ABSTRACTS AND PROCEEDINGS OF THE SEVENTH ANNUAL MEETING OF THE UTAH MOSQUITO ABATEMENT ASSOCIATION

Magna, Utah

March 19 and 20, 1954

OFFICERS AND COMMITTEES OF THE

UTAH MOSQUITO ABATEMENT ASSOCIATION

1953

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Howard Widdison-Vice President	Ogden - Hooper
Lewis E. Fronk-Secretary-Treasurer	Ogden

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(Committees Cont.)

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O. C. Finley	Magna
T. A. Schoenfeld	Salt Lake City
O. W. Young	Ogden
Ward Warnock	Farmington
Ray P. Greenwood	Salt Lake City
Don M. Rees	Salt Lake City

Attendance

A total of 61 persons registered at the Magna meetings. Others attended that did not register. All Utah agencies, and organizations interested in mosquito abatement were represented at the meetings. Two distinguished visitors from California were present. Among those participating were representatives of city, county, state, and federal public health agencies; the principal institutions of higher education in Utah; the U.S. Bureau of Reclamation; representatives of city and county governments; industry; and all of the organized mosquito abatement districts in the state.

PROGRAM OF THE

SEVENTH ANNUAL MEETING of the UTAH MOSQUITO ABATEMENT ASSOCIATION

FIREMAN'S HALL, MAGNA, UTAH. MARCH 19th and 20th, 1954.

FRIDAY MORNING, MARCH 19, 1954

9:00 Registration - Fireman's Hall -

MORNING SESSION
9:30 A.M.

9:30 Call to Order - O. C. Finley, Magna, Utah - President of U.M.A.A.

Address of Welcome - John Rokich, Exec. Sec'y and Treas., Magna Chamber of Commerce

9:35 Response - President O. C. Finley.

9:40 Remarks - C. R. Naylor, Magna, Representing Associated Industries.

9:50 Contribution of Mosquito Abatement to Public Health - George A. Spendlove, M.D., State Health Commissioner, Salt Lake City, Utah.

10:10 The Cooperative Drainage Program in Salt Lake County - Lamont B. Gunderson, Commissioner of Salt Lake County.

10:20 Remarks - James N. Stacey, President, Utah Municipal League and Mayor of Richfield, Utah.

10:30 PANEL DISCUSSION - Leader: Dr. S. J. Ware, Chief, Water Projects, U.S. Publ Health Service, Logan, Utah.
Subject: Mosquito Control Benefits -

10:35 Complementary Benefits to Mosquito Abatement from Inter-agency Cooperation - R. L. Stenbrug, S. A. Sanitary Engineer, U.S.P.H.S.

10:50 Measurement of Mosquito Populations as a factor in Evaluating Benefits from Mosquito Control - L. D. Beadle, Sanitarian, U.S. P.H.S.

11:05 Health and Economic Benefits from Mosquito Control - Dr. L. R. Edmunds, S. A Scientist, U.S.P.H.S.

11:20 Open discussion -

11:30 Handling the Mosquito Control Problem in the Weber Basin Project - Reid Jerman, Regional Planning Engineer, U.S. Bureau of Reclamation, Salt Lake City, Utah.

11:45 Sound film strip - "Mosquito Problems in Irrigated Areas" - G. G. Keener, Jr. Entomologist, U.S.P.H.S.

Adjourn for lunch.

FRIDAY AFTERNOON, MARCH 19

1:30 Call to Order - O. C. Finley

Report of Nominating Committee - T. A. Schoenfeld, Chairman.

1:55 The Use of Gambusia fish in a Mosquito Control Program - Dr. O. Whitney Young, Weber College, Ogden.

2:05 Notes on Mosquitoes in Utah and the Turkey Disease Synovitis - Reed S. Rober Utah State Agricultural College, Logan.

2:15 The Equine Encephalomyelitis Problem in Utah - Dr. A. W. Grundmann, Parasitologist, University of Utah.

2:25 Mosquito Production in Polluted Water - Dr. A. R. Gaufin, Aquatic Biologist, University of Utah.

2:35 The Aedes nigromaculis mosquito situation in Utah - Dr. Don M. Rees, Entomologist, University of Utah.

2:45 PANEL DISCUSSION ON INSECTICIDES -
Panel Leader - Dr. Geo. F. Knowlton, Utah State Agricultural College, Loga

Introduction to the Discussion on Insecticides -

2:55 Use of the Airplane in the Application of Insecticides in Mosquito Control - Lewis E. Fronk, Supervisor, Weber County, M.A.D.

3:05 The Use of Granular Larvicides in Mosquito Control - Dr. Geo. F. Edmunds, Jr Biologist, University of Utah.

3:15 Effective Use of Heptachlor for Mosquito Abatement - Jay E. Graham, Supervisor, South Salt Lake County M.A.D.

3:25 Toxicity to Humans of Currently Used Insecticides - G. Allen Mail, Entomologist, U.S.P.H.S.

3:40 Discussion -

Adjournment.

SATURDAY MORNING, MARCH 20

9:30 Call to Order - Howard Widdison, Hooper, Utah, Vice-President, U.M.A.A.

9:35 The Highlights of the 22nd Annual Conference of the California Mosquito Control Association, Inc. - G. Edwin Washburn, Manager, Turlock, Californi M.A.D.

9:50 The Mosquito Control Program of the California Bureau of Vector Control - Thomas D. Mulhern, Bureau of Vector Control, Calif. Dept. of Public Health.

10:05 The Mosquito Abatement Situation in Cache County, Utah - E. L. Fillmore, Chief Sanitarian, Logan, Utah.

10:15 The Mosquito Abatement Program in Utah County - Dr. Elden Beck, Entomologist, Brigham Young University, Provo.

REPORTS FROM THE MOSQUITO ABATEMENT DISTRICTS

10:25 Box Elder County - Karl L. Josephson, Supervisor of the district.

10:35 Davis County - G. W. Stewart, County Commissioner and Pres. of the Board of Trustees.

10:45 Magna - O. C. Finley, President, Board of Trustees, 1953.

10:55 Salt Lake City - T. A. Schoenfeld, Pres. Board of Trustees, 1953.

11:05 South Salt Lake County - Henry Beckstead, Mayor of Midvale and Pres. Board of Trustees.

11:15 Weber County - J. B. Marsh, Pres. Board of Trustees.

11:25 BUSINESS MEETING - Pres. O. C. Finley - Conducting.

1. Election of Officers -
2. Report of Auditing Committee - Karl L. Josephson, Chairman
3. Report of Resolutions Committee - Harry Drew, Chairman
   Other Business -

12:00 Adjourn.

SATURDAY AFTERNOON 1:30 P.M.

1:30 Call to Order - President Elected for 1954.

(PANEL DISCUSSION) - Utah Law on Forming and Taxing Mosquito Abatement District
Panel Leader - Lynn M. Thatcher, Chief Sanitarian, State Health Dept. and Chairman of the Legislative Committee of U.M.A.A.

Panel: Members of Legislative Committee
O. C. Finley - President U.M.A.A.
Ray P. Greenwood - Commissioner of Salt Lake County
Dr. Don M. Rees - Entomologist, University of Utah
T. A. Schoenfeld - Board of Trustees Salt Lake City District
Ward Warnock - Sanitarian, Davis County
Dr. O. W. Young - Biologist, Weber College

Topics for Discussion -

1:30 Explain existing law -

1. How organized.
2. Governing Board - Terms. How appointed.
3. Organization of Board of Trustees.
4. Duties of Trustees - Compensation.
5. Determining tax levy and administering the funds.

2:00 Discussion of Proposed Ammendments to existing law.

2:30 Review of Constitution and By-laws of U.M.A.A. - Frank D. Arnold, Sanitarian, Salt Lake City Health Department.

3:00 MEETING EXECUTIVE COMMITTEE

BUSINESS MEETING 11:25 A.M. Saturday March 20

At the business meeting the following officers of the Utah Association were elected for 1954.

President	-	Howard Widdison, Ogden, Hooper
Vice-President	-	DeLore Nichols, Farmington
Sec'y-Treasurer	-	Lewis E. Fronk, Ogden

The above officers will act as part of the Executive Committee. Other districts not represented above will appoint one member to serve on the Executive Committee. This appointment should be made by the board of trustees of the respective district. Motion made by Harry Drew, and seconded.

A report was asked from the Auditing Committee. Mr. Karl Josephson reported that due to the fact that Mr. Karl D. Hardy, a member of the committee, was not present, it would not be legal to report at this time.

A future audit will be conducted.

Due to the shortage of time, the business meeting was adjourned at 12:00 noon.

ABSTRACTS AND PROCEEDINGS

FRIDAY MORNING SESSION; 9:30 A. M.

CALL TO ORDER - Mr. Finley, President of the U.M.A.A., welcomed the members and friends of the U.M.A.A. and thanked the organization for bringing the meeting to Magna.

ADDRESS OF WELCOME - Mr. John Rokich, executive secretary and treasurer of the Magna Chamber of Commerce, warmly welcomed everyone to Magna, the copper center of the world and "former mosquito center of the world." He expressed his appreciation for the benefits derived from mosquito abatement in Magna and thanked all the members and guests of the U.M.A.A. for their efforts in mosquito control. Members and guests were invited to visit Magna and surroundir area and note the many civic improvements of the past few years.

RESPONSE - Mr. Finley thanked Mr. Rokich for his kind and pertinent remarks. He then pointed out the contributions and exceedingly active aid given by the industries to control of mosquitoes in the Magna area and introduced the next speaker as a representative of Associated Industries.

REMARKS - Mr. C. R. Naylor, of Magna, enumerated the major industries in the area. He discussed the benefits which industry and mosquito control had gained from the cooperative efforts of the Magna Mosquito district and industry. He commented especially about the results of the remarkable use of blasting in development of the drainage and water control program in the Magna area.

CONTRIBUTION OF MOSQUITO ABATEMENT TO PUBLIC HEALTH by
George A. Spendlove; State Health Commissioner

As the goals of public health are realized, the need for hospitals, the expense of illness, rehabilitation, and welfare for the disabled will decrease.

Even now, our entire people enjoy a state of health undreamed of by kings and nobles of the privileged classes of a few centuries ago. Insurance is helping us to meet the cost of medical care, but it does not protect the community against epidemics, accidents, or insanity. Hospitals are important, but sick-beds alone will not prevent disease. The objectives of positive health are much broader than the salvage of the sick and injured. We have the best medical facilities that are available. The medical profession has incriminated insects as transmitters of numerous diseases. Entomologists and engineers have cooperated in providing us with information on how to control insects, but despite the wonderful progress enjoyed during the last century many humans still sicken and die of preventable disease. Many serious community health problems still exist which should not be ignored. We have information; we have materials; we have the manpower; now, we, the people must unite in organized effort wherever problems exist to solve these problems in our usual democratic way.

