -			Mosquitoes Counted - Premises -			Total Inspections
	0-4	5-9	10 & over	1-4	5-9	10 & over	
	July 1 through December 31, 1947						
Butler	21	21	1	7	0	0	43
Mississippi	18	31	1	10	0	0	50
New Madrid	26	10	0	4	1	0	36
Pemiscot	18	40	3	6	0	0	61
Ripley	22	22	1	0	0	0	45
Scott	25	23	1	5	0	0	49
Stoddard	31	24	2	0	0	0	57
Total	161	171	9	32	1	0	341
	January 1 through June 30, 1948						
Butler	11	2	1	2	0	0	14
Dunklin	27	2	0	2	0	0	29
Mississippi	9	3	2	1	0	0	14
New Madrid	11	2	0	0	0	0	13
Pemiscot	9	3	0	1	0	0	12
Ripley	2	2	1	1	0	0	5
Scott	5	1	1	0	0	0	7
Stoddard	15	4	0	0	0	0	19
Total	89	19	5	7	0	0	113



USPHS

DISTRICT 8

Headquarters: Denver, Colo.



Activities in District 8 during the fiscal year 1948 were directed along five general lines: (1) rodent control, (2) insect control, (3) insecticidal demonstrations, (4) educational and training activities, (5) preparation of articles for publication.

RODENT CONTROL. Rodent surveys were conducted in Denver and in the Tri-County Health District, Colorado; Cheyenne, Wyo.; Salt Lake City, Utah; Grangeville, Moscow, and St. Maries, Idaho. The CDC representative also assisted with the rat-poisoning program sponsored by the Denver Health Department. These activities were performed in close cooperation with local and State health agencies, and with representatives of the U. S. Fish and Wildlife Service.

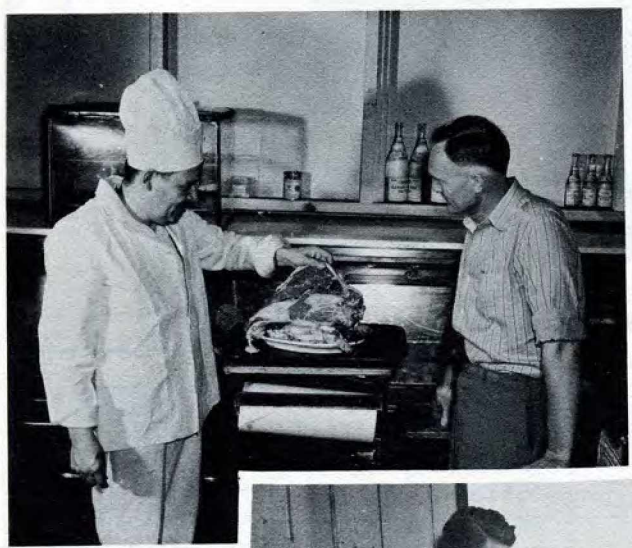
INSECT CONTROL. Mosquito control surveys were conducted at St. George and Moab, Utah, to assist local and State officials and civic organizations in the establishment of mosquito abatement programs. Studies were made of the biting gnat problem at the Oil-Shale Demonstration Plant, U. S. Bureau of Mines, Rifle, Colo. Recommendations were made with respect to control of these pests. Investigative studies were made of the problems associated with the control of mosquitoes in Glacier National Park, Mont., and of flies at Caldwell, Idaho. Appropriate recommendations were submitted.

INSECTICIDAL DEMONSTRATIONS. Demonstrations pertaining to the control of insects of public health importance were conducted at seven Indian Reservations in Montana and at one in Wyoming. Similar programs were given during the training courses for sani-

tarians, held at Laramie, Denver, and Veterans Administration facilities in Salt Lake City. Similar demonstrations also were presented to local and State health personnel at Salt Lake City.

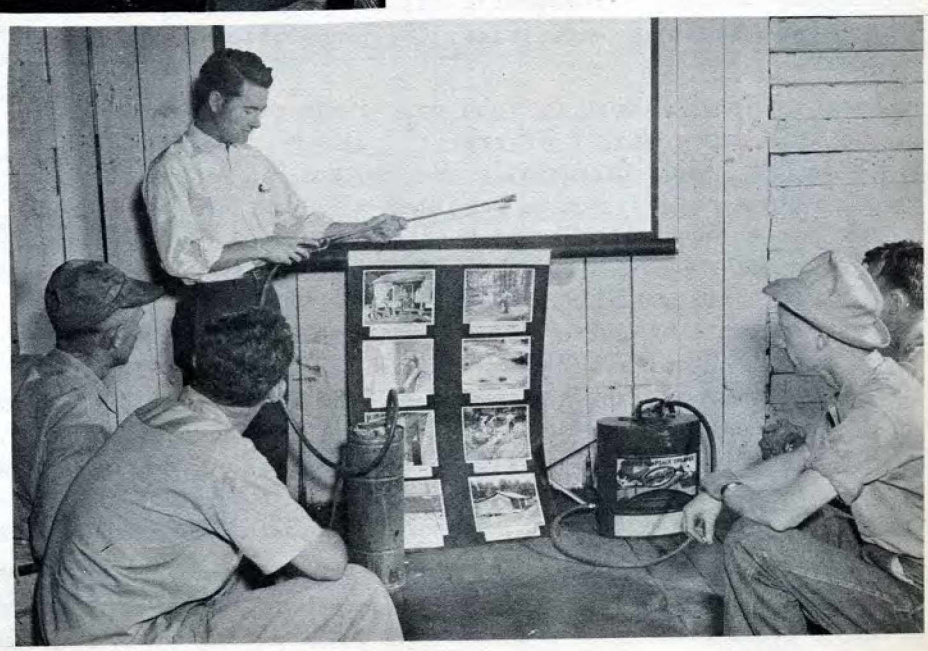
EDUCATION AND TRAINING. This phase of the program centered around the presentation of films and lectures dealing with rodent and insect control problems. Such activities were a part of training courses in rodent and insect control for professional exterminators, conducted under the auspices of the local health departments at Denver, Colo., and Salt Lake City, Utah. Similar courses were presented at the training school for sanitarians, University of Colorado School of Medicine, and the short course in restaurant sanitation, Laramie, Wyo. Seminars concerning rodent and insect control were conducted by the CDC representative in Logan and Ogden, Utah; and at the Department of Biology, University of Utah, Salt Lake City.

