ABSTRACTS AND PROCEEDINGS OF THE

SIXTH ANNUAL MEETING

OF THE

UTAH MOSQUITO ABATEMENT ASSOCIATION

Brigham City, Utah
February 21, 1953

OFFICERS AND COMMITTEES OF THE

UTAH MOSQUITO ABATEMENT ASSOCIATION

1952

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PROGRAM OF THE

SIXTH ANNUAL MEETING OF THE UTAH MOSQUITO ABATEMENT ASSOCIATION

HIGH SCHOOL, 400 EAST FOREST STREET, BRIGHAM CITY, UTAH

SATURDAY FEBRUARY 21, 1953

9:00 A.M. Registration - Science Building

MORNING SESSION

9:30 A.M.

Presiding -
T. A. Schoenfeld, President, Utah Mosquito Abatement Association

Address of Welcome -
Honorable Lorenzo J. Bott, Mayor of Brigham City

Response and President's Report -
T. A. Schoenfeld, President, Utah Mosquito Abatement Association and President of the Salt Lake City Mosquito Abatement District.

Greetings from the American Mosquito Control Association -
Dr. C. R. Twinn, Ottawa, Canada, President of the American Mosquito Control Association, Inc., read by Dr. Don M. Rees

Relation of the State Department of Health to Mosquito Abatement in Utah -
Dr. George A. Spendlove, Utah State Health Commissioner, Salt Lake City, Utah

Mosquito Abatement and the County Commission -
Honorable Ray P. Greenwood, President, Utah State Association of County Officials and Commissioner of Salt Lake County.

Bureau of Reclamation Plans for Water Development in the Central Valley of Utah -
Reid Jerman, Regional Planning Engineer, Water Resources and Development, U.S. Bureau of Reclamation, Region 4, Salt Lake City, Utah, read by J. W. Funk.

Mosquitoes and Health -
Dr. J. A. Rowe, Senior Scientist, C.D.C.A., P.H.S., F.S.A., Salt Lake City, Utah

Technology of Mosquito Control -
Dr. Bernard Brookman, Scientist, C.D.C.A., P.H.S., F.S.A., Salt Lake City, Utah

AFTERNOON SESSION, 1:30 P.M.

Conducting -
O. C. Finley, Vice-President, Utah Mosquito Abatement Association, and President of Magna Mosquito Abatement District.

Problems Encountered in Organizing a Mosquito Abatement District - DeLore Nichols, Secretary, Davis County Mosquito Control Commission and County Agricultural Agent, Farmington, Utah.

Problems of Initiating Mosquito Abatement in an Organized District - Henry Beckstead, President, South Salt Lake County Mosquito Abatement District and Mayor of Midvale, Utah.

Problems Arising through Operating a Fly and Mosquito Abatement District - Karl L. Josephson, Supervisor, Box Elder County Mosquito and Fly Abatement District, Brigham City, Utah.

Importance of Public Relations in a Mosquito Abatement Program - Howard Widdison, Secretary, Weber County Mosquito Abatement District, Hooper, Utah.

Relationship between Temporary and Permanent Control in a Mosquito Abatement District -
O. C. Finley, President, Magna Mosquito Abatement District, Magna, Utah.

Importance of Measuring Results of a Mosquito Abatement Program - Robert A. Wilkins, Manager, Salt Lake City Mosquito Abatement District, Salt Lake City, Utah.

Panel Discussion of Above Problems -
Panel Leader - Don M. Rees, University of Utah.

Members of the Panel -
1. Lynn M. Thatcher, Chief Sanitary Engineer, State Health Department, Salt Lake City.
2. Dr. J. A. Rowe, Senior Scientist Water Projects Section, Technological Branch, C.D.C., U.S. Public Health Service, Salt Lake City, Utah.
3. Dr. B. Brookman, Scientist, Water Projects Section, Technological Branch, C.D.C., U.S. Public Health Service, Salt Lake City, Utah.
4. W. B. Schreeder, Irrigation Engineer, Water Projects Section, Technological Branch, C.D.C., U.S. Public Health Service, Salt Lake City, Utah.
5. Dr. Geo. F. Knowlton, Extension Entomologist, State Agricultural College, Logan, Utah
6. L. T. Nielsen, Entomologist, University of Utah, Salt Lake City, Utah.