In an educational pamphlet entitled, "Florida Health Notes," the following story is related: The Panama Canal area had taken the attitude that "it couldn't happen here." Since the days of its construction in 1905, yellow fever had been absent. Quite suddenly in 1948, without any previous warning, yellow fever appeared. Unlike the epidemics of past centuries, airplanes were rushed to the area with yellow fever vaccine. One of the greatest mass scale inoculations was carried on to that date. The epidemic was stopped, but not until a great number of people had paid with their lives and the disease was once more implanted in the jungles of central American countries. In 1951, during mosquito trouble in Florida, California shipped the Miami Chamber of Commerce a container of mosquito eating fish, but in 1952, "the birds came home to roost in California," when California experienced an epidemic of encephalomyelitis, as well as an epidemic of malaria.

Wherever the carrier mosquito exists in sufficient numbers there is danger of epidemic mosquito borne diseases. The World Health Organization informs us that three hundred million people still have malaria, and that three million die with malaria each year. We must keep in mind that yellow fever, Dengue fever, malaria, encephalomyelitis, and other diseases borne by mosquitoes are transmitted to man. Encephalomyelitis, anaplasmosis, fowl pox, bird malaria, and heart worm are transmitted to horses, mules, birds, cattle, deer, dogs, and cats.

An ounce of prevention is worth a pound of cure, and usually much cheaper. The cost of prevention is negligible when compared to the loss of tourist trade, loss from effects on livestock and poultry, loss from effects on labor, loss from the poverty, misery, disease, and death that could result from neglect of preventive efforts.

THE COOPERATIVE DRAINAGE PROGRAM IN SALT LAKE COUNTY by Lamont B. Gunderson; Commissioner of Salt Lake County

With the exception of the Surplus Canal, constructed in 1922, the major drainage system of Salt Lake County was constructed during the years 1935 and 1936. As no provision was made for the maintenance of these drains they were heavily silted by 1941, and flooding was common throughout the county. Although considerable aid was given by local industries, the military establishments,

railroads and private individuals, the principal task of maintaining drainage in Salt Lake County fell upon the Salt Lake City Mosquito Abatement District, Salt Lake City and Salt Lake County. In the early years most of the maintenance was done by hand labor but since 1946 the job has been done more and more by tractor, ditcher, and dragline. In 1949 Salt Lake City Corporation, Salt Lake County, and the Salt Lake City Mosquito Abatement District entered into a Cooperative Drainage agreement. This new cooperative drainage organization was charged with control of flood waters in all major streams, canals, and ditches other than the Surplus Canal and the Jordan River. In 1953, Cooperative Drainage dredged 18,529 feet of drains removing 13,893 cubic yards of dirt, removed moss and other aquatic plants from 13,650 feet of drains #1, and leveled 1200 feet of area, at a cost of $24,057.50. Cooperative drainage has been very effective in Salt Lake County and has given it a very effective drainage program at a great savings to the taxpayers.

REMARKS - Mr. James N. Stacey, President of the Utah Municipal League, and Mayor of Richfield, expressed his appreciation to mosquito control workers for improving living conditions in certain cities in Utah. He indicated his hope that mosquito control benefits may be extended to other areas of the state where it is needed. He felt that mosquito abatement districts should cooperate with municipal officials and that this in turn would lead to increased support from these municipal officials.

PANEL DISCUSSION - MOSQUITO CONTROL BENEFITS

INTRODUCTION by Dr. Stanton J. Ware, Chief, Water Projects Unit, Communicable Disease Center, Public Health Service, U. S. Department of Health, Education, and Welfare, Logan, Utah

The mosquito control worker is convinced in his own mind and heart that he is performing a beneficial service for his fellow citizens. He knows, after listening to their complaints all season, from early spring when the first mosquitoes begin to emerge to some time in the fall when the last ones disappear naturally, that the residents are vehement in their dissatisfaction at being bitten by even a single mosquito. He has read in the newspapers and magazines that when an epidemic of encephalitis occurs, such as happened in the state of California in 1952, the pesky mosquito has had something to do with it. He is convinced that to do something about reducing the numbers of mosquitoes makes the area in which he lives a better place--and so it does.

On the other hand, with the coming of cold weather and the disappearance of mosquitoes, the problem is soon forgotten by the average citizen. It is just another example of the leaky roof: when it's raining, it's too late to fix it, and when it's not raining, it doesn't need fixing. I have often heard it observed by mosquito abatement personnel that one of their biggest jobs is selling mosquito abatement districts to those affected, so that the proper funds and equipment can be available to do the job when the mosquito season comes.

Although there is no disputing that mosquito control constitutes a benefit, little has been done to analyze the basis of this belief or to document the evidence. Owing to the fact that such material is needed, we have begun work on the preparation of material concerning the benefits of mosquito control. Although little progress has been made, you will observe the evidence of the three papers that the subject has considerable potential value.

Mr. Robert L. Stenburg, S. A. Sanitary Engineer, will point out some of the complementary benefits to be derived from cooperation among the organizations concerned; Dr. Lafe R. Edmunds, S. A. Scientist, will refer to particular health and economic benefits; and Mr. Leslie D. Beadle, Sanitarian, will cite the measurement of mosquito populations in terms of evaluating the potential benefits from mosquito control.

COMPLEMENTARY BENEFITS TO MOSQUITO ABATEMENT FROM INTER-AGENCY COOPERATION by Robert L. Stenburg, Senior Ass't. Sanitary Engineer, Water Projects Unit, Communicable Disease Center, Public Health Service, U. S. Department of Health, Education and Welfare, Logan, Utah.

For many years the nation's water resources have been developed by federal state and private organizations, with little or no thought given to the effects these water developments might have on the creation of mosquito-producing habitats.

Typical of the many side effects which have resulted from this so-called "single objective" type of approach, is the widespread mosquito production occurring on the 124,237 acre Milk River Irrigation Project in Montana. Mosquito studies carried out on this project by the U. S. Public Health Service in cooperation with the Montana State Board of Health and the Montana Agricultural Experiment Station show that 71.3 percent of all mosquitoes produced on the study plot occurred within the boundaries of irrigated fields and were caused by (1) residual water on irrigated fields, (2) irrigation waste water, and (3) overflow from farm distribution systems. Such conditions were directly related to (1) improper irrigation practices, (2) inadequate maintenanc of irrigation and drainage systems, (3) heavy soils, and (4) insufficient land preparation.

The need for a coordinated approach to the development of the nation's water resources has long been recognized and is now beginning to be realized at the federal level through the establishment of various River Basin Inter-Agency Committees. Through its participation on these River Basin Inter-Agency Committees, the Public Health Service has an opportunity to review the project proposals of several federal agencies carrying on active water resources development work and to make suggestions and recommendations designed to prevent potential mosquito breeding habitats from developing after the project is constructed. The U.S. Bureau of Reclamation, the U.S. Corps of Engineers, and the U. S. Soil Conservation Service are three of approximately ten federal agencies engaged in water development activities with which the Public Health Service cooperated.

On the Angostura Irrigation Project in South Dakota, Public Health Service personnel have worked with Soil Conservation Service and Bureau of Reclamation personnel to determine ways by which potential mosquito breeding habitats could be built out of the project during its initial construction. As a result of this cooperative approach, the mosquito preventive steps which have been taken by the construction agencies on this project should go far towards inhibiting excessive increases in mosquito populations after irrigation water is applied to project lands.

Such inter-agency cooperation, to promote "mosquito prevention rather than mosquito control," should not be limited to federal agencies, but should include city, county, and state health departments; city, county, and state planning boards with various interests; highway departments; drainage or mosquito abatement districts, private individuals, and agencies or committees that plan and

participate in any activity which regulates or otherwise affects the water resources of the nation.

It should be the recognized responsibility of every public health and mosquito abatement organization to acquaint itself with the water resources development activities being undertaken within its own sphere of influence and to initiate the necessary contacts to bring mosquito preventive and control measures to the attention of any organization or individual contemplating any action which might result in the creation of a mosquito breeding habitat.

Inter-agency cooperative planning can be a very effective means of accomplishing permanent mosquito prevention on newly developed projects as well as on existing ones. In addition to the actual control accomplished on specific projects, this approach has the advantage of promoting mosquito prevention concepts in "outside" agencies not specifically engaged in mosquito abatement, and of effectively enlarging the ranks of those working for mosquito control.

MEASUREMENT OF MOSQUITO POPULATIONS AS A FACTOR IN EVALUATING BENEFITS FROM MOSQUITO CONTROL

by Leslie D. Beadle, Sanitarian from the Communicable Disease Center, Public Health Service, U. S. Department of Health, Education, and Welfare, Logan, Utah

It is obvious that the success of mosquito control work is not measured in terms of gallons of insecticide sprayed, number of acres treated, or miles of drainage ditches constructed, but rather--what is the mosquito count? Although several methods of sampling adult mosquito populations have been developed for evaluating the effectiveness of control work, the New Jersey light trap undoubtedly is the one most widely used in this country. In view of the extensive use of the light trap as a sampling device, it is paradoxical that very little information exists regarding the relation of light trap catches to human comfort It is difficult to envision how mosquito abatement organizations can properly evaluate the benefits of their work if they cannot interpret their entomological findings in terms of human comfort.

What do light trap catches mean in terms of annoyance? In 1932, Dr. T. J. Headlee attempted to answer this question by stating that "for average New Jersey conditions it may be considered that when this trap accumulates more than 24 mosquitoes in a single night the density is sufficient to develop trouble for the householder." He considered that a catch of 24 females per night was equivalent to the same density present when 1 female could be caught each 15-minute period by a human collector. In 1937, VanDerwerker published data to show that the trap-annoyance figure might vary from area to area in New Jersey. In areas under good mosquito control, the figure might be as low as 8 female mosquitoes per trap night, whereas in areas not under control it might be as high as 40.

In order to secure data that might be used in determining a trap-annoyance figure for conditions in western states, studies were conducted at Mitchell, in Scotts Bluff County, Nebr., from June to October 1953.

On 202 occasions, biting collections were made at 4 sites where light traps were operated during the same evenings. These sites were located in a 2-mile line; 2 at farmsteads, 1 at the edge of town, and 1 in the center of town. The

light traps, equipped with 25-watt bulbs, were operated from sunset to 7 a.m. Biting collections were made during the 2-hour period immediately following sunset. Mosquitoes were taken from the exposed legs of the collector by means of a chloroform tube with a paper funnel in its mouth. A flashlight with subdued light was used for the collecting periods after dark. In order to obviate possible individual differences in attractiveness to mosquitoes, five collectors participated in the biting studies. An average of 3 biting collections per week was made at each of the 4 sites.

Principal mosquito species in the area--- Based on a total of 43,405 female mosquitoes taken by the two methods during the period June 9 to October 8, 1953, the three principal species were Aedes vexans, Culex tarsalis, and Aedes dorsalis. These species comprised 91 percent of the mosquito fauna.

A comparison of the all-night light trap collections with the 2-hour biting collections showed that the trap catches were numerically superior by about 1.5 to 1. Considering individual species, the closest similarity between catches by the two methods was for C. tarsalis and the greatest dissimilarity was for A. dorsalis.