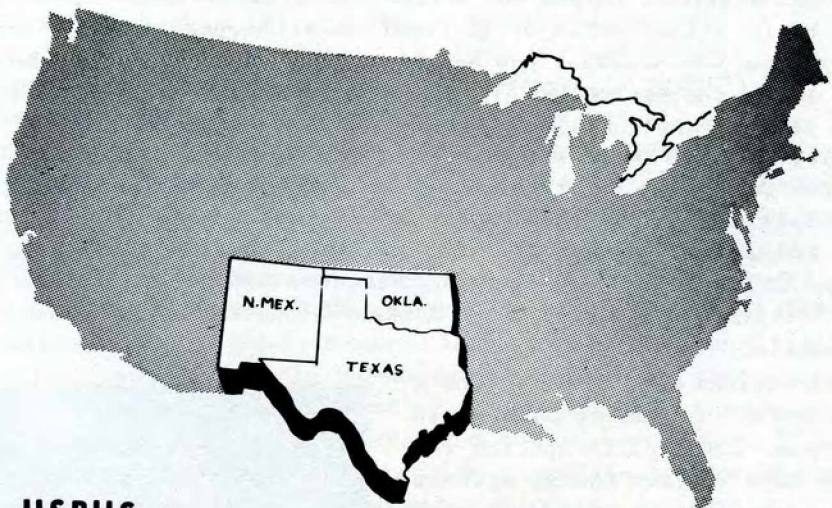
ARTICLES FOR PUBLICATION. Three manuscripts were prepared and approved for publication.



Trainee discusses meat storage and other problems with restaurant owner.

Training films and other audio-visual aids are utilized in classes for rodent and insect control trainees.





USPHS

DISTRICT 9

Headquarters: Dallas, Texas

Communicable Disease Center activities in this District during the fiscal year 1948 consisted of State-operated programs in Texas and Oklahoma. Consultation and technical services compatible with their respective requirements were made available to State and local health departments located in the District.

FSA
REGION 8
Effective FY 1949

Oklahoma

GRADY F. MATTHEWS, M.D. Commissioner of Public Health

Malaria control through the application of DDT residual spray to houses in the river-bordering areas constituted the principal CDC activity in Oklahoma during the fiscal year 1948. Special efforts were exerted to increase local participation in the spray program. Other activities included surveys and larviciding in areas sur-

rounding military and Veterans Administration installations, special entomological investigations in addition to those of routine evaluations, and a diversified educational and training program.

RESIDUAL HOUSE SPRAYING. During the fiscal year residual house spraying activities were conducted in all or parts of 15 counties with operations centered in the 9 counties bordering the Arkansas and Red Rivers and their major tributaries. Spray applications during the year totaled 37,638 at an average expenditure of 1.06 pounds of DDT and 1.35 man-hours per house. Of the 50,735 man-hours expended in spray operations, CDC provided 36.8 percent and local communities 63.2 percent.

The nine counties in the river-bordering areas were organized into three districts of three counties each for the 1947 spray season. District No. 1 included McCurtain, Pushmataha, and Choctaw Counties; District No. 2, Haskell, Latimer, and LeFlore Counties; and District No. 3, Sequoyah, Wagoner, and Muskogee Counties. Limited spraying activities were carried on in Atoka, Okfuskee, Coal, McIntosh, Bryan, and Pittsburg Counties.

Spraying operations were conducted on a county-wide basis, including both urban and rural areas. Local participation was on the basis of a minimum charge against individual householders in accordance with an established rate based on the number of rooms involved. Although generally well received, a number of disadvantages in this formula were observed. They included: (1) a significant number of householders in the more malarious areas could not meet the charge due to economic limitations; (2) collecting numerous small amounts entailed burdensome administrative details; and (3) travel and man-hours required to contact householders in collecting the fee materially increased the cost per unit. Accordingly, a previously proposed budgetary formula, whereby participating counties assume financial responsibility, was adopted early in the 1948 spray season. Under this plan rural county-wide spraying was made contingent upon the county providing the costs of labor, and urban spraying costs were made a budgetary responsibility of all cities and towns of more than 100 population. Communities of less than 100 population were considered rural. By the end of the fiscal year this plan was well established, needing only refinement to make it satisfactory as an effective malaria control program.