BUSINESS MEETING 4:00 P.M.

At the business meeting the following officers of the Utah Association were elected for 1953.

President - O. C. Finley, Magna
Vice President - Howard Widdison, Hooper
Sec'y-Treasurer - Lewis E. Fronk, Ogden

Magna, Utah was selected as the place for the 1954 meetings. The officers were to select the date of the meetings as soon as possible and appoint the members of the different committees of the Association.

The reports of Auditing and Resolutions Committee were read and accepted.

In the report of the Resolutions Committee thanks was extended to the Box Elder County Commission and the Brigham City High School for courtesies and cooperation in making the meetings successful and to those participating on the program for their assistance.

After some discussion it was unanimously agreed that the Utah State law on the Forming and Taxing of Mosquito Abatement Districts should be critically examined by a committee and as a result of this study the proposed revisions of this law should be prepared by this committee for consideration by members of the Utah Association. Mr. Lynn Thatcher was elected chairman of this Committee on Legislation and each district and agency actively engaged in mosquito abatement work in the state were invited to appoint one member to serve on this committee. Mr. Thatcher to be informed of this appointment as soon as possible. Mr. Thatcher was authorized to call upon any one who might assist in the evaluation of this law.

The first report of this Committee on legislation is to be presented for consideration of the members of the Utah Association at the 1954 annual meetings of the Association in Magna.

It was also agreed that a committee on publicity be appointed by the officers of the Association at the time the membership of the other Committees were appointed.

ABSTRACTS AND PROCEEDINGS

MORNING SESSION

ADDRESS OF WELCOME by the Honorable Lorenzo J. Bott, Mayor of Brigham

Mayor Bott extended a cordial welcome to all attending the meetings and stated that the people of Brigham City and Box Elder County sincerely appreciated the efforts of mosquito control organizations and were deeply interested in the success of the Utah Mosquito Abatement Association. Mayor Bott further expressed the hope that those attending the meetings from other parts of the state would enjoy their visit. He invited the members of the Association to schedule the meetings of this organization in Brigham City as often as possible.

RESPONSE AND PRESIDENT'S REPORT by T. A. Schoenfeld, President U.M.A.A.

Thank you, Mayor Bott, for the very warm welcome to this beautiful city, founded and named after that great pioneer, Brigham Young, our first Territorial Governor. History also records that great event when two great railroad systems were united in this vicinity by the driving of a golden spike at Promontory Point. We are mindful of your developments since and sincerely appreciate being here in this land of milk and honey and the world's finest peaches.

We come here today in the interest of mosquito control and with the idea of cooperation to make living more healthful and life more abundant. For your welcome we are sincerely grateful.

PRESIDENT'S REPORT FOR YEAR 1952

In order to give you a full and concise report of the Utah Mosquito Abatement Association and the accomplishments during the year 1952, it is necessary to refer to the Utah Association and its part in the National Convention of the American Mosquito Control Association, held in Salt Lake City March 24th to 27th, 1952, at the Hotel Utah.

The opening session by the Utah Association, directed by Dr. O. Whitney Young, President, as you will note by the program, was given over to the Utah M.A.A. As the committees for arrangement were formed, it was decided that these several committees be headed with chairmen from the Salt Lake district in the interest of eliminating long travel and in order to save time. Preparation for the meetings necessitated almost a daily contact of committee members.

Through the sale of exhibits, and the cooperation of some business associates, we were able to carry the entire expense of the Convention without drawing on the Utah Association for any financial aid; in fact, there was a $20.75 petty cash fund that was turned over to the President of the Utah Association to be used as deemed necessary. This was used to cover petty expenses of a trip to Sevier County. At the request of Dr. Spendlove of the State Board of Health, a survey was conducted on mosquitoes and the outbreak of Encephalitis in Sevier County, with the aid of the Salt Lake City Mosquito Abatement District and officers of the Utah Association. This survey was completed and the report turned to the State Board of Health with recommendations. The officers of the Utah Association also assisted in the organization of South Salt Lake County Mosquito District and with the Davis County mosquito abatement program.