Comparison of catches at the four sites--At three of the sites (Nos. 1, 2, and 4), light trap catches exceeded the biting collections. Light trap 4, which took especially large catches, collected more mosquitoes than the other 3 traps taken together. This particular trap was located on the bank of a stream where it was well sheltered by a dense growth of vegetation. With reference to site 3, one possible explanation for the superior catches by biting is the fact that the distance between the biting station and the trap (10 yd.) was shorter than that of the other sites. Light from the trap may have caused a disproportionate number of mosquitoes to be in the area immediately surrounding the human bait.

Light trap annoyance figure for the Mitchell area--The average number of female mosquitoes per collection was 170.4 for the traps and 110.1 for biting (2-hour collections). If it is assumed that 1 mosquito biting each 15 minutes (or 8 per 2 hours) constitutes the threshold of annoyance, then 110.1 : 170.4 = 8 : X. Thus, it follows that a catch of 12.3 mosquitoes in a trap is equivalent to 1 mosquito biting each 15 minutes.

The trap-annoyance figure varied from site to site for the same species, and there also was considerable variation between species. For example, an average catch of 8 female C. tarsalis by light traps was equivalent to 1 biting each 15 minutes, but this figure varied from 5 to 9, according to the site. The average catch for A. vexans was 13 mosquitoes, with a range from 4 to 26; for A. dorsali 33, with a range from 24 to 55; and for all species, 12, with a range from 6 to to 17.

The trap-annoyance figure varied also according to time of year. It was largest in June and smallest in August.

On the basis of foregoing data, the following conclusion seems warranted: that a catch of 12 female mosquitoes instead of 24 (as proposed by Headlee) is equal to 1 bite each 15-minute period. This might be considered as a trap-annoyance figure for Mitchell, Nebr.

Mosquito control benefits--Since the theme of this panel pertains to mosquito control benefits, data is presented here to show the magnitude of the mosquito problem in an area not under organized mosquito control. This is an indirect way of showing benefits. The average number of bites in a backyard in the center of town (site 3) averaged 37 per hour for the entire summer period at one of the farmsteads (site 4) it averaged 74.

In order that one can appreciate what mosquito control means to a community two areas are compared--one not under organized mosquito control and the other under mosquito abatement. (The author is indebted to Dr. Don M. Rees for entomological data from his district.) If an attempt is made to apply the figure of 12 mosquitoes per light trap catch as being the threshold of annoyance we find that in the Mitchell area 97 percent of the catches exceeded 12 females, whereas in Salt Lake City Mosquito Abatement District during 1953, only 4 percent were above. The implication seems obvious.

HEALTH AND ECONOMIC BENEFITS DERIVED FROM MOSQUITO CONTROL

by Lafe R. Edmunds, Senior Assistant Scientist (R), Communicable Disease Center, Public Health Service, U. S. Department of Health, Education and Welfare, Logan, Utah

More than 25 million people of the United States live in areas where mosquito control programs are in progress, and for these programs more than $6,500,000 is appropriated annually. Through public demand the mosquito abatement districts have grown from 1 in 1913 to over 25 at the present time. This has been due in large part to public education on the importance of mosquitoes and the extend to which they affect our health and economy.

Mosquitoes have annoyed man and undermined his health for centuries, and at present are regarded as the most important group of all our blood-sucking insects. In general, mosquitoes affect human welfare in the following ways:

1. Mosquitoes transmit diseases to man.
2. Mosquitoes transmit diseases of domestic and game animals.
3. Mosquito bites cause considerable annoyance.
4. Reduction in real estate and other property values occur when there is an excessive abundance of mosquitoes.
5. Mosquitoes cause economic losses to agriculture.

I. Mosquitoes as Carriers of Human Diseases

Mosquitoes alone carry malaria, yellow fever, dengue, and filariasis. They also carry certain types of encephalitis and may be involved in the mechanical transfer of tularemia and anthrax.

During 1952 there were 61 cases of human encephalitis reported in the Mountain States. Since 1940 there have been 22 human deaths recorded in Utah due to encephalitis. Outbreaks of this disease sometimes reach epidemic proportions in certain areas. This has not occurred in Utah but since a few

cases occur here practically every year, and Culex tarsalis is abundant, there is danger that an epidemic might occur.

II. Mosquitoes as Carriers of Diseases of Domestic and Game Animals

Mosquitoes are known to transmit equine encephalomyelitis, heartworm of dogs, myxomytosis or "big head" of rabbits, fowl pox, anaplasmosis, fowl spirochaetosis, tularemia, anthrax, and blue tongue. In Utah there were 250 animals affected by equine encephalomyelitis in 1952, of which 95 died. In commercial poultry areas of Utah, fowl pox is recognized as a hazard and inoculations of young birds is practiced at considerable expense to the poultrymen.

III. Mosquito Bites Cause Considerable Irritation

Practically everyone bitten by a mosquito suffers irritation. Some people suffer severe local reactions and in a few instances allergic reactions develop. In many people the bites cause swellings and severe itching, followed by incessant scratching, and the formation of infected pustules. This is followed by restlessness, loss of sleep, nervous irritation, and a determination to avoid mosquito areas at all costs. Mosquitoes sometimes stop man's work and prevent enjoyment of recreational facilities.

IV. Reduction in Real Estate and Other Property Values Due to Mosquito Annoyanc

People who might otherwise purchase land for homes, farms, or industry will be to some extent deterred from doing so by the excessive prevalence of mosquitoes. Most people on pleasure trips and vacations will leave hotels, beaches, and summer camps if mosquitoes are numerous, and will warn others about the discomfort of such places. This represents a cash loss to property owners and summer business.

V. Mosquitoes Cause Economic Losses to Agriculture

There is considerable evidence to support the belief that mosquitoes play an important role in weight gains of meat animals and in the milk production of dairy cows. Bishopp (1933) reported the death of 173 head of livestock in Florida due to attacks of Psorophora confinnis, and in addition to these deaths the milk supply of the area was reduced 1,000 gallons per day.

It has been estimated that 500 mosquitoes will draw one-twentieth of a pint of blood per day from an exposed animal. The importance of this was evident in a study made on July 18, 1953, at Mitchell, Nebr., where during a three-hour period (6-9 p.m.) 1,244 mosquitoes were collected while feeding on a horse. It would be possible under these conditions for the horse to lose nearly a pint of blood each day.

Summary

The health and economic benefits derived from mosquito abatement work are thus multiple and varied. In many sections of our country well organized, and well directed plans for mosquito control are bringing about a reduction of these noxious pests. The primary benefits resulting from this work are: (1) prevention of human disease; (2) prevention of diseases of domestic and game animals; (3) increase in land and real estate values; (4) increase in agricultural

production; (5) contribution to the enjoyment of gardens, playgrounds, parks and other recreational facilities; (6) reduction by proper drainage of the population levels of many parasites such as liver flukes, stomach worms, large round worms, lung worms, and many other parasites.

HANDLING THE MOSQUITO CONTROL PROBLEM IN THE WEBER BASIN PROJECT by
Reid Jerman: Regional Planning Engineer, Bureau of Reclamation

The Weber Basin project was authorized nearly 5 years ago and it will soon be 2 years since the first construction funds were appropriated. The project is Utah's largest to date and since it is actually under construction we can appropriately discuss it in relation to mosquito control problems.

The first reclamation projects were constructed with the sole objective of getting water onto the land. Gradually, we have learned that other objectives can often be incorporated into the plan to advantage. Not least in importance but perhaps the last associated benefit to be fully considered was the matter of public health. Since the enactment of the Water Pollution Control Act of June 30, 1948, the Bureau has cooperated in plan formulation with the Public Health Service and the State Health Department.

Regulation of surplus Weber River flows will be provided under the project plan by new reservoirs at the Wanship, Lost Creek, and Willard sites and by enlargement of the existing Pineview and East Canyon Reservoirs. The Echo Reservoir will be correlated into project operation at its present size. All of these reservoirs are in mountain areas except Willard which is on the shore of Great Salt Lake. Project water released from mountain reservoirs will be distributed to some extent by existing works, some of which will be modified, but largely through new facilities. Flows that cannot be controlled by the mountain reservoirs will be diverted from the Weber River west of Ogden and conveyed 11 miles north to the Willard Reservoir. The reservoir will be surrounded on at least three sides by a dike that will separate it from Great Salt Lake. Water will be pumped from the reservoir as needed and returned to the Weber River through the Willard Pump Canal. The Weber Basin project as now planned will include about 80 wells in the lower areas to provide usable water and to lower the water table. It will also include surface and deep drains for removing standing surface water and reclaiming seeped lands. The drains will also capture some reusable return flow water from higher irrigated lands. Water from wells and drains will be used for irrigation and other purposes including use at migratory waterfowl refuges.

While the investigation of the Weber Basin project was being made the Public Health Service and the Utah State Department of Health were called in to make water pollution and mosquito surveys. Among the findings of the mosquito study were these: (1) about 100,000 acres of ground in the Weber Basin is favorable for mosquito production, (2) inhabitants of all the major communities and rural sections of the survey area are accessible to mosquitoes originating in major producing areas, (3) irrigation provides more than 50 percent of the mosquito-producing water in the area, and (4) fourteen species of mosquitoes were collected, the three most abundant of which are capable of transmitting encephalitis.

An acute mosquito problem was concluded to exist and improper disposal of irrigation waste water was found to be a major cause. The lack of a comprehensive basin-wide drainage plan prevents thorough drainage. Numerous individual efforts at drainage as a rule only change the locale of the mosquito production.

The Public Health Service concluded that the extensive drainage system proposed as a part of the Weber Basin project would reduce mosquito production. It recommended, however, that the drains be extended all the way to the surface of Great Salt Lake rather than terminate 5 feet above the lake level. The Willard Reservoir, it was found, would reduce mosquito production by inundating 11,000 acres in the most prolific producing area in the basin. Minor extensions of the Willard dikes were recommended as a further means of mosquito control, and various suggestions were made with respect to the design of project structures and the coordinated operation and administration of the project in the interest of mosquito abatement.

Construction designs have not yet been made for project facilities that will have a bearing on mosquitoes. When the work is undertaken the previous recommendations of the Public Health Service and the State Health Department will be considered and these agencies will be called on for further help in formulating the final plans and in establishing operating criteria. With their help the Bureau of Reclamation will undertake to design and construct a drainage system that will not only prevent new mosquito breeding areas being formed as a result of the increased irrigation but will provide an outlet for areas that are now offensive. Attention will be given to land leveling and the prevention of swamp-forming leakage from canals and ditches. Means will be considered to relieve artesian water pressures that cause upward leakage of water into surface areas. Refuse and vegetation will be removed from lands that will be inundated by new reservoirs as a means of mosquito control and for other reasons. Proper irrigation practices will be encouraged.

It can be stated with confidence that through these cooperative efforts the Weber Basin Reclamation project will substantially lessen rather than increase the mosquito problem in its area.

"MOSQUITO PROBLEMS IN IRRIGATED AREAS" - SOUND FILM STRIP - by
G. G. Keener, Jr., Entomologist, U. S. P.H. S.