Type of light trap used in the mosquito survey conducted in cooperation with the University of Oklahoma.

Operations during the 1948 spray season encompassed 11 counties. In the main, the old district lines were abandoned and the counties of Okfuskee and Atoka were bracketed with the nine counties included in the three districts. Six counties supplied labor for county-wide spraying, eight towns contracted for complete community spraying, and a limited amount of participation was provided by the remaining counties.

LARVICIDING. Reconnaissance surveys were made in the following areas during the year: Veterans Administration Hospital, Muskogee; Will Rogers Memorial Hospital, Oklahoma City; Oklahoma Veterans Hospital, Sulphur; Naval Ammunition Depot, Savanna;

Tinker Air Force Base, Oklahoma City; and Fort Sill, Lawton. Only in the environs of the Veterans Administration Hospital, Muskogee, was the production of *A. quadrimaculatus* sufficient to justify control measures. Larviciding operations were carried out in this area through the 1947 season and reinstituted in June 1948. Paris green in diesel oil was applied in 1947 and DDT in diesel oil was used in 1948. A DDT house spraying crew was especially trained to apply the larvicide at 10-day intervals in the latter season. Supervision was by the District supervisor and inspection by the State entomologist.

ENTOMOLOGICAL INVESTIGATIONS. Survey and evaluation procedures were continued in the residual house spraying areas with the inspection of sprayed houses and adjacent unsprayed resting places, and in the larviciding zone with the inspection of adult and larval mosquito collection stations. Routine inspections started in June each year. The findings of these surveys through the fiscal year are summarized in table 1.

Special investigations included the extension of the mosquito light trap survey into all counties not previously covered in this program. Traps were placed in 23 locations in 1947, and in 1948 the survey was completed with the placing of traps in 24 locations. The collections were made in cooperation with the University of Oklahoma where the specimens have been assembled for determination. It is anticipated that the results of these studies will provide a complete picture of mosquito distribution in Oklahoma, both seasonally and geographically.

Other investigations included studies of the housefly production in Durant and of the house infestation by blood-sucking conenose, *Triatoma sanguisuga*, in Oklahoma City. The former was made in connection with the development of a community sanitary program.

The State CDC office also cooperated with the Corps of Engineers and the Impounded Water Branch of CDC headquarters in surveys and recommendations relating to reservoirs planned, under construction, or completed. Field investigations were made in the areas of Eufaula, Heyburn, Tenkiller Ferry, Wister, and Texoma reservoirs.

EDUCATION, PROMOTION, AND TRAINING. Full use was made of the normal information dissemination channels and methods, including news items and feature articles in newspapers, radio programs, talks before civic groups, and distribution of printed material. Orientation and training of all field personnel preceded each operational season. Replacements were similarly trained. The State CDC office also participated in the training of reservoir personnel for the Corps of Engineers.

Table 1

ENTOMOLOGICAL SURVEY IN RESIDUAL HOUSE SPRAYING PROGRAM

Year	1947		1948	1947 — 1948	
Month	July	August	June	Total	Percent
Sprayed houses inspected	159	173	81	413	—
Sprayed houses with mosquitoes	0	4	1	5	1.2
Unsprayed houses inspected	16	14	8	38	—
Unsprayed houses with mosquitoes	2	4	0	6	15.8
Resting places inspected	201	205	89	495	—
Resting places with mosquitoes	161	165	85	411	83.0

Texas

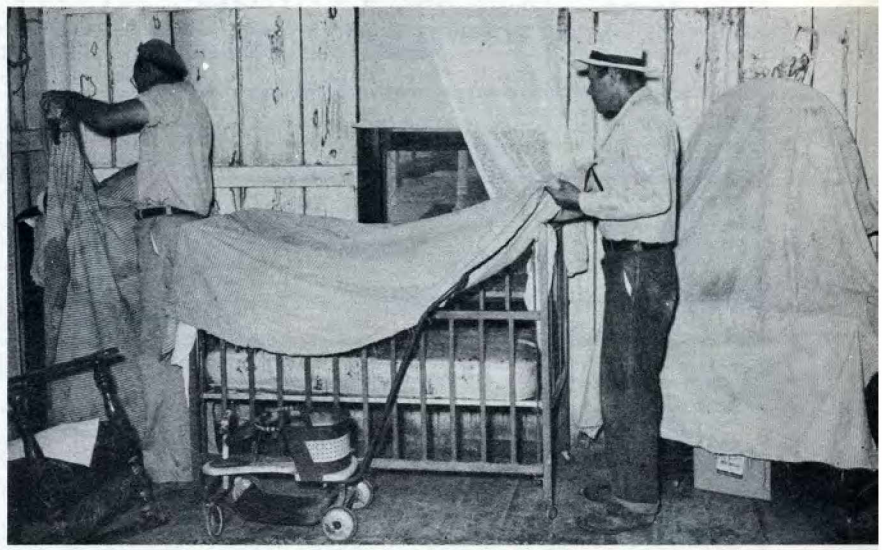
GEORGE W. COX, M. D. State Health Officer