GREETINGS FROM THE AMERICAN MOSQUITO CONTROL ASSOCIATION, INC.
by Dr. C. R. Twinn, President A.M.C.A. Inc., Read by Don M. Rees.

The A.M.C.A. had another very active and successful year in 1952. The high point of interest, of course, was the joint meeting of the Association with the Utah Mosquito Abatement Association held in the Hotel Utah, Salt Lake City, on March 24 to 27, under the able leadership of our immediate Past-President, Dr. Don M. Rees. Nearly 50 papers were presented and many of these were subsequently published in the June, September, and December issues of Mosquito News, the cost being largely covered by proceeds from the Salt Lake City meeting. A useful feature at the meeting was the distribution of abstracts of these papers in mimeographed form to all

attending. The Mayor of Salt Lake City, the Honorable Earl J. Glade, gave an address of welcome and presented the incoming President of the A.M.C.A. with a key to the City, made of Utah copper!

The excellent attendance (fully representative of North America), the high calibre of the papers presented, the interest and enthusiasm displayed at meetings of the Board of Directors and at the general business sessions, were a fine demonstration of the growing vitality of this splendidly useful international organization. It was with sincere regret that the Board of Directors accepted the resignation of T. D. Mulhern as Executive-Secretary. Tommy was presented with a handsome chiming clock as a token of the esteem of his fellow members. To replace him we were fortunate in obtaining the services of Ted Raley of Selma, California. He, and the Treasurer, Rowley Dorer, of Norfolk, Virginia, have done wonders in placing the business and finances of the Association on a sounder footing.

Another important event during the year was the publication, in March, 1952, of A.M.C.A. Bulletin No. 2, entitled "Ground Equipment and Insecticides for Mosquito Control." This 116-page bulletin is well written and authoritative and essential to all engaged or interested in mosquito control It was prepared by the Miscellaneous Publications Committee of the Association and edited by Dr. E. F. Knipling. Arrangements are being completed to publish a third bulletin under the title of "Mosquito Rearing Techniques," the manuscript of which has been prepared by Miss Helen Louise Trembley.

On July 30 and 31, an informal summer field trip of the A.M.C.A. was held at Ottawa, Canada. The officers and regional directors of the Association were informed of this meeting in advance, and it was intended to give it wider publicity through Mosquito News. Unfortunately, the June issue was distributed too late for this purpose. However, a good representation of members attended and all reported they had a most enjoyable and interesting time under ideal weather conditions. A full report of the event appeared in the September Mosquito News.

On the invitation of the Pan-American Sanitary Bureau, Dr. F. C. Bishopp and Mr. Harry H. Stage were named to represent the Association at the First Inter-American Congress of Public Health, held at Havana, Cuba, on Sept. 26 to Oct. 1. This Congress was sponsored co-jointly by the Bureau and the Government of Cuba.

An application for Class B (non-dues paying) membership for the A.M.C.A. in the Agricultural Research Institute, Washington, D.C., was made on October 21, and Harry Stage was named as the Association's representative in the event that the application is approved. The purpose of the A. R. I. "is to provide a mechanism for the collaboration of industrial, academic, and governmental scientists in promoting agricultural research and practices that will lead to the best long-time utilization of the nation's agricultural resources."

The A.M.C.A.'s Good Neighbor Club is still going strong under

Harry Stage's enthusiastic leadership, and additional contributions are welcomed to place subscriptions of Mosquito News and distribute other pertinent publications to worthy organizations and individuals in less favoured parts of the world.

The next outstanding event in the A.M.C.A. calendar will be the joint meeting of the A.M.C.A. and the Florida Anti-Mosquito Association, at the Sheraton-Plaza Hotel, Daytona Beach, Florida, April 12 to 17, 1953. Local arrangements are in the hands of a committee under the chairmanship of Sam Minnich, President of the Florida Association; Dr. F. C. Bishopp, Vice-President of the A.M.C.A., is chairman of the program committee. Advance notices of the meeting have appeared in recent issues of Mosquito News. An exceptionally interesting, profitable, and enjoyable meeting is assured, and we look forward to the pleasure of seeing many of you there.