This excellent film strip prepared by the U. S. Public Health Service gave a concise account of the origin of mosquito producing waters, the life histories of the mosquitoes, and the control of mosquitoes by drainage and proper practices in irrigated areas.

FRIDAY AFTERNOON SESSION, 1:30 P.M.

THE USE OF GAMBUSIA FISH IN A MOSQUITO CONTROL PROGRAM by O. Whitney Young, Ph.D.; Weber College, Utah

Since Gambusia fish were introduced into Utah by Dr. Don M. Rees in 1932, then of the Salt Lake City Mosquito Abatement District, many efforts have been made to use them in controlling mosquitoes throughout the state. Being originally from the lower Mississippi drainage area, they are not adapted to our severe winters and cannot stand the conditions of life under ice. In Weber County some have survived (apparently) in the ponds around flowing wells, and an excellent source of supply of the fish is the pond just outside of the Crystal Springs resort in Box Elder County.

Gambusia fit in well with the natural balance to be found in any body of water that is not temporary. They cooperate with back swimmers, water boatmen, dragonfly nymphs, larvae of predaceous diving beetles and other predatory animals to keep the mosquito larvae in check. In an undisturbed marsh or other body of water, the number of mosquitoes produced is apt to be very limited, but wherever the balance is upset by destruction of predators or non-existent as in the case of water in a hoof-track, the number of mosquitoes can be limited only by the facilities for growth.

One factor in the upset of the balance of nature within a small pool could be the unwise use of chemicals to kill mosquito larvae. Too much spray material could well mean the destruction of the natural enemies of the mosquito. The mosquito abatement worker should be careful not to work against such natural controls but to do all he can to cooperate with nature. Thus he not only may save money, time and labor, but he can help to preserve the natural beauty and purpose of such bodies of water he has to manage.

This principle of biological control we may regard as basically sound. We should strive toward the ideal of using natural controls wherever possible. However, depending upon Gambusia and other predators involves considerable risk, as they are subject to many factors which may wipe them out. For example, glossy ibis and other waterfowl, may clean out Gambusia fish in a short time. The fish themselves have no time in which to become acquainted with their situation into which they have been introduced. The only effective use of Gambusia, as far as our local mosquito abatement districts are concerned, is to plant them in ornamental pools where they are protected against waterfowl.

If, after repeated plantings, Gambusia were to become acclimatized and adapted to their situation so they could survive the onslaughts of bird predators they then would constitute a valuable aid in combatting mosquitoes. Such a process promises to be expensive and disheartening, but it might be worthwhile. If we do not try to develop something of this nature of depending upon predators to help us control mosquitoes, then our only other recourse is to look forward to better chemicals and drainage.

The principle of natural or biological control is still a sound one. We should try to come as close to the ideal as is consistent with our duty of abating mosquitoes.

MOSQUITOES AND THE DISEASE SYNOVITIS (STAPHYLOCOCCOSIS) OF TURKEYS by Reed S. Roberts, Utah State Agricultural College, Logan, Utah

The growing importance of the turkey industry in Utah has focused considerable attention on the disease synovitis which occurs in turkeys. This costly

disease, which has been known since 1891 has, during some years, caused considerable loss to Utah turkey growers.

Past research by scientists of the U.S.A.C. Experiment Station has made available considerable information concerning the causitive organism, the pathology and symptoms of the disease. However, in spite of intensive research, the mode of transmission of the causitive organism (Staphylococcus aureus) Micrococcus pyogenes var. aureus has not yet been determined. Likewise, there is to-date no known cure or treatment that has proved satisfactory. Thus, the turkey growers of Utah find themselves confronted by a disease that is yearly killing hundreds of their birds and we have not yet been able to tell them how the disease is transmitted nor how to treat it. Discovery of either the mode of transmission or of a suitable therapeutic agent would be an important step forward in controlling this disease.

There are many reasons, both pro and con, why an Arthropod vector may be transmitting this disease. Consider first however, those factors which would lead us to believe that the disease is not transmitted by an Arthropod.

1. In several areas of Utah the suspected insect vector and the turkeys live together without the disease.

2. Usually the disease occurs more often in the toms than in the hens.

3. Research to-date has failed to demonstrate the organism in any suspected insect vector. Improved techniques may, however, give different results.

4. The matter of feed as a factor in relation to this disease is beyond the scope of this paper, but it should be mentioned here that some scientists and some turkey growers feel that an insufficient amount of essential vitamins in the turkey feed (i.e. Niacin) constitutes a predisposing factor in making the birds more susceptible to weak leg diseases, including synovitis.

5. Techniques employed to-date have failed to find any live mites, ticks, fleas or lice on either sick or healthy turkeys.

6. Mosquitoes are the suspected vectors, yet, only rarely do mosquitoes transmit bacterial diseases.

Now consider those factors which would lead us to believe that the disease is transmitted by an Arthropod vector.

1. The causitive organism is ubiquitous, but even when placed in turkey feed, water or on the equipment, it fails to give rise to the disease.

2. Past research has shown the disease not to be transmitted through the egg or the female reproductive system of the turkey.

3. If the organism is innoculated into the muscle tissue or the abdominal cavity of the turkey, only a local reaction takes place.

4. If the organism is rubbed into bruised flesh, or onto the oral or rectal areas the bird does not get the disease.

5. If the causitive organism is innoculated directly into the blood system, the turkey gets the disease and dies. This is very important.

6. This is a summer disease. Turkeys usually start getting the disease at 12

weeks of age which is about the time they are put out on the range and the disease is reported to subside almost at once after the first frost.

7. Where the turkeys are ranged may be a very important factor on the incidence of the disease. Although very few if any turkey ranges are beyond the flight range of suspected insect vectors, the nearness of the range to the lowlands in the valley does seem to be important.

8. Two major turkey growers in Sanpete County informed the author that mosquitoes had been a problem on their turkeys. One said that the mosquitoes were so bad one year, several years ago, that they built smudge fires to smoke them away.

9. Mosquitoes, especially Culex tarsalis, have been found with ease, on the walls and ceilings of turkey range houses at night. Often times the females were fully engorged with blood. Examination of the blood from these engorged mosquitoes has shown it to be of avian origin, not mammalian. Circumstantial evidence is very strong that it is turkey blood.

10. Mosquitoes are known to transmit bacterial disease, although rarely, the two disease being plague and tularemia.

Failure to isolate the causitive organism of synovitis from female Culex tarsalis which have fed on infected birds may be due to inadequate techniques. Apparently, if mosquitoes are the vectors, they must feed on the turkeys during the septicemic stages of the disease. This stage, which seems to be very short in duration, occurs before any outward symptoms of the disease appears. To-date, we have been able only to examine mosquitoes that have fed on birds which were showing marked symptoms of the disease. The possibility also exists that transmission may be mechanical, especially if the mosquitoes are interrupted when feeding.

Conclusions:

The mode of transmission of the disease synovitis in turkeys is as yet unknown. Evidence now available indicates that continued investigation along current lines involving mosquitoes should definitely be continued.

THE ENCEPHALITIS PROBLEM IN UTAH by A. W. Grundmann, Ph.D.; University of Utah

Of the mosquito born infections transmissable to man and the horse, none are more important to the people of this region than those producing encephalitis. In general, when encephalitis is discussed, the discussion involves several types as produced by the viruses of western equine encephalomyelitis (WEE) and St. Louis encephalitis (SLE). WEE has been frequently reported from Utah in the past, as occurring in horses, but the actual virus involved was established by laboratory methods in only a few cases. In order to establish the virus, or viruses, responsible for these infections, and to check the diagnosis made heretofore largely on symptoms, Dr. G. R. Leymaster of the Department of Preventive Medicine and the author began a study of the situation in Utah.

There have been few reported clinical cases in horses during the last 12 to 15 years. Therefore, it was obvious that the ratio of immune to non-immune horses and humans would provide information that would be valuable not only in establishing the distribution of the disease in the State, but also the proportion of susceptibles that might be involved in a new epidemic. Also, it was thought,

preventive. If the mosquito is controlled, transmission to man will be largely prevented and epidemic conditions unlikely to occur. Since we know so little about the natural host-parasite cycle occuring in nature where these viruses are concerned, it is difficult to say what effect abatement will have on this aspect. Therefore, to be effective in the future, mosquito abatement must be a continual process.

MOSQUITO PRODUCTION IN POLLUTED WATERS by A. R. Gaufin; University of Utah

Until just a few years ago, most Americans lived on farms and in small towns. There were relatively few factories, and most of them were small. Waste disposal and water pollution were not major problems then; even the smaller rivers could take care of the pollution load they received.

But now, three out of five people live in cities. Our industries have grown to enormous size and are still growing rapidly. These cities and industries are pouring increasingly vast amounts of wastes into our waterways.

Today there are over 22,000 sources of pollution in the United States: 11,800 municipal sewer systems and 10,400 factory waste outlets. Despite the reduction of wastes by 9,300 treatment plants the wastes still discharged into our waters equals that from over 150,000,000 people. The disposal of these wastes either by discharge into bodies of water or by disposal onto land is creating very definite health hazards including serious mosquito abatement problems.

If an industrial or municipal waste is to be discharged by land disposal, it might be disposed of after certain preliminary treatment by percolation into the ground. The successful control of odors would necessitate that the effluent be placed into the soil and disappear from impoundment on the surface within two or three days. Such a rate of percolation would probably not create any mosquito breeding areas because of the rapid cycle involved.

The disposal of wastes into oxidation ponds or lagoons, which constitute permanent bodies of water, might create a very definite mosquito breeding potential. Such ponds contain nutrients which cause prolific growths of algae, including floating algal blankets, that might intensify the mosquito control problem in what was a previously permanent impoundment with little mosquito problem.

Water pollution control authorities in some states such as California are attempting to minimize such potential hazards by reviewing the plans, specifications, and details of existing and proposed waste treatment and disposal facilities. However even in such cases the authorities cannot tell the discharger of wastes that the embankments around his oxidation ponds must be wide enough to permit use as access roads, or that his ditches must be designed, constructed, and maintained in any particular manner. Under present laws water pollution control boards can only specify the end results to be maintained in a disposal area without reference to the manner or equipment used to achieve these results.

The discharge of wastes into streams might not appear to pose any additional mosquito breeding areas or problems that do not already exist. However, such is not the case, since pollution even in streams might intensify or create a mosquito breeding hazard. Such a condition is well illustrated by Lytle Creek, a small stream in southwestern Ohio, which the author studied intensively for a number of years. Lytle Creek is a small stream approximately 11 miles long, 3 to 35 feet

wide during non-floodstage, and a few inches up to 6 feet deep. During the winter and spring, flows average about 6 to 7 cubic feet per second, while during the summer and fall, flows are generally small averaging about 1 c.f.s. The gradient of the streambed averages about 25 feet per mile, resulting in a fairly rapid flow throughout the stream.