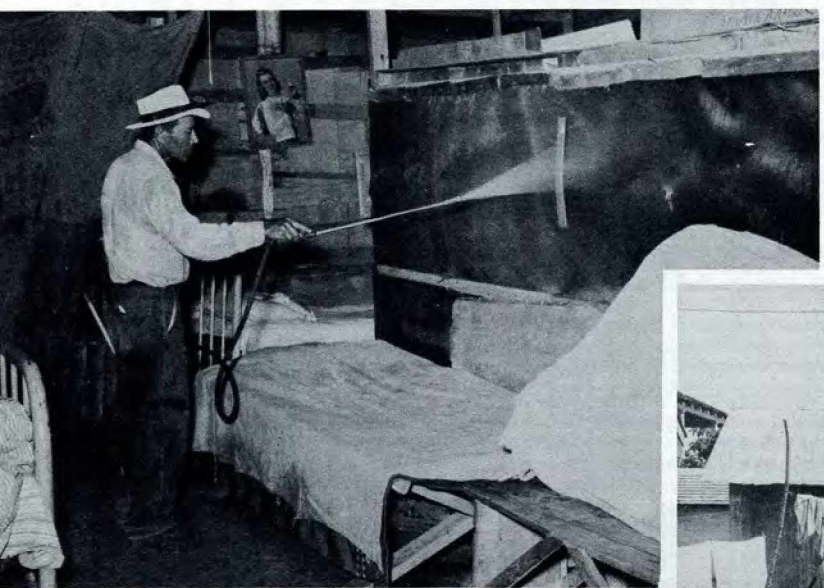
The operational programs in Texas this year continued to center around malaria, typhus, and plague control activities. There was no impressive expansion in the respective programs, but a considerable increase was registered in local participation, especially in residual spray operations. This was due, at least in part, to the inauguration of a standard policy whereby a fee is collected from householders receiving the spray service. Approximately 50 percent of man-hours expended in the respective activities were locally contributed. There was an added emphasis upon entomological activities, which resulted in an increase in trapping operations. More cities sponsored larviciding programs. The residual spray program operated along lines similar to those of previous years. Dusting and poisoning operations approximated the 1947 level. The various programs continued to be offered through local health units and city and county officials.

MALARIA CONTROL. Since programs are planned and executed on a calendar year basis, policy changes and revisions of techniques often are introduced in the middle of the fiscal year (beginning of calendar year). Thus, almost half of the residual spray work of fiscal year 1948 was under the two application policy which was abandoned in favor of a single 7 percent DDT application, with the beginning of the 1948 spray season. (Because of the more southernly latitude, the two application treatment was retained in the Rio Grande Valley area.) The single spray policy has proved successful from a standpoint of public acceptance and economy of application. The two application policy was administratively difficult and somewhat ineffective, since often householders were disinclined to cooperate in the second application programs. In the sparsely populated East Texas area, a two-man crew, utilizing hand sprayers, has been adopted as standard. In the valley area, where population is more dense and dwelling units are smaller, power sprayers have been found more effective. A uniform formula for local participation has been developed. Initially, during the 1948 fiscal year, local sponsors were required to bear the costs of the helper for each crew. This proved inadequate; and during the latter part of the year, local sponsors were required to bear the costs of crew helpers and in addition, $50.00 per month for the operation and maintenance of each crew vehicle. Inability of some local units to underwrite sponsorship budgets out of county funds resulted in the adoption of a system whereby local units activated a malaria control fund, which was reimbursed out of fees collected from householders. This formula developed two major weaknesses: (1) It does not compensate for the variance in application costs between sparsely and densely populated rural areas; and (2) a high percentage of those declining the service are the dwellings which need it most, if the objective of preventing the transmission of malaria in those areas where *A. quads.* are prevalent is to be realized. Emphasis is being placed on the adjustment of these deficiencies. Accompanying tables 1 and 2 summarize activities during the year, and also reflect the switch from a two to a single application policy. Larviciding operations were practiced in the Fort Worth-Dallas area. War malaria inspections were made in the same area. Entomological activities were devoted primarily to premises in the residual spray counties.

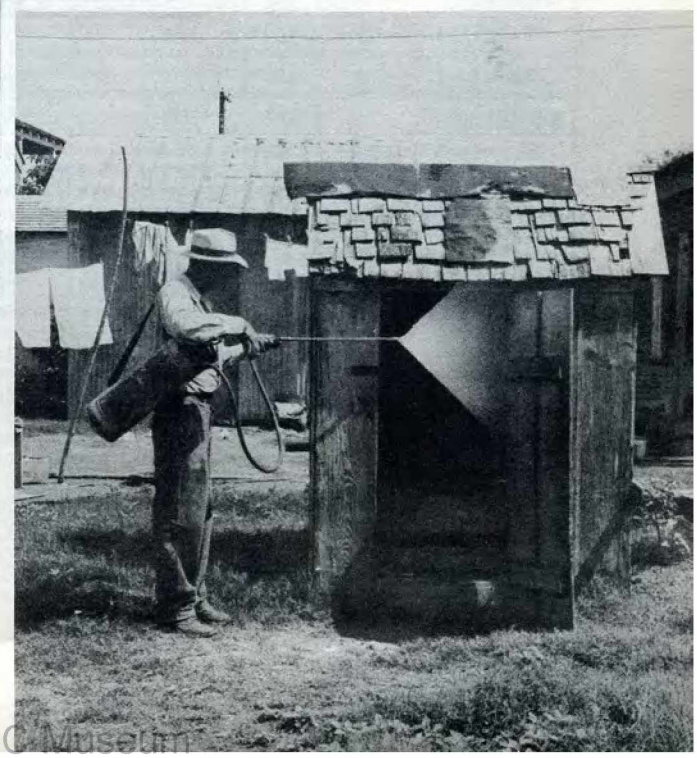
Advance contact man interviewing householder.