RELATION OF THE STATE DEPARTMENT OF HEALTH TO MOSQUITO ABATEMENT IN UTAH

By George A. Spendlove, M.D., State Health Commissioner
Utah State Department of Health

As guardians of the health of our citizens, the State Health Department is the leading champion for disease prevention. The task of prevention is difficult, but immeasurably simpler and cheaper than dealing with the heartaches and inconveniences of epidemics. We believe as Lemuel Shattuck of 1850, that "The conditions of perfect health, personal or public, are seldom or never attained though attainable; that the average length of human life can be very much extended, and its physical power augmented; that every year thousands of lives have been lost which might have been prevented; that a vast amount of ill health and physical disability exists among those who are not actually confined by sickness; that measures for prevention will effect infinitely more good than remedies for the cure of disease."

President Hoover, at the Third White House Conference, made the following statement: "Let no one believe that these are questions which should not stir a Nation; that they are below the dignity of statesmen or governments. If we could have but one generation of properly born, trained, educated, and healthy children a thousand other problems would vanish."

These great minds have testified to the advantage of preventive measures. The State Health Department wishes to compliment your organization in its fight to prevent the diseases spread by mosquitoes. It hasn't been many years ago since malaria and yellow fever were important even to this area, which is inhabited by the mosquito carriers of these diseases. The possibility of infection remains as long as these mosquitoes are present. As recent as last year there was a small epidemic of malaria in Idaho. Sleeping sickness was present in great numbers in our neighboring State of California. There were two proven cases in Utah. How many additional

cases misdiagnosed as polio will never be known.

We recognize the mosquito problem as a constant menace to public health. We further recognize this problem as a local responsibility. We agree with Dr. Rees that the effectiveness of mosquito control programs will be directly proportional to the ability and knowledge of individuals directing them. We further feel that there would be mutual benefit if such programs could be coordinated with and become a part of the local public health organization. Surely they have one and the same purpose, that of providing our citizens with comfort and health. Any lines demarcating control methods of mosquito abatement, other insect abatement, rodent control, and sanitation are imaginary.

The State Health Department wishes you well in the mosquito abatement program and highly recommends that local health units lend encouragement and support to this program.

MOSQUITO ABATEMENT AS VIEWED BY THE COUNTY COMMISSION by Ray P. Greenwood Commissioner of Salt Lake County.

I feel it an honor to be asked to participate on your program today as a representative of the Utah State Association of County Officials.

In recent years the Utah State Legislature has seen fit to pass laws permitting the creation of special boards to administer special services. These boards have been created under seperate statutes and no two are organized in the same way, nor do they act with the same type of authority. However, the organization of these districts and the appointment of the boards is always under the governing body of the County in which they are organized.

In the case of the Mosquito Abatement Districts, the County Commission controls the appointment of members of the board when vacancies occur and terms of office expire. These are the only functions required by law for which the County Commissioners are responsible.

The Boards, after being organized, have the power and authority to set their tax levy and administer duties and responsibilities of their office in their respective districts. However, to obtain efficiency and economy, it is most important that there be very close cooperation between the Mosquito District Board and the County Commissioners. While one of the intentions of the law in organizing these special districts under independent and non-political boards was to remove them from politics, it is important that you Board members see to it that you do not let pressure groups and political influence creep into your district organization. This is one of the objections to special Boards, considered most frequently by County Commissioners. Their argument has been that an appointive board lacks the sense of responsibility that they should have to the people they serve. This feeling, however, can be eliminated. In my opinion, these suspicions are due to the lack of understanding and the knowledge of the functions and responsibilities of the Mosquito Abatement Boards and could be eliminated by closer cooperation between County Commissioners and Mosquito Board members.