Seven miles above its mouth, the creek receives the effluent from the primary sewage treatment plant of Wilmington, Ohio, a city of about 10,000 people. During periods of low summer flow, the sewage plant effluent overwhelms the stream with oxygen depleting wastes and causes a septic zone to be produced for several miles below the sewage outfall. In the upper and lower clean water sections of the stream 79 species of animals were collected during the summer of 1951 with no species exceeding 500 individuals per square foot. In the septic zone only 10 different species were collected with the mosquito, Culex pipiens, occurring in numbers exceeding 3,000 larvae per square foot. This mosquito also occurred in the clean water sections but was never present in numbers in excess of 1 or 2 per sample. Its abundance in the septic zone was made possible by the abundant food supply and its ability to exist under the oxygen deficient conditions which eliminated most of its clean water competitors. Similar conditions enable other species of mosquitoes, such as Culex tarsalis, to breed in enormous numbers in the marshes into which Salt Lake City often disposes of its raw sewage during the irrigation season.

While the enormous productive potential of mosquitoes in such polluted waters constitutes an important problem in itself, the control of mosquitoes in such areas is made much more difficult by the fact that often a heavier dosage of larvicide is required to effect a kill. Yates and Stage (1941) working in New Jersey reported that a pond approximately one acre in size, which was heavily polluted from a slaughterhouse nearby, and was heavily infested with Culex pipiens required repeated applications of 50 to 60 gallons of a dilute pyrethrum-oil emulsion to get a reasonable kill. Ginsburg (1946) also in New Jersey reported that a much shorter residual effect of D.D.T. was obtained in heavily polluted water than in clear water. In reporting to the Utah Mosquito Abatement Association meetings in 1949 Geib reported that D.D.T. was ineffective in heavily polluted waters in California necessitating a return to oil sprays. Edmunds (personal communication) reports a similar problem to have existed in the Salt Lake District in 1953.

From a medical standpoint the close association of mosquitoes with the human wastes contained in many polluted waters constitutes a potentially hazardous situation. The possibility of adult mosquitoes picking up human pathogens from sewage contaminated waters and serving as accidental vectors of these organisms presents a problem which cannot be ignored. This problem is especially acute in the Salt Lake County area where Culex tarsalis, a known carrier of human encephalitis, breeds in large numbers in heavily polluted areas. On the basis of present knowledge the accidental transmission of pathogenic organisms by sewage contaminated mosquitoes seems highly improbable but additional research needs to be conducted to satisfactorily answer the problem.

Research is also needed to determine what effect the use of insecticides on polluted waters might have on the rate of purification of such waters. Since many of the organisms responsible for the breakdown of wastes and consequent recovery of polluted streams might be killed in a mosquito abatement program, it is possible that the distance and time required for such streams to purify themselves might be prolonged thus increasing their mosquito breeding potential.

THE AEDES NIGROMACULIS MOSQUITO SITUATION IN UTAH

by Don M. Rees; University of Utah

Aedes nigromaculis (Ludlow) is a medium sized dark mosquito. It is distinguished from all other species of Aedes in this area by a distinct white ring on the proboscis.

It is a plains species and is present throughout most of the more arid plains of middle western United States, extending from Mexico into Canada. It is found in Utah on the plains and prairies throughout the state in the same localities as Aedes dorsalis. It is also found associated with Aedes campestris, A. niphadopsis and A. vexans.

The females of Aedes nigromaculis readily attack man and animals and inflict a rather painful bite. Where they are abundant they constitute a severe pest of man and animals. They are also proven vectors of the virus encephalitis.

When mosquito abatement work was started in Salt Lake City and vicinity A. nigromaculis larvae and adults were collected during the sampling of the mosquito population. However, this species seems to have gradually disappeared in this area after several seasons of intensive mosquito control operations. For a number of years no larvae or adults of this species have been collected in Salt Lake City or the controlled area in the vicinity of the city.

In 1953 near the Jordan River west of Murray between 5100 and 5400 south, a large brood of Aedes nigromaculis emerged during the first week of July. Immediate control measures were successful in preventing the adults from creating a serious annoyance.

The appearance of this large brood of A. nigromaculis presents this interesting question to mosquito abatement workers. Is this a remnant of a species disappearing from the area under mosquito abatement pressures or is it a recent revival of this species which may develop into a major control problem such as exists in parts of California where this species has recently made an appearance. According to available information Aedes nigromaculis was reported as first being collected in Shasta County, California, in June, 1937. It was reported from Stanislaus and Tulare counties in 1939. It was later reported in Los Angeles County in 1948 and in Alameda County in 1950. Where A. nigromaculis has appeared in California it seems to be increasing in numbers especially in the regions of irrigated pastures. According to Reeves (1941) "Aedes nigromaculis seems to be taking over where Aedes dorsalis was formerly prevalent."

In any event, since 1937, Aedes nigromaculis has become, in parts of California, the major mosquito problem. In the light of this information the question is, will this species become an increasingly important control problem in Utah, taking over where Aedes dorsalis is now the dominant species, or is it on its way out as control pressures are increased. This is something worthy of note and careful investigation. The answer will be forthcoming in the not too distant future.

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PANEL DISCUSSION ON INSECTICIDES

Panel Leader - Dr. Geo. F. Knowlton, Utah State Agricultural College, Logan, Utah.

The subject was introduced by reviewing briefly the history of the use of insecticides in mosquito abatements and discussing the development of the newer insecticides.

USE OF THE AIRPLANE IN THE APPLICATION OF INSECTICIDES IN MOSQUITO CONTROL by Lewis E. Fronk, Director; Weber County Mosquito Abatement District

For the Weber County Mosquito Abatement District to have a completely successful abatement campaign against mosquitoes, aerial application of insecticide has become a must in its program. Until the year 1951, even though hand and power spraying was done throughout the mosquito season, mosquitoes were still abundant in most sections of the county. The answer to this was evident. With all the hand and power spraying being done, the program was as yet not complete. The vast marsh and pasture areas could not be covered with spray by use of ground equipment.

At the end of the 1951 mosquito season, it was decided by the board of trustees of the district, to adopt aerial spraying as a regular part of its program. The 1952 program saw over ten thousand acres sprayed by air, and in 1953 aerial spraying totaled over 19,825 acres.

The results of aerial application were evident. The light-trap collections from 1947 through 1953 revealed nearly an 80 per-cent decrease in the mosquito populations. The complaints tapered off from hundreds a season to only a few at the end of the 1953 program.

TABLE I

Materials used, application and results of aerial spraying:

ACRES	INSECTICIDE	lbs. PER ACRE	GALS PER ACRE	CARRIER	KILL
15,812	DDT	.2	2	Water and #3 oil	30% to 95%
1,793	DDT	.4	4	"	60% to 95%
2,145	#3 oil only		2 to 4	#3 oil only	60% to 80%
50	Heptachlor	2 lbs of 2½%		Bentonite Granules	less than 10%
25	Dieldrin	2 lbs of 5%		Clay Pellets	less than 10%

19,825 total acres treated by aerial equipment.

It is well to note that the poor results obtained from using Heptachlor and Dieldrin in the granular and clay forms were a result of bad formulation, rather than the insecticide itself. The future of granular material is definitely promising and Weber County Mosquito Abatement District is looking forward to its use.

TABLE II

Aircraft and specifications of aircraft used in the Weber County Mosquito Abatement program.

AIRCRAFT	GALS CAPACITY	M.P.H. WHILE SPRAYING	BOOM LENGTH	SWATH HEIGHT	NO OF NOZZLES
Piper cub J-3	40	70 - 80	25 ft.	30 ft 5-12 ft	15
Aronica 7 AC	40	70 - 80	25 ft.	30 ft 5-12 ft	15
Super Cub PA18A	70	60 - 80	32 ft.	40 ft 5-12 ft	21

The super cub is equipped with a conversion unit for applying dusts and granular material. It is of the "ventura" type and capable of carrying 800 pounds per load.

Airplane loading system.

Inasmuch as the abatement district contracts their airplanes on an hourly rate, the time in servicing the craft with insecticide is a very important factor A 1,000 gal. capacity tank was "rigged" on a four wheel trailer and equipped with a small compressor and gasoline engine. This rig can easily be transported to the various landing strips in the county without much time loss. It also makes it possible to keep the planes air-borne almost constantly. This of course "pays off" in actual acres sprayed per hour. By keeping the compressor running, it is also possible to service the insecticide tank in the airplane in about 1½ minutes, which also "pays off" in acres sprayed per hour.

Airplane rates, costs and total costs per acre.

As mentioned above, the airplanes are contracted on a hourly rate. This includes the use of the airplane, the pilot, maintenance of the airplane and of course the gasoline. The rate paid for one airplane is $15.00 per hour air-time, and $7.50 per hour ground-time. This rate might seem rather high to some people, but the total cost per acre is comparable with the unit price per acre rate. This district is convinced that the hourly rate is much better inasmuch as the pilot will take greater pains in doing his job well and not attempt to merely cover a lot of acres. The total cost to spray 19,825 acres which includes application, insecticide and other labor was $15,704.17 or $.78 per acre.

Importance of good inspection.

When dealing with large-acreage spraying, it is very important that the inspectors do a good job. The best time to spray is when the larvae reach 3rd instar so that most of the cycle developing will be killed. If the spraying is done too early, those eggs not hatched out may survive the spraying. If the spraying is done too late, many adults may emerge and get on the wing. Therefore

it is important that the inspectors report the breeding areas at just the proper time.

Precautions.

There are a number of precautions a district should be aware of when using the airplane for spraying.

1. Avoid spraying oil base sprays while ducks are nesting.

2. Avoid spraying over areas at the time geese are mating.

3. Avoid spraying in areas where cattle are near. The plane may cause them to run through wire fences and possible injury may resut.

4. Do not spray within 1½ miles from bee colonies without giving the owner 48 hours notice.

5. Be especially careful that the correct amount of material is sprayed per acre. A mistake in large acreage work may be of serious consequence.

THE USE OF GRANULAR LARVICIDES IN MOSQUITO CONTROL by George F. Edmunds, Jr.; University of Utah

Granular larvicides were developed primarily for mosquito control and have met with remarkable success primarily for two reasons: (1) because of low dosage per-acre, large areas may be treated by a light plane with a single load; and, (2) most of the insecticide reaches the water, very little being lost on the vegetation or in the air. There are the additional advantages in that planes can be flown higher, and hence more safely, and that there is less drift than with sprays. The granular carrier for the insecticide should be chosen according to the intended use, but the heavier materials have less drift and give penetration of vegetation. When used for prehatch treatment the carrier should dissolve slowly, but for post-hatch treatment it should dissolve rapidly.

Large and regular areas may be treated effectively by plane but some of the most extensive spraying jobs facing the districts in Utah are along the edges of duck marshes. In some cases a winding strip 10 to 100 feet wide and miles long may need spraying. In such cases the airplane and ground equipment are of limited use. The advent of granular materials may have opened up the use of the air-driven boat as an important mosquito abatement vehicle. It is probable that a device for feeding granules into the air stream of a boat would convert any air boat into a useful tool for applying larvicides.

During the 1953 season, the Salt Lake City Mosquito Abatement District effectively used granular formulations of 2½% and 5% haptachlor and 5% dieldrin hand broadcast on mosquito producing waters that were small, scattered or difficult of access. Field inspectors were supplied with 4-pound bags of 2½% granular larvicides, and were able to treat all of the smaller pools they encountered at rates of 2 pounds per acre. This treatment by the inspectors resulted in a great savings in man-hours.