It is good practice to remove or cover food, cooking utensils, beds, and such items prior to spraying interior of homes.





Applying spray to all exposed surfaces assures maximum effectiveness in mosquito and fly control.



Interior of privies should be sprayed thoroughly.

Table 1

RESIDUAL SPRAY OPERATIONS

July 1 through December 31, 1947

County	Premises Sprayed	Pounds DDT Used	Man-Hours				Pounds DDT per Premises	Man-Hours per Premises	Man-Hours per Pound DDT
			CDC	Local	Percent Local	Total			
RUSK	2,816	3,890	3,181	2,124	40.0	5,305	1.38	1.88	1.36
Henderson	806	673	32	1,098	97.2	1,130	0.83	1.40	1.68
PANOLA	880	2,193	1,630	1,392	46.1	3,022	2.49	3.43	1.38
MARION	152	351	395	312	44.1	707	2.31	4.65	2.01
SHELBY	1,257	3,446	2,185	1,620	42.6	3,805	2.74	3.03	1.10
Timpson	478	399	—	456	100.0	456	0.83	0.95	1.14
SAN AUGUSTINE	482	1,400	1,017	736	42.0	1,753	2.90	3.64	1.25
SABINE	376	945	722	544	43.0	1,266	2.51	3.37	1.34
BOWIE	1,779	2,639	2,770	2,048	42.5	4,818	1.48	2.71	1.83
RED RIVER	972	1,918	2,264	1,236	35.3	3,500	1.97	3.60	1.82
Clarkville	255	317	—	476	100.0	476	1.24	1.87	1.50
TITUS	133	356	482	288	37.4	770	2.68	5.79	2.16
Mt. Pleasant	500	365	136	296	68.5	432	0.73	0.86	1.18
LAMAR	1,421	2,286	2,478	1,416	36.4	3,894	1.61	2.74	1.70
Paris	1,771	1,586	—	2,088	100.0	2,088	0.90	1.18	1.32
DELTA	574	1,469	698	464	39.9	1,162	2.56	2.02	0.79
Cooper	209	134	—	400	100.0	400	0.64	1.91	2.98
FANNIN	657	1,128	1,032	928	47.3	1,960	1.72	2.98	1.74
ANDERSON	1,153	2,089	2,696	1,488	35.6	4,184	1.81	3.63	2.00
Palestine	182	161	—	216	100.0	216	0.88	1.19	1.34
CHEROKEE	685	890	684	520	43.2	1,204	1.30	1.76	1.35
HENDERSON	488	788	932	730	43.9	1,662	1.61	3.40	2.11
Athens	320	253	—	352	100.0	352	0.79	1.10	1.39
LEON	839	1,926	1,484	1,188	44.5	2,672	2.30	3.18	1.39
FREESTONE	299	704	644	448	41.0	1,092	2.35	3.65	1.55
HOUSTON	305	1,598	1,116	448	28.6	1,564	5.24	5.13	0.98
Crockett	792	520	—	448	100.0	448	0.66	5.66	0.86
TRINITY	750	1,181	1,208	1,016	45.7	2,224	1.57	2.97	1.88
MADISON	502	1,674	1,224	1,000	45.0	2,224	3.33	4.33	1.33
FRANKLIN	189	398	520	360	40.9	880	2.11	4.66	2.21
BRAZORIA	631	628	648	464	41.7	1,112	1.00	1.76	1.77
POLK	1,646	1,230	1,714	794	31.7	2,508	0.75	1.52	2.04
Livingston	172	147	—	168	100.0	168	0.85	0.98	1.14

Table 1 (Contd.)

County	Premises Sprayed	Pounds DDT Used	Man-Hours				Pounds DDT per Premises	Man-Hours per Premises	Man-Hours per Pound DDT
			CDC	Local	Percent Local	Total			
SAN JACINTO	296	353	610	424	41.0	1,034	1.19	3.49	2.93
ANGELINA	841	928	616	551	47.2	1,167	1.10	1.39	1.26
Diboll	492	411	—	704	100.0	704	0.84	1.43	1.71
TYLER	676	719	604	484	44.5	1,088	1.06	1.61	1.51
MONTGOMERY	653	555	592	364	38.1	956	0.85	1.46	1.72
GRIMES	256	296	496	364	42.3	860	1.17	3.36	2.91
LIBERTY	103	139	344	164	32.2	508	1.35	4.93	3.65
CHAMBERS	1,331	1,160	1,212	936	43.6	2,148	0.87	1.61	1.85
HIDALGO	231	283	501	220	30.5	721	1.23	3.12	2.55
CAMERON	8,293	4,304	3,615	7,962	68.8	11,577	0.52	1.40	2.69
Brownsville	208	108	80	400	83.3	480	0.52	2.31	4.44
WILLACY	—	—	—	—	—	—	—	—	—
Raymondville	1,382	742	320	1,400	81.4	1,720	0.54	1.24	2.32
Totals	39,233	49,680	40,882	41,535	50.4	82,417	1.27	2.10	1.66