I believe that I can refer to my own County as a fair example, to show how cooperation with the different governing departments in a community obtains greater efficiency and economy. In the past few years we have had a joint working agreement between Salt Lake County, Salt Lake City, and the Salt Lake City Mosquito Abatement District, which in my opinion has been most successful. Each of these agencies have agreed to expend each year equal amounts on joint work from which the departments engaged will receive benefits. The cooperative work projects are determined and the funds administered by a board composed of two members from each of the three agencies concerned. This Board has set a meeting day each month for reports of work accomplished and to agree on work to be done. The work approved is supervised jointly by the Mosquito Abatement supervisor, County Flood Control supervisor, and City Engineer. I believe that in Salt Lake County we have been able to increase our efficiency materially by this working agreement and the cooperation of these departments.

The following is a concrete example whereby drainage, Flood Control and Mosquito Control was accomplished under this joint project. In the area between the Great Salt Lake and Salt Lake City, is a comparatively flat marshy section which has in the past been an ideal breeding ground for mosquitoes. This condition has been caused by the Jordan River, which flows through Salt Lake Valley, and has no direct channel into the Great Salt Lake and, therefore, floods these marsh lands over a wide area. In the last year and one-half, through the joint working agreement, we have been able to construct a channel some $7\frac{1}{2}$ miles long directly into the lake. This channel will carry the major portion of the capacity of the Jordan River, now flowing through the Surplus Canal, and contributes materially to solving Flood Control problems and in eliminating a mosquito breeding area.

The County has participated in excess of its one-third portion on this particular project owing to the fact that the Flood Control benefits accrued were greater than either removal of city drainage water or mosquito abatement. Furthermore, this project, in my opinion, has produced one of the greatest benefits and is one of the best examples as to what can be done through proper cooperation between departments of government.

We have in the past year organized a new Mosquito Abatement District in Salt Lake County which covers most of the area of the County outside of the two existing districts, so that at the present time almost the entire area of Salt Lake County is under mosquito control. Consolidation of these districts to form one county wide district to be governed by one board has been discussed. This, in my opinion, sounds reasonable and I think it is worth study and investigation. I, myself, have questioned in the past the advisability of the creation of special districts and of special boards with as much authority as some of the existing boards now have, but my experiences since January 1, of this year, have convinced me that it is a good policy to have at least some departments in our County Government that cannot be disrupted and progress retarded by newly elected Commissioners, who through their stupid suspicions, ignorance of County Government and political ambitions, can be extremely expensive to the tax paying public in this respect.

I wish to congratulate the State Organization on Mosquito Abatement work and particularly Dr. Don M. Rees, Mr. T. A. Schoenfeld and the Supervisor of the Salt Lake City Mosquito Abatement District, Mr. R. A. Wilkins. It has been my pleasure to work with these gentlemen for the past few years. I have appreciated their association and have learned much by the knowledge they possess in mosquito abatement work. I feel that much progress has been made in this field, and credit goes to you who have been willing to spend your time and energies in this work.

BUREAU OF RECLAMATION PLANS FOR WATER DEVELOPMENT IN THE CENTRAL PORTION OF UTAH

by Reid Jerman, Regional Planning Engineer, Bureau of Reclamation, Region 4, Salt Lake City, Utah. Read by J. W. Funk.

The area with which we are concerned consists of the highly developed region extending along the western base of the Wasatch Mountains from Brigham City south through Ogden, Salt Lake City, Provo, and Nephi. The only sources of water for this area are the streams flowing from the Wasatch Mountains. Most of the streams have either reached or are approaching full practicable development. The principal means for making more water available to the area concerned are the Weber Basin and the Central Utah projects. Construction of the Weber Basin project was recently started, and a report recommending authorization of the initial phase of the Central Utah project was submitted last December by the Secretary of the Interior to the President through the Bureau of the Budget.

The completed Weber Basin project, a $70,000,000 development, will provide about 270,000 acre-feet of additional water annually to the area from Brigham City to the outskirts of North Salt Lake. The increased water supply will be made available by further regulation of the water of the Weber River system in new reservoirs at Wanship, Lost Creek, and Willard sites and at enlarged reservoirs at the Pineview and East Canyon sites. Water released from the reservoirs will be distributed to some extent by existing works but largely through new facilities.