Spray crews also used granular materials on large areas that were difficult of access. Granular materials were particularly useful in mountainous areas.

In the dense willow growths of mountain meadows it is easier to spread granules by hand than to use sprayers. When using bentonite formulations it is easy to see the bentonite in the water, thus reducing errors of doubling back onto treated areas and missing others. Granular larvicides were also used effectively for pre-hatch treatment at one locality. None of the granular materials used proved effective against pupae, even when used at heavy dosages.

EFFECTIVE USE OF HEPTACHLOR FOR MOSQUITO ABATEMENT by Jay E. Graham, Supervisor, South Salt Lake County M.A.D

Heptachlor has been used experimentally in the control of mosquitoes for several years and found to be effective at dosages from 0.04 to 0.05 lbs. per acre and all higher dosages when used as a larvicide.

During the year 1953, the South Salt Lake County Mosquito Abatement District used heptachlor emulsifiable concentrate as the principle insecticide for both larviciding and adulticiding. It was found to be effective against all species o: mosquito larvae in the county when used at the rate of 0.05 lbs per acre and against all species of adults when used at the rate of 0.1 to 0.2 lbs per acre. Heptachlor applied as the residual adulticide on vegetation at the rate of 0.1 to 0.2 lbs per acre was found to be an effective barrier to migrating or dispersing Aedes dorsalis and various species of Culex and Culiseta. Heptachlor was used fo: the first time in the control of larvae of Anopheles freeborni at the rate of 0.04 lbs per acre and found to be effective. Granular bentonite containing $2\frac{1}{2}$ per-cent heptachlor was used as a larvicide in areas of thick vegetation and found to be effective when applied at the rate of 2 to 3 lbs of granules per acre. One-percent heptachlor in No. 2 fuel oil was found to be an effective formulation for the control of adults when used in the TIFA fogger.

As a result of these experiments, it is concluded that heptachlor is an effective and economical insecticide for all species of mosquitoes in Salt Lake County when used according to the above specifications.

TOXICITY TO HUMANS OF INSECTICIDES CURRENTLY USED FOR MOSQUITO ABATEMENT OPERATIONS by Allen Mail, Entomologist from the Communicable Disease Center, Public Health Service, U.S. Department of Health, Education, and Welfare, Logan, Utah.

The two main classes of insecticides currently used in mosquito abatement work are the chlorinated hydrocarbons and to a lesser degree polyphosphates.

The greatest hazards to human health are involved in operator exposure to spray or dust formulations.

While many studies have been made of the pharmacology, pathology and toxicology of the chlorinated hydrocarbons, in most cases these studies have been made on laboratory and farm animals of different species. Because of the wide variation in the results obtained, it is difficult to relate these findings to humans. Data on toxicity to humans of many insecticides are lacking. In some cases autopsy of victims of accidental death from exposure, or reports of clinical experience, provide the only available information on the human hazards involved in the use of these insecticides.

On the basis of animal tests, massive exposure to nearly all of the chlorinated hydrocarbons results in liver and/or kidney damage and cumulative storage in fatty tissues. There are wide variations in the acute and chronic toxicity of different insecticides and in the rate of deposition in body organs.

Practically no information is yet available in the literature on toxicity to humans of dieldrin and heptachlor, two of the newer chlorinated hydrocarbons, and EPN and malathon, two recently introduced polyphosphates. However, it is generally accepted, and verified by experience, that they present hazards in use, and the polyphosphates especially must be handled with stringent precautions.

Some auxiliary solvents in insecticide formulations possess toxic properties that cause symptoms which sometimes are attributed to the active insecticide present.

SATURDAY MORNING SESSION; 9:30 A.M.

HIGHLIGHTS OF THE 22nd ANNUAL CONFERENCE OF THE CALIFORNIA MOSQUITO CONTROL ASSOCIATION, INC. by G. Edwin Washburn, Manager, Turlock, California M.A.D.

Last December 2 - 4, 1953 there assembled in Berkeley, California over 350 persons representing 54 mosquito control agencies in California. This conference was the best attended and more real "down-to-earth" information was given, than in any previous conference held by the California Mosquito Control Association. The Proceedings and Papers of this, the 22nd Annaul Conference, are nearing completion and will be ready for distribution in the near future.

Many persons, noted in their fields of mosquito work, gave the benefits and conclusions they had reached after years of toil and effort. You have long been loyal supporters of the California Mosquito Control Association and I trust that we may be of help to you in your work in Utah. We certainly don't know all of the answers, but much effort is being made to find the answers to the many complex problems facing the mosquito abatement agencies of our state.

There was no adopted theme for the conference but had there been one it could have been titled - "Inter Agency Cooperation for Better Mosquito Control" As each year passes greater and greater emphasis is being placed, in our state, on Mosquito Source Reduction and of course less emphasis on the chemical approach to mosquito control. We are, therefore, leaning more heavily on the basic approach to our problems. In spite of the tremendously increased water problem area in the state, as well as our rapid growth in population and industry, the early recognition of their import and the long range needs in overcoming their demands upon our abatement resources, have enabled the California Mosquito Control Agency, in cooperation with other interested agencies, to develop many facets in a manifold program toward the common goal of reduced mosquito problems.

Search is constantly being made for new and better insecticides for mosquito control. No matter how extensive or thorough a source reduction program may be we must rely on effective pesticides for many situations. The past year (1953) has seen a decided shift, particularly in the hot Central Valley, away from the chlorinated hydrocarbon insecticides to the more toxic phosphorus materials. This has been due to the specter of "resistance." 1953 saw extensive use of EPN, Parathion and Malathion in the districts in this portion of the state. They are, of course, highly toxic materials, however with proper training in the techniques of handling and applying they are extremely effective mosquito larvicides. Granular insecticides have been used extensively by some districts with very good results. There appears to be a real future for this type of material.

We are now witnessing the initial benefits of education in agricultural and water management practices on the part of the farmer, we are seeing increased private and public support for the removal of undrained water, we note improved planning and consultation undertaken by agencies effecting new water developments; and we are aware of the aid provided through an increasing knowledge of mosquito ecology and agricultural practices based on sound research and study projects.

A greater effort than ever before is being made to acquaint the individual property owner of his responsibility toward mosquito control. Some districts accomplishing this by various educational methods have employed Source Reduction consultants to promote and advise all parties concerned and accomplish the job while others tend to apply the law to recalcitrant parties. Even television is being used as a medium of putting across the ideas. A regular weekly 15 minute program is going out over one station. The Health and Safety Code of the State of California states:

> "All breeding places for mosquitoes which exist or shall exist as a result of any use made of land or premises on which the same are found or of any artificial change in the natural conditions thereof, are hereby expressly declared to be a public nuisance, and may be prosecuted as such in all actions and proceedings whatever and all remedies which are or may be given by law for the prevention and abatement of nuisance shall apply hereto and it shall be unlawful to maintain the same. The remedies herein above provided shall be in addition to the remedy by way of abatement hereinafter provided."

This gives us considerable legal leverage, which at times, must be applied. In general however, cooperative efforts toward eliminating the mosquito sources brings the greater results.

Research into many of the unknowns of mosquito control is being carried on, not only by the districts themselves, but through an Operational Investigations Study Unit located in three areas of the state. This is a cooperative effort between the California Mosquito Control Association, The California Department of Public Health, the United States Public Health Service, and the United States Department of Agriculture. Much valuable information is being obtained through these basic studies. Extensive investigations are being carried on in the fields of irrigated pasture mosquito problems, rice field mosquito problems and several phases of toxicological and insecticidal problems. Progress reports have been given in detail at our conferences each year and are to be found in the Proceedings and Papers which are published after each conference.

You all recall the 1952 outbreak of infectious encephalitis which occurred in California when we had a total of 813 reported human cases. This was the largest number of reported cases in any year on record for California. Emergency control measures were instituted early in that year (1952) but unfortunately too late to stem the tide of the mosquito vector Culex tarsalis, or the disease itself. The emergency measures were aimed at destruction of adult vector mosquitoes in populated areas as contrasted to normal programs which consist of elimination of breeding places or destruction of the aquatic stages of mosquitoes.

Experience during 1952 clearly demonstrates the limitations of present techniques for coping with adult mosquitoes and pointed up the need for better understanding of the factors controlling survival of Culex tarsalis over the winter months, as well as the need for better methods of measuring the prospect of a large number of infected vector mosquitoes early enough in the year to permit the establishment of preventive rather than palliative measures. Steps were taken during 1953 to obtain valid data in an effort to alleviate some of the pitfalls of the past.

One of the highlights of the conference was a panel discussion of many of these problems in which experts in the field gave answers to questions on encephalitis which had been submitted to them by persons attending the meetings

Many of the points covered were complex but a better understanding of the many problems was gained by the mosquito abatement officials in attendance.

The Bureau of Acute Communicable Diseases of the State Department of Public Health is currently carrying on a field study for the purpose of developing a simple skin test for western equine encephalomyelitis. To further the study, arrangements were made with the California Mosquito Control Association for a cooperative study with the group attending the association's annual conference in Berkeley in December.

A group of 84 mosquito control workers from various parts of the State volunteered to cooperate as experimental subjects during the conference. They became the first group used in the study whose experience with the disease was not known. Previously the skin testing material had had a preliminary evaluation by being tested on a group of individuals who had clinical symptoms of the disease in 1952.

It is hoped that the development of a quick and easily administered survey tool, such as indicated in the skin test now being developed, may make it possible to determine the relative frequency with which man becomes infected with the virus without exhibiting recognized clinical symptoms.

We are now making extensive plans for the next annual conference, the 23rd. This will be a joint meeting of the American Mosquito Control Association and the California Mosquito Control Association and should be the best yet. It will be held in Los Angeles, California from January 24-27, 1955. We trust that many of you may be able to attend this conference as the distance isn't great and the inducements will be such that you won't be able to forego a visit to our fair state.

THE MOSQUITO CONTROL PROGRAM OF THE CALIFORNIA BUREAU OF VECTOR CONTROL by Thomas D. Mulhern, Bureau of Vector Control, California Department of Public Health

No abstract available.

THE MOSQUITO ABATEMENT SITUATION IN CACHE COUNTY, UTAH by E. L. Fillmore, Chief Sanitarian, Logan City Health Department

Previous reports from Cache County have dealt with activities in regard to mosquito control over the valley as a whole. This report will deal primarily with problems confronting those who are attempting to influence the establishment of a mosquito abatement district in Cache County.

The task of reporting on the mosquito abatement situation in Cache County is a simple one in view of the fact that little or no progress has been made. From what I can learn the situation stands just about where it was last year or the year before. A few local spray programs have been undertaken, but these would obviously have little effect on the mosquito population. The most effective measure, that of drainage, has not been contemplated by those in authority.

The reasons behind this lack of progress are readily apparent when one delves into the situation. First of all, the present county commissioners are reluctant to appropriate money for a project over which they have little control after appropriation. They feel that the appointing of a board to administer the program is not to their liking, and if the commissioners were allowed to retain control of the administration, they would be more willing to set aside money for the program.