Table 2

RESIDUAL SPRAY OPERATIONS
January 1 through June 30, 1948

County	Premises Sprayed	Pounds DDT Used	Man-Hours				Pounds DDT per Premises	Man-Hours per Premises	Man-Hours per Pound DDT
			CDC	Local	Percent Local	Total			
RUSK	2,916	3,839	2,615	1,824	41.1	4,439	1.32	1.52	1.16
Henderson	1,800	1,051	—	1,216	100.0	1,216	0.58	0.68	1.16
PANOLA	1,135	1,627	1,550	1,196	43.6	2,746	1.43	2.42	1.69
MARION	397	775	573	392	40.6	965	1.95	2.43	1.25
Jefferson	83	114	—	136	100.0	136	1.37	1.60	1.19
SHELBY	1,624	3,406	2,323	1,584	40.5	3,907	2.10	2.41	1.15
SAN AUGUSTINE	712	1,411	1,152	760	39.7	1,912	1.98	2.69	1.36
SABINE	649	1,196	1,080	720	40.0	1,800	1.84	2.77	1.51
BOWIE	2,357	2,164	3,471	2,160	38.4	5,631	0.92	2.39	2.60
RED RIVER	1,919	3,266	2,794	2,268	44.8	5,062	1.70	2.64	1.55
Clarksville	399	160	—	178	100.0	178	0.40	0.45	1.11
TITUS	1,181	1,552	1,600	1,416	46.9	3,016	1.31	2.55	1.94
Mt. Pleasant	695	187	—	200	100.0	200	0.27	0.29	1.07

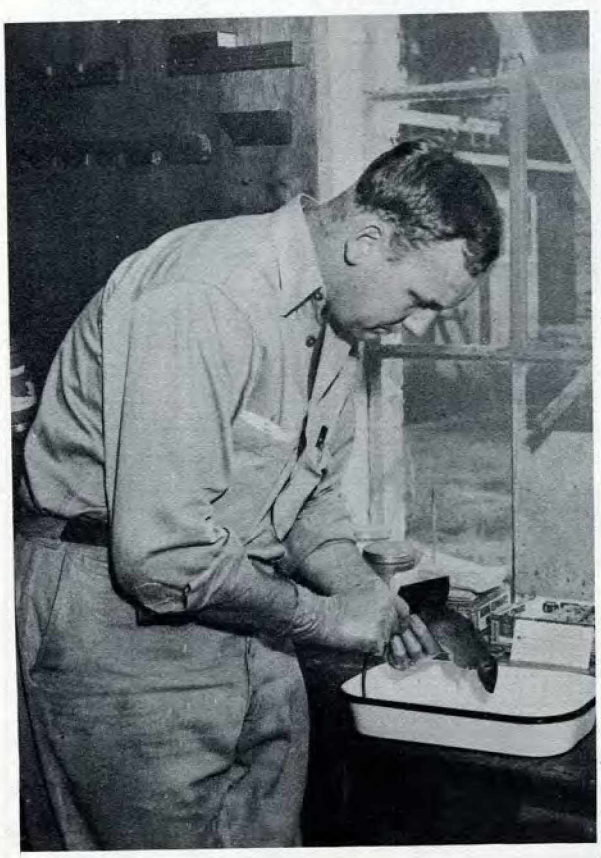
Table 2 (Contd.)