The initial phase of the Central Utah project would import about 141,000 acre-feet of additional water annually to the Salt Lake-Nephi area. The additional water would be obtained from streams on the southern slope of the Uinta Mountains as far east as Rock Creek. The stream flows would be intercepted on the mountain side and conveyed by gravity to an enlarged Strawberry Reservoir high in the Wasatch Mountains. From this reservoir, the water would drop through a series of hydroelectric power plants located in a branch of Spanish Fork Canyon before being used for irrigation, municipal, and industrial uses. Some water presently used in the Uinta Basin would be diverted by the project and replaced to Uinta Basin water users from the potential Hanna and Starvation Reservoirs. The water delivered via Spanish Fork River to Utah Lake would be increased, thus relieving the Provo River of part of its obligation to furnish water to the Lake. Provo River flows thus released could be stored in the potential Bates Reservoir on the Upper Provo River. Provo Bay would be diked and drained.

Since enactment of the Water Pollution Control Act of June 30, 1948, the Public Health Service and the State Health Department have fully cooperated with the Bureau of Reclamation in planning reclamation projects.

Reports have been made by the Public Health Service and the Utah State Department of Health on the Weber Basin project.

The Public Health Service report on the Weber Basin project has concluded that the project would reduce mosquito production since large areas of surface water would be removed from areas now producing mosquitoes. The Service has recommended, however, that project drains, planned to terminate 5 feet above the present elevation of Great Salt Lake, be extended directly to the lake. The Public Health Service also has concluded that the proposed Willard Reservoir would reduce mosquito production by inundating one of the most extensive and prolific mosquito sources in the basin.

The Bureau of Reclamation fully realizes the value of cooperation with mosquito control agencies. Minor changes that they may recommend in project plans may bring extensive benefits in mosquito control. For instance, the cost of extending Weber Basin project drains to the level of Great Salt Lake, as recommended by the Public Health Service, would be considerably less costly than temporary antimosquito control measures. It should be mentioned, however, that extension of the drains would eliminate marsh areas and shallow water ponds which wildlife interests would like to maintain for the propagation of migratory waterfowl. It is not uncommon for one project purpose to conflict in some degree with another. In these cases it is usually possible to resolve the differences and adopt a course that is in the greatest public interest.

Mosquito problems in connection with the Central Utah project have not been studied. Drainage and reclamation of the extensive Provo Bay area at the edge of Provo City, however, undoubtedly will accomplish much in the way of mosquito control.

MOSQUITOES AND HEALTH by John A. Rowe, Senior Scientist from the Communicable Disease Center, Public Health Service, Federal Security Agency, Atlanta, Ga.

At the beginning of the 20th Century, when it became known that mosquitoes were responsible for the transmission of disease, health workers in this country and elsewhere began to fight mosquitoes in an organized fashion. Major efforts were directed toward the control of Anopheles mosquitoes to combat malaria, and of Aedes aegypti to combat yellow fever and dengue. In other sections of the world, efforts were also directed against additional species for the control of filariasis and other diseases.

For many years the successful prosecution of these control programs was very difficult because materials and methods employed were costly, difficult to use, and not too effective. Despite much effort and the expenditure of many millions of dollars, malaria and dengue still persisted in significant proportions throughout the southeastern states in the 1920's, and malaria, yellow fever, and other mosquito-borne diseases were rampant in Asia, South America, Africa, and elsewhere. The successful control of these diseases in the world seemed to be an impossible task and their eradication was not even contemplated. Then came World War II and the tremendous upsurge of technology which was a part of our war effort and which produced new methods and materials for fighting insects and disease. The effectiveness against mosquitoes of some of these new developments was and, for most species, still is phenomenal. Weapons were now available whereby it was easy to control

mosquito vectors and it was possible to reduce the diseases they transmit to an insignificant level. We all know what has happened. At least partly through the intensive use of these newer tools, malaria has been almost banished from the United States; certain mosquito vectors have been all but eradicated from some South American countries; malaria is under control in Greece and several other Mediterranean countries; and feverish efforts to eliminate mosquito-borne diseases are now being made in scores of localities.

Before the advent of the newer insecticides, the major interest and effort of health agencies was focused on mosquitoes which were known to be vectors of specific diseases. In the years following the war, there have developed new concepts of health which have broadened health interests and activities.