Secondly, the commissioners feel that the people are too heavily taxed at present, and the need is for reducing the tax load rather than increasing it. The commissioners have stated that they would be willing to undertake a limited spraying program with money from the present budget, but I am of the opinion that such measures, without a drainage program, would be money wasted.

A third problem, and an extremely difficult one to cope with, is the fact that a great many people in Cache County forcibly resist any change. Many of the farmers do not want their land drained. There have been several instances in which the college has demonstrated that many acres of land could be greatly improved, and the mosquito population reduced, by relatively simple drainage measures. The farmers have declined emphatically to use the measures regardless of the benefits, and have told the people from the college to stay where they belong. The farmers feel that draining the low lands may have some deleterious effect upon the land, which is not troubled with high ground water.

The Logan City Commission is very much in favor of a control program, and would be more than willing to help financially. However, any measures which might be taken within Logan City would be wasted without control measures being undertaken in the surrounding county area.

After enumerating these problems, it is obvious that there is great need for an intensive public education program in Cache County on the benefits of mosquito control. At present there are few people sufficiently interested to undertake such a program. There must be more than a few people interested before the public can be informed properly. It would be advisable for these interested people to encourage the Cache County Commissioners to talk with commissioners from other counties where abatement programs are being carried on, and in such a way could get the view-points of other commissioners in regard to the administration of the program.

Obviously, the outlook for a mosquito abatement program in Cache County is not bright. We, of the Health Department, sincerely hope that more progress can be made in the year ahead.

THE MOSQUITO ABATEMENT PROGRAM IN UTAH COUNTY

Dr. Elden Beck, Entomologist; Brigham Young University, Provo

Dr. Rees read a letter from Dr. Beck and also one to Dr. Beck from Glenn Sagers, Chief Sanitarian of the City-County Health Department of Utah County. Mr. Sagers reported to Dr. Beck that:

1. Nothing has as yet been done on a mosquito abatement program.

2. There should be an abatement district set up which would be County-wide inasmuch as there are numerous breeding areas throughout the County.

3. A small amount of work was done by the U. S. Public Health Service in 1952 in the way of airplane spraying and some roadside spraying. This work was done within a period of about two weeks and for some time good results were noticed from the areas treated. There was nothing done in the way of a permanent mosquito control.

4. We would like to see some interest from some of the civic organizations throughout our County and other areas of the State which might serve to stimulate sufficient interest in Utah County for the establishment of an abatement district.

Dr. Beck reported that he had met with representatives of the county commission and of the various cities within the county. After outlining a county-wide survey and control program, the reaction from the county was that the added tax levy needed to operate the district should not be imposed upon the taxpayers at the present time. The group that Dr. Beck met with felt that the greatest need at the present time was for an educational program concerning the need of mosquito control in Utah County. Although there has been no general control mosquito program some cities and private property owners have done some spraying in the county.

REPORTS FROM THE MOSQUITO ABATEMENT DISTRICTS

BOX ELDER COUNTY by Karl L. Josephson, Supervisor of the District

We started our mosquito control activities early in the year, but cold, late spring seemed to hold back any development of any consequence. We started early inspections but found no necessity of many control methods until the month of May.

We sprayed all cemeteries and recreational areas and areas adjacent to these locations prior to Memorial Day. Following this, the weather warmed up fast and we used all our mosquito control units, as well as some of our fly spraying units, to help us catch up to the larviciding of mosquitoes.

A fogging unit was purchased from the Liquified Gas and Engineering Company of Stockton, California. We started operating this unit on June 19th and operated it every night, weather permitting, until the first part of October. We received so many requests for the fogger to be operated that we couldn't keep up to them. Reports of relief from mosquitoes came in from all areas where the fogger was used. Farmers reported the first relief from mosquitoes during the sugar beet and tomato harvest they had had. One area, south of Willard, had some 600 acres of tomatoes and were losing tomato picking crews every two days. The fog gave them relief for days. Due to the nature of the fogger in relation to the weather, we couldn't give service to some areas because of the wind conditions at the time of attempted application.

I believed more fogging equipment is a necessity to the District as 'The proof of the pudding is in the eating,' so the proof of control is in the results received.

We could not obtain the services of the airplane when we needed it earlier in the season, and after the airplane pilots' earlier committments were taken care of, the water situation was so that we didn't need too much of this type of control.

I believe also, that the use of an airplane when the need is greatest will give us better control of mosquitoes.

Our Gambusia Fish planting program is going forward with the continuous flow of fish into both Malad and Bear Rivers. We plant many barrels of these fish during the season in fish ponds, sloughs, drains, reservoirs and streams. We also furnish the Weber County District with these fish.

Our Fly and Earwig control program was more successful this year than last year, as more people participated in spraying. Our fly control was directly reflected in relation to the sanitation condition in given areas. Where poor control or many flies were reported after spraying, inspection of these areas showed bad sanitation conditions.

This year we were able to cut the charge to the taxpayers from 15 cents to 10 cents per gallon. This seemed to stimulate more participation in spraying. We sprayed 4279 parcels of improved property as compared to 3126 the year before We had three communities that sprayed 100% and those towns defrayed all expenses of spraying. They were Deweyville, Howell and Wheelon. The latter was paid for by the Utah Power and Light Company.

We have no reason to believe we have a fly or earwig that is immune to Chlorinated Hydrocarbons. Next year, as an added precaution of the possibility of this, I propose to use Malathion in place of DDT-Lindane in places with poor sanitation.

Our earwig control seems to be very satisfactory, especially where some cooperation is given the spray crews as they proceed with their work.

Our cattle spraying program, which is a service to the taxpayers of our District, was participated in by many people with more than two-thousand head of cattle being sprayed once or more times. The results are very gratifying.

DAVIS COUNTY by G. W. Stewart, County Commissioner and President of the Board of Trustees

My report will be short as our existence is only now going on our fourth year. We started our first mosquito work in 1951 with four men mainly doing exploration work. The following year we purchased a Jeep truck and mounted it with a spraying outfit. Last year we started in earnest, purchasing one more Jeep spraying outfit. We organized our County into four districts using six men and the two jeeps. We owe much to the guidance of Dr. Don M. Rees in getting underway. We have also leaned heavily on Salt Lake Mosquito District. Last year we airplane-sprayed approximately 3,000 acres. This was costly for our budget, but we realized that along our better than 40 miles of shoreline along the Great Salt Lake that airplane spraying will probably have to be one of our main sources of coverage.

We were interested in Mr. Reid Jerman, of the Reclamation Bureau, remarks on what their planning was for drainage in connection with the Weber Basin Project. In making survey of our district we are sure that drainage is the only thing that will cut our area down to a size where it can be satisfactorily and permanently handled. Last fall we drained the so-called Farmington big slough on a cooperative basis with the land owners and the County. This drainage will

materially cut the work that will have to be done west of Farmington. In our last meeting last fall we asked our mosquito workers to make a survey of possible drainage projects that could be accomplished with a minimum of work but that would accomplish a drying up of some of our worst sloughs. We found last year that one small pasture cost us close to $600.00. The worth of the pasture itself probably isn't much more than this amount. We hope to do a little educational work this year on land owners of this type.

This year our mosquito district organization will become effective. We organized last year and all of the area except two towns on the east side of Davis County and one on the west came into the district. These border on Weber County, so we will both have a problem from that source. This year we have organized our district into five districts and we have just purchased a Dodge power-wagon. We are now employing six men and we feel that a more complete coverage can be made with this organization. Our income so far has been derived from an equal contribution from the towns and the county. This next year we will be on the tax rolls and if we set up with a half-mill levy this will increase our budget by about one third. We could have gone on our tax budget this year but our board voted to go on as we had finaced before, rather than go on deficit financing.

We feel we are making headway in our work and I again want to thank Salt Lake and Weber Counties for their help in getting us underway.

MAGNA DISTRICT by O. C. Finley, Pres., Board of Trustees

The district had a very successful year, having good results from our mosquito control efforts as well as making a number of improvements. We were able to move into a new 90 x 150 foot lot. The lot is surrounded by a chain-link fence and has a new garage and work shop. The lumber for the new buildings was donated by the Kennecott Copper Co. The new lot and buildings are valued at $5,000. During the year we also purchased a new 1½ ton Ford truck equipped with a winch.

Three full-time employees were utilized in inspecting and spraying in the district during the breeding season. Five miles of drains were constructed by blasting.

The funds for operations of the district came from a number of sources. A one-mill tax levy yielded $7,000 in revenue and $5,000 dollars were contributed by Kennecott Copper Co. and the American Smelting and Refining Co. In addition about $750 was payed to the district by individuals for drainage of private property, and $750 was received for rental of some of our equipment to a water company.

SALT LAKE CITY by T. A. Schoenfeld, Pres., Board of Trustees

Among the five members of the Board of Trustees of the Salt Lake City Mosquito Abatement District each member has, by rotation, a chance to act as president for one year. As this years president, I hereby present a brief summary of our procedure for 1953. Last year (1953) the mosquito abatement program of our district was very effective. This was due chiefly to careful planning and inspection. As a result of our six light traps operated in Salt

Lake City we were able to determine the direction of movement of mosquito migrations and to inspect the area and act accordingly. For the details of our light trap results please consult the annual report of the district which shows the number of each species taken in each trap as determined by the Department of Invertebrate Zoology and Entomology of the University of Utah.

By means of colored pins used on the maps at the district headquarters it was possible to immediately ascertain conditions throughout the district and assign the personnel on the basis of daily need. Although most of the spraying was done by ground equipment, airplane spraying was effectively and economically used on large or inaccessable areas. Only the best insecticides as approved and tested by the U. S. Department of Agriculture Field Operation Department and the U.S. Public Health Service were used for spraying and fogging operations against larvae and adults. Careful study was also made of some of the newer insecticides.

Mosquito fish were stocked in many of the approximately 1200 pools within the district. Fogging and spraying was done to offer further protection against mosquito annoyance to public gatherings in such out of door locations as parks, schools, churches, etc.

We have advanced from two truck stalls and two old trucks in the city equipment yards to having our own property at 463 North Redwood Road where we now have adequate buildings and sheds, including a first class repair shop where all our equipment is regularly repaired, serviced, and overhauled. Our twelve trucks are all durable and late models and one is equipped with a TIFA fogger.

Cooperative drainage by the joint effort of Salt Lake County, Salt Lake City, and the Salt Lake City Mosquito Abatement District was of great benefit because of the value of committee planning and elimination of overlapping work. The commissioners of Salt Lake City and Salt Lake County have through their advice and aid made this program efficient and effective.

It is my pleasure to thank and indicate my sincere respect for my fellow board members, especially Dr. Don M. Rees of the faculty of the University of Utah , and also those employed as managers, field inspectors, and those men who do their work well. I personally regard this appointment as a sacred trust and try to serve to the best of my ability to secure the best results.