County	Premises Sprayed	Pounds DDT Used	Man-Hours				Pounds DDT per Premises	Man-Hours per Premises	Man-Hours per Pound DDT
			CDC	Local	Percent Local	Total			
CAMP	Crew Organization		72	64	47.1	136	—	—	—
NORRIS	Crew Organization		72	64	47.1	136	—	—	—
LAMAR	2,763	4,662	3,348	2,720	44.8	6,068	1.69	2.20	1.30
Paris	1,242	678	78	680	89.7	758	0.55	0.61	1.12
DELTA	1,164	1,785	1,276	976	43.3	2,252	1.53	1.93	1.26
FANNIN	1,774	3,292	2,088	1,464	41.2	3,552	1.86	2.00	1.08
Bonham	357	237	40	160	80.0	200	0.66	0.56	0.84
ANDERSON	2,244	3,360	2,660	2,024	43.2	4,684	1.50	2.09	1.39
Palestine	1,343	369	—	394	100.0	394	0.27	0.29	1.07
CHEROKEE	601	952	629	452	41.8	1,081	1.58	1.80	1.14
HENDERSON	1,283	2,004	2,154	1,488	40.9	3,642	1.56	2.84	1.82
LEON	631	1,365	1,083	696	39.1	1,779	2.16	2.82	1.30
HOUSTON	457	853	639	504	44.1	1,143	1.87	2.50	1.34
TRINITY	784	1,684	998	832	45.5	1,830	2.15	2.33	1.09
MADISON	510	1,171	787	624	44.2	1,411	2.30	2.77	1.20
BRAZORIA	1,936	1,978	1,816	1,128	38.3	2,944	1.02	1.52	1.49
POLK	1,239	1,412	2,012	1,496	42.6	3,508	1.14	2.83	2.48
Livingston	576	380	44	508	92.0	552	0.66	0.96	1.45
Corrigan	205	208	108	224	67.5	332	1.01	1.62	1.60
SAN JACINTO	535	913	1,184	972	45.1	2,156	1.71	4.02	2.36
ANGELINA	922	1,432	1,101	808	42.3	1,909	1.55	2.07	1.33
Diboll	617	646	44	810	94.8	854	1.05	1.38	1.32
TYLER	340	783	826	544	39.7	1,370	2.30	0.40	1.75
MONTGOMERY	784	1,065	1,262	856	40.4	2,118	1.36	2.70	1.99
GRIMES	506	602	710	536	43.0	1,246	1.19	2.46	2.07
Navasota	358	246	30	288	90.1	318	0.69	0.89	1.29
LIBERTY	995	1,643	1,592	1,246	43.9	2,838	1.65	2.85	1.73
Dayton	329	218	20	143	87.7	163	0.66	0.50	0.75
CHAMBERS	843	841	880	596	40.4	1,476	1.00	1.75	1.75
HIDALGO	3,018	3,200	3,330	2,184	39.6	5,514	1.06	1.83	1.72
CAMERON	4,814	3,196	2,200	3,736	62.9	5,936	0.66	1.23	1.86
Harlingen	1,916	1,288	636	2,216	77.7	2,852	0.67	1.49	2.21
Brownsville	2,731	1,772	720	3,106	81.2	3,826	0.65	1.40	2.16
San Benito	1,898	1,207	480	2,146	81.7	2,626	0.64	1.38	2.18
WILLACY	567	436	120	542	81.9	662	0.77	1.17	1.52
Raymondville	1,589	908	548	1,896	77.6	2,444	0.57	1.54	2.69
Total	57,738	67,534	52,745	53,173	50.2	105,918	1.17	1.83	1.57

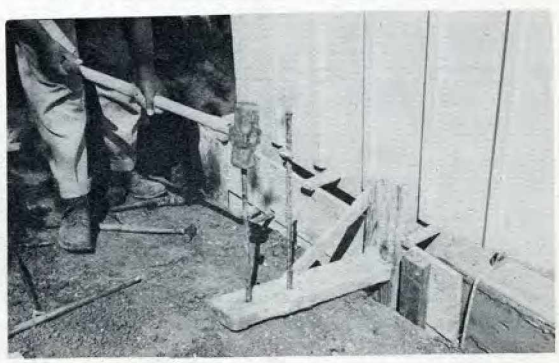
TYPHUS CONTROL. Activities in this field during the year included rat dusting and trapping (65 counties), rat poisoning (56 counties), and ratproofing (17 cities in 14 counties). In ratproofing, man-hours expended averaged 63.5 per premises. Trapping was done in 16 counties that received no dust, and three of the cities covered in ratproofing operations were in the plague area. Tables 3 and 4 reflect operations in these activities. Trapping operations, before and after dusting, continued to be stressed in the entomological phase of the work. Blood specimens were collected for tests and rodents were combed for ectoparasites. There were some specimens added to the permanent ectoparasite collection of the State department of health.

PLAGUE. The fiscal year saw personnel devoted to plague activities brought up to full strength. Two additional mobile units, making the total three, were added. The plague project continues to have a two-fold operation plan. The first is typhus control and plague prevention by rat and rat-ectoparasite control, both rural and urban. The second part of the project emphasizes plague investigations. In December 1947, plague organisms were found in a pool of fleas from pack rats. The rats were collected in Dawson County on October 2 and 3. The site of this discovery was approximately 9 miles from the area where the bacillus was discovered in May 1947, from a pool of fleas from prairie dogs. Using mobile units as special field laboratories, animals were hunted and trapped, ectoparasites removed, and tissues obtained. Tissues and fleas were forwarded to the State Laboratory for examination. Operations in this field are depicted in table 5. Three rat stoppage programs were carried on during the year.

Combing rat for ectoparasites.



Installing concrete foundation wall



Treating rat burrow in typhus control operations.