In the preamble of the Constitution of the World Health Organization, health is defined as "A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." Acceptance of this definition implies first that mosquitoes, as a group, regardless of their relationship to disease, are of health significance, and second, that health workers are now interested in and concerned with the prevention and control of all mosquito species.

In following the new concepts of health and health activities, local, State, and Federal workers are presently engaged in a wide variety of antimosquito endeavors. In addition to maintaining their efforts against vector species, many State health departments are actively seeking legislatior to enable the formation of mosquito abatement districts. Some health departments have obtained funds to subsidize the work of local abatement organizations. Many local health departments are operating community control programs, and in these areas technical assistance is being made available by the States. Large amounts of money and time are being devoted to the development of new materials and methods for combating mosquitoes, and information from these studies is being put together in the form of films, film-strips, brochures, and other such training media for wide distribution to all antimosquito organizations.

Perhaps one of the most recent efforts of health agencies in the field of general mosquito control is the new cooperative State-Federal program directed toward the prevention of mosquito problems associated with the national water resources development work. This program is of special interest to people of the irrigation States using irrigation because major efforts are being directed toward the prevention of problems associated with irrigation projects. We in Utah have long recognized the fact that our forefathers created severe mosquito problems when they brought water to these arid valleys; yet, investigations and studies show that irrigation projects can be built without creating such mosquito problems <u>if</u> there is full cooperative effort of all groups interested and engaged in the developmental work. The justification for this new endeavor is based upon two facts: (1) that the huge mosquito populations, so often prevalent in irrigated areas, seriously interfere with the physical efficiency, comfort, and productiveness of the people; and (2) that the mosquito species presently involved in the transmission of virus encephalitis are naturally adapted to conditions which develop following irrigation, and the creation and maintenance of breeding areas for these species sets the stage for increased transmission of this disease.

I am proud to be able to say that the people of Utah have recognized that mosquitoes are detrimental to their health, comfort, and well-being. This organization is ample evidence that the people of your districts are justly concerned. It is hardly necessary for me to expound on the Aedes problems of the Utah valleys with which you work every day, except to say that they are of significant health importance and, in accomplishing their control, you are contributing to a more healthful environment. Furthermore, and perhaps more important, encephalitis is present and occurs in Utah each year, and your efforts against the vectors of this disease, especially Culex tarsalis, are the "first line of defense" against the disease. I am sure you will find the health workers of this State and of Federal agencies anxious to support your work and ready to aid you to the fullest possible extent in your antimosquito programs.

TECHNOLOGY OF MOSQUITO CONTROL by Bernard Brookman, Scientist, from the Communicable Disease Center, Public Health Service, Federal Security Agency, Atlanta Georgia.

In contrast to the earliest operations for mosquito control, wherein a toxic and suffocating material, such as crude oil, was poured on the surface of pools containing mosquito larvae, antimosquito work today is a large-scale, complex, and highly skilled technology. It draws on the findings of such fields as biology, engineering, chemistry, and physics, and it may be said, in general, that the success of an antimosquito program will depend, in a large part, upon the extent to which these findings are utilized and upon the ability of the mosquito-control operator to apply these findings most effectively to his particular problems. This is true, of course, in the case of any programs aimed at the control of insects.

In addition, mosquito control today encompasses what may be termed sociopolitical activities. Included among such activities are administration (fiscal, personnel management, and equipment management), public relations, and coordination and cooperation with local, Federal, and State agencies.

Thus, it would appear that mosquito control has become a most complicated endeavor and that a degree of specialization is necessary. In today's successful operation of an antimosquito program, proficiency in all the activities mentioned, and formal training in the disciplines of biology and engineering, are of great importance.

Obviously there is not time now to examine all of the phases of an antimosquito program, and, indeed, some aspects of what we have called sociopolitical activities will be discussed in the afternoon session. Therefore, we will confine this presentation to the technical aspects of mosquito control.

A glance through publications primarily devoted to mosquito control - Proceedings and Papers of the Annual Conferences of the California Mosquito Control Association; Mosquito News; and Herms and Gray's book, "Mosquito Control" - will quickly indicate the paramount importance of technical services in the mosquito abatement program. If we analyze the contents of these publications, we will note that such services are primarily biological and engineering in scope. By a yet more detailed analysis, the functions of each of these disciplines become clear.

Certain phases of any mosquito control program fall in the category of biology, and, therefore, can best be carried out by a person with biological - perhaps, more specifically, entomological - training. These may be listed as follows:

1. A determination of the mosquito problem.
   a. The extent and distribution of mosquito production: larval surveys.
   b. The species of mosquitoes present: collection of immature and adult mosquitoes by various means, and identification of these mosquitoes.
   c. Habitats of the major species: description of larval and adult habitats, classification of larval habitats.

2. A determination of the relationship of local mosquitoes to diseases of man and domestic animals.

3. An evaluation of the efficacy of control operations.

4. The development and testing of new mosquito-control techniques.

It may be pointed out here that some of the biological information listed above (all of which should be available for successfully prosecuting a program) can probably be obtained from other than a permanent employee of a mosquito abatement district. Thus, identification of local mosquitoes often can be obtained through the departments of entomology or biology of the State university, or possibly of a local college. Also, information relative to the local incidence of human mosquito-borne disease and the possible role of certain species of mosquitoes in disease transmission may be available from Federal, State, or local health sources. Development and testing of new mosquito-control techniques are being carried out constantly throughout the world by health agencies, agricultural research organizations, insecticide manufacturers, and mosquito abatement groups. Information relative to new methods and new toxicants is published every day in technical journals and brochures. However, in most cases, these methods and materials are applicable in a given situation only after certain modification. Each technique and insecticide formulation must be tested by an individual mosquito-control agency under conditions prevailing in its particular area. Thus, there is a need in abatement districts for trained biological personnel to carry out such tests. In addition, biologically trained individuals should be available constantly to evaluate the effectiveness of the control operations of a given district. It is entirely feasible, in the case of several small, adjoining districts with comparable problems, that they jointly hire a biologist who could then make available to each district the information necessary to carry out successful control operations.

The training and proficiency of an engineer are used by mosquito abatement agencies in the following ways:

1. The determination of control methods to be used.
2. The planning and constructing of permanent antimosquito works.
3. The management of mechanical equipment.
4. In collaboration with the biologist, the development and testing of new techniques, materials, and equipment.

Again, as in the case of biological services, engineering services may be obtained outside of the permanent staff of an abatement district. Thus, in many instances, sanitary or civil engineering departments of universities may be prevailed upon to furnish some of the needed information; or the engineering staffs of health agencies may have personnel available for consultation. In addition, private consulting engineering firms may be retained to solve specific problems. However, in the long run, abatement districts undoubtedly will find themselves in a more favorable position to cope with day-to-day problems if engineering service is readily available.

In mosquito abatement practice in the United States, technical aid may, in some cases, be required by law; in other cases, such services may be strongly recommended by State agencies most closely allied with the local abatement organizations. In yet other instances, the procurement of such services may be left to the discretion of the boards of trustees, and, therefore, it actually falls to the lot of district managers, if they are not themselves trained as engineers or biologists, to persuade their respective boards as to the need for these technological services.

In summary, we cannot emphasize enough the importance of the intelligent use of engineering and biological skills in the operation of an antimosquito program. A comparison might be made between mosquito control and modern road construction or house building. Undoubtedly, the best roads or houses result from the endeavors of highly trained people. It appears to us that taxpayers in an abatement district are entitled to the most effective control of mosquitoes that can be obtained with present-day know-how.

AFTERNOON SESSION 1:30 P.M.

PROBLEMS ENCOUNTERED IN ORGANIZING A MOSQUITO ABATEMENT DISTRICT by DeLore Nichols, Secretary of the Davis County Mosquito Control Commission

Many and varied problems arise during the organization of a mosquito abatement district and a number of these confronted the committee during its attempt to organize the Davis County Mosquito Abatement District.

The sections of a district or community whether on high ground or in the lowlands, produce differences in the opinion of the residents as to responsibilities and benefits. The highland areas are very willing to concede the ownerships of the breeding areas to the nearby communities situated in the lowlands. There is the feeling among the citizens of these areas that land owners who irrigate are responsible