SOUTH SALT LAKE COUNTY by Henry Beckstead, Mayor of Midvale and Pres., Board of Trustees

I am here today to report the results of the mosquito abatement program conducted by the South Salt Lake County Mosquito Abatement District for the year 1953. As most of you know, the mosquito control operations of last year were the first sustained operations in South Salt Lake County. Although in the past, the Salt Lake City Mosquito Abatement District has controlled mosquitoes in parts of Salt Lake County, their operations did not normally extend past 4500 South. Our district was organized in 1952, but did not begin operation until the following year. Our budget for 1953 was below expectations. This low budget for the initiation of our program gave us a pessimistic viewpoint at the beginning of the season. Fortunately, our program was a success and our pessimism was not justified.

At the beginning of the season, the board of trustees decided on an evaluation of the program based on a quantitative measurement performed by technically trained people using accurate measuring devices. With this in mind, an arrangement was made with Dr. Don M. Rees of the University of Utah. Since he had placed standardized New Jersey-type light traps in representative places throughout the district in 1952 and had evaluated the results, he was able to compare the mosquito population in 1953 with 1952 by again placing the light traps in the same representative spots. This comparison showed a mosquito reduction of 91% for 1953 when compared with 1952.

This information gained from an evaluation of the light trap catches of mosquitoes convinced the board that the program was effective, but the question remained as to whether or not the taxpayers of the district were satisifed with the results. People throughout the district were questioned about the results of the program and were asked to compare 1953 with 1952. We found that the people were not only satisfied that the work was effective, but were highly pleased with the results achieved. With this information from such diverse sources, the board of trustees feels certain that the work was well done and the people's money properly spent.

We do not feel that the success of our program just happened. There are several good reasons for it. Each member of the board of trustees of the district took an active interest in the workings of the control program, but did not interfere in the conduct of the program in any way except to keep a watch on expenditures and the results achieved. We appointed a trained and experienced man as manager of the district and delegated to him the authority to employ or dismiss workmen. Every member of the board of trustees agreed that the sole criterion for employing a man was his ability to do the work. As a result we had men who were hard-working and efficient. After a brief period of training, these men could be trusted to do their work completely and correctly in a minimum of time without direct supervision. The results of the program have justified this policy.

Another factor that contributed materially to the success of the control program of our district was the use of the best insecticides that we could find. We believe firmly in a policy of research, within the limits of our budget, to find just what procedures and insecticides are best for our particular district. If any method proves to be better than what we are using, we will adopt it. At the same time we are keeping in mind that source reduction is fundamental to mosquito control and we are striving to accomplish as much as possible in that direction.

The interest and cooperation of the citizens of Salt Lake County was of particular importance to the control program. This interest of the people expressed itself not in complaints regarding the manner in which the control program was being conducted, but rather in efforts to do what they could to help abate the mosquito nuisance. Many water users changed their irrigation practices in order to decrease the amount of mosquito production. Some helped in the construction of drainage ditches, without financial remuneration, or contributed culverts to help drain areas of stagnant water. Many left their tasks on the farm or around their homes to help employees of the district get vehicles out of the mud. Cooperation such as these people have given us is gratifying.

And finally, I wish to express my thanks to Dr. Don M. Rees, Mr. Robert A. Wilkins, and the Salt Lake Mosquito Abatement District for the help they have given us in the process of organizing our control program. We consider the work accomplished to date as a mere beginning of bigger and better things. We realize that it will be impossible to eliminate every mosquito in Salt Lake County, but each year we will try to have less than the preceeding year. We feel that we are fortunate in being able to take advantage of the experience of the older district of the state in formulating of our own control program.

WEBER COUNTY by J. B. Marsh, Pres., Board of Trustees

The Weber County Mosquito Abatement District came into being by the efforts of Mr. Howard Widdison, now secretary of the district and Dr. O. W. Young, now at Weber College. The task ahead was great. In order to organize, and get the vast number of signatures required meant endless hours of time and effort. We are indeed grateful to these two men for all they have done toward bringing the Weber County district into being.

In the beginning, the district started out small. The district operated in 1947 on $5,000.00 borrowed from Weber County, out of which one jeep and two hand sprayers were purchased. A director was hired and two school boys. This was the equipment and crew of men to try and control over 600 square miles of mosquito country.

The following year, 1948, the budget was set up, out of which the $5,000.00 used for 1947 operations, had to be paid back to the country fund.

In 1954, the Weber County Mosquito Abatement District has the following equipment, buildings and grounds: 7 Jeeps, completely equipped with spray equipment, 1 3/4 Ton pickup truck 4 x 4, 1 Station Wagon 4 x 4, 1 Dodge power-wagon, 1 Model E Quickway Dragline and backhoe, 1 Half truck, 1 1,000 gallon capacity power airplane loader on 4 wheel trailer, 3 fog machines (Liquified gas) mounted on two wheel trailers, 1 Lawrence "Aero Mist" mounted on two wheel trailer, 30 hand sprayers (Lofstrand), 1 quonset building (6 stall) 40', 1 headquarter building and shop 25' x 50', and the lot or property. We have on our payroll 10 permanent employees, and 3 part-time employees.

The success of the district is attributed to a number of things, among which are: practical application of technical knowledge, proper and sufficient equipment, good personnel, freedom from the outsider, and freedom from political influence or political pressure.

Progress cannot be gauged by the scope of the work entirely, but by the results obtained. This can best be accomplished by keeping within the intended purpose of the organization--mosquito abatement, and mosquito abatement is a full time job. Spraying for flies, earwigs, etc. is not mosquito abatement. These pests should be and can be controlled by the individual; while the mosquito is a public emergency and cannot be controlled without special equipment and "know-how." If the district once starts spraying other insects, where is it going to end? The first thing you know the district will be trying to spray everything and accomplishing practically nothing.

SATURDAY AFTERNOON SESSION; 1:30 P.M.

PANEL DISCUSSION - Utah Law on Forming and Taxing Mosquito Abatement Districts. Panel leader - Lynn M. Thatcher, Chief Sanitarian, State Health Department and Chairman of the Legislative Committee

Panel: Members of Legislative Committee

O. C. Finley
Ray P. Greenwood
Dr. Don M. Rees
T. A. Schoenfeld
Ward Warnock
Dr. O. W. Young

The legislative committee presented a number of recommendations as a result of its study. Each recommendation was then discussed and debated. By individual motions, duly presented and adopted, the following decisions were then made with respect to changes in the Utah Mosquito Abatement Law (26-14-1 to 26-14-14, Utah Code Annotated, 1953), with the understanding that the Executive Committee would approve final proposed amendments to the law before presentation to the 1955 legislative session:

1. That the law be amended to require that a county commissioner be made a member of each mosquito abatement district board of trustees, in addition to members already specified.

2. That if the present law does not permit the board of trustees to name an executive committee to conduct the bulk of its business, an amendment be made to permit this, with the stipulation that such committee shall consist of at least 5 members.

3. That the law be amended to simplify the procedure of annexing new territory to a mosquito abatement district. This procedure should be more in harmony with that specified for initial creation of a district.

4. That the law be amended to permit consolidation of adjacent districts with full consent of each board involved.

5. That the law be amended to require at least 24 hours notice of special board meetings instead of the present 3 hours.

6. That the law be amended to exercise the type of control over mosquito breeding nuisances that is exemplified by the California law.

7. That no amendment of the law be made with respect to the type of insects controlled.

8. That no amendment be made with respect to technical guidance of districts by a state organization, or with respect to representation of health departments or county agents on boards.

9. That no amendment be made with respect to payment by the district of costs of assessment and collection of taxes.

10. That an investigation be made into the legality of acceptance by districts of contributions from persons, firms, or corporations, and that

if such acceptance of contributions is found to be illegal, the law be amended to make this practice legal.

REVIEW OF CONSTITUTION AND BY-LAWS OF THE UTAH MOSQUITO ABATEMENT ASSOCIATION by Frank D. Arnold, Sanitarian R.S.; Salt Lake City Health Department

Utah has been fortunate in having an active and efficient mosquito abatement association to promote close cooperation among those directly and indirectly concerned or interested in mosquito control and related work.

The Utah Mosquito Abatement Association was organized through the efforts of a few far-sighted individuals who saw the need for such an organization to guide and assist all who were engaged in mosquito control activities in this state. In recent years attendance at the annual meeting has grown from few to many. Its usefullness as an agency for the dissemination of information is appreciated by all organized mosquito abatement districts as well as interested health departments throughout Utah.

Although the Utah Mosquito Abatement Association has progressed and developed considerably under the present Constitution and By-laws it is felt that certain revisions should be made, especially the articles governing membership, officers and revenue. Such revisions are necessitated because of increased membership, diversity of membership and the active interest shown by many who would like to take a more active part in the various functions of the association.

Under the present Constitution the membership of the association consists of three classes-regular members, associate members and honorary members. Regular memberships are available to any duly constituted mosquito abatement district created under the provisions of the laws of the State of Utah, and any county, city or town government. Each of the above is entitled to one vote. Associate membership is available to any Utah civic or commercial organization. The Executive Committee of the U.M.A.A. has the power to appoint any person as an honorary member of this association. No dues are required of either of the latter two types of member and he has no vote in the association, but he has the right to participate in all the activities of the organization.

As stated above, regular members, one from each organized mosquito abatemei district, are the only ones allowed to vote. At the present time there are only six eligible votes.

There are many interested persons from universities, state and local health departments, agricultural agencies and other organizations who are worth of and interested in holding office, voting for officers and on the various issues which confront the association. Provisions should be made so that these individuals can vote and participate in all activities of the organization. Votes of regular members should be more heavily weighted because of their highe dues and greater representation. In addition to voting privileges membership bestowed upon interested personnel should allow the privilege of participation in all activities of the organization. Revisions should include provisions for more active participation of commercial organizations and honorary members.

According to the constitution the executive committee consists of the president, vice president, secretary-treasurer, plus four members elected from

the regular membership. It is provided that the officers need not be regular members of the organization, but may be any person that the membership determine to elect to that office. If these officers are elected from other than the regular membership, according to the article on membership, they are not eligible to vote, although they are a part of the executive committee.

If all persons on the seven man executive committee are regular members seven votes should be allowed. Since there are now only six organized districts six votes are the maximum allowable. These conflicting rules need to be revised.

Revenues of the association are derived by the regular members paying annual dues in advance, in the sum of twenty five dollars per annum, and from the sale of publications or such other sources as the executive committee determines and prescribes.

It is believed that provisions should be made for payment of dues by individuals who are not part of a member organization. Such dues should not be of the magnitude of the dues of regular members. They should be sufficient to pay for publication of annual proceedings and other incidental expenses incurred in the operation of the association.

It is proposed[1] that a committee, to be designated by the executive committee, be assigned the responsibility of studying the Constitution and By-laws of the Utah Mosquito Abatement Association for the purpose of recommending revisions thereof to provide for increased participation by members not affiliated with organized mosquito abatement districts. It is further proposed that the recommendations be placed before the entire membership at the next annual meeting so that, if it is the desire of the association, the changes may become effective on the date of the next annual meeting.

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1 Proposal seconded and passed at the meeting.