Table 3

DDT DUSTING
Fiscal Year 1948

County	Premises Dusted	Pounds Per Premises	Man-Hours
Anderson	210	2.15	613
" Trap	103	—	415
Bastrop	8	2.37	90
" Trap	14	—	57
Bee	—	—	24
" Trap	18	—	56
Bell	—	—	57
" Trap	7	—	41
Bexar	3,883	1.54	1,282
" Trap	100	—	326
Bosque	32	1.72	136
" Trap	144	—	320
Brazoria	13	1.31	13
Brown Trap	—	—	16
Burnet Trap	5	—	48
Caldwell	62	1.98	238
" Trap	21	—	116
Chambers	45	3.80	80
" Trap	32	—	444
Coleman Trap	—	—	48
Colorado	—	—	48
" Trap	—	—	24
Comal	—	—	40
" Trap	8	—	16
Comanche	—	—	16
Dallas	505	4.51	2,818
" Trap	657	—	1,403
DeWitt	42	5.54	112
" Trap	7	—	24
Duval	47	3.74	164
" Trap	—	—	128
Ellis Trap	33	—	64
Falls	179	1.97	200
" Trap	15	—	112
Fayette	—	—	16
" Trap	—	—	8
Fisher	47	2.19	104
Fort Bend	163	4.89	363
" Trap	—	—	8
Galveston	900	2.54	4,501
" Trap	329	—	2,409
Goliad Trap	42	—	188
Gonzales	31	2.39	96
" Trap	7	—	48
Gray	2	3.00	8
Grimes	—	—	8
Guadalupe	148	3.61	358
" Trap	45	—	185
Henderson	91	4.47	315
" Trap	32	—	78
Houston	185	1.91	326
" Trap	45	—	121
Jasper	81	3.30	72
" Trap	25	—	136
Jefferson	8	3.75	32
Jefferson Trap	8	—	256
Jim Wells	—	—	16
Jones	8	3.00	5
Lampasas	—	—	4
Lavaca	55	2.67	174
" Trap	16	—	180
Lee	7	3.86	73
" Trap	11	—	35
Liberty	—	—	56
" Trap	9	—	64
Limestone	21	2.05	16
" Trap	34	—	304
Live Oak	—	—	8
McCullough Trap	5	—	56
McLennan	18	3.11	44
" Trap	834	—	968
Madison	3	1.00	4
" Trap	20		62
Milam	186	1.88	255
" Trap	11	—	28
Mills Trap	—	—	80
Nueces	529	8.03	4,874
" Trap	79	—	530
Orange	—	—	80
" Trap	4	—	110
Refugio	57	5.35	168
" Trap	12	—	40
Robertson	58	3.02	16
" Trap	15	—	80
Runnels	85	1.66	21
San Patricio	—	—	32
" Trap	30	—	216
Smith	220	1.46	129
Tarrant	375	4.57	2,500
" Trap	247	—	1,250
Taylor	34	2.21	120
Tom Green	91	5.05	360
Travis	121	0.70	139
" Trap	8	—	21
Tyler	—	—	24
Victoria	37	4.41	193
" Trap	18	—	40
Waller	—	—	24
Washington	10	—	24
" Trap	4	—	64
Webb	4,012	2.45	3,944
" Trap	89	—	2,804
Wharton	—	—	32
Williamson	133	2.10	418
" Trap	29	—	167
Wilson	—	—	16
" Trap	9	—	16
Total (Dust)	12,742	2.60	25,899*
(Trap)	3,181	—	14,210**

*Local 14,865; CDC 11,034
**Local 5,001; CDC 9,209

Table 4

POISON WATER
Fiscal Year 1948

County	Premises Poisoned	Pints Per Premises	Man-Hours	County	Premises Poisoned	Pints Per Premises	Man-Hours
Anderson	244	0.60	513	Jasper	203	1.14	264
Bastrop	200	0.36	377	Jefferson	146	0.93	352
Bee	26	3.69	80	Jones	10	0.40	16
Bell	97	0.37	274	Lampasas	5	0.40	28
Bosque	56	0.82	120	Lavaca	36	0.44	48
Brazoria	23	0.78	74	Lee	118	0.36	317
Brown	34	1.18	360	Liberty	67	1.49	96
Burnet	31	0.52	32	McCullough	6	1.33	48
Caldwell	292	0.33	296	McLennan	226	0.71	518
Chambers	102	1.07	144	Madison	99	0.42	238
Colorado	114	0.45	80	Milam	123	1.53	267
Comal	61	0.52	64	Nueces	2,203	0.49	3,003
Comanche	19	0.84	96	Orange	284	0.90	584
Dallas	5,763	0.46	3,603	Potter	4	2.00	4
DeWitt	109	1.32	144	Refugio	242	1.69	328
Duval	20	1.60	32	Robertson	37	0.65	81
Erath	25	1.04	120	Runnels	202	0.16	77
Falls	241	0.40	320	San Patricio	80	1.70	152
Fayette	100	0.24	72	Smith	469	0.58	549
Fisher	24	1.08	120	Tarrant	6,112	0.34	9,305
Fort Bend	166	2.77	321	Taylor	33	1.70	168
Galveston	1,023	0.04	1,868	Tom Green	56	0.54	128
Goliad	45	1.42	80	Travis	35	0.23	32
Gonzales	93	0.39	138	Victoria	33	1.82	40
Gray	9	1.56	56	Washington	45	0.36	48
Guadalupe	91	0.37	91	Webb	189	2.00	754
Hardin	55	0.58	96	Williamson	254	0.40	472
Henderson	54	0.59	184	**Total**	20,661	0.50	27,896*
Houston	227	0.31	224				

*CDC 11,176 Local 16,720

Table 5

PLAGUE OPERATIONS
Fiscal Year 1948

County	Premises Treated With:				Materials Used		
	10% DDT	"A" Dust	Poison Water	Trap	Pounds DDT	Ounces "A" Dust	Pints Water
Dawson	87	2	63	45	325	20	22
Gaines	179	168	6	—	1,217	619	16
Hockley	433	19	115	155	2,975	816	82
Lamb	748	1	64	39	3,946	18	61
Lubbock	583	16	95	24	5,814	110	63
Terry	444	—	84	98	2,688	—	64
Yoakum	291	223	203	102	1,965	1,250	100
Total	2,765	429	630	463	18,930	2,833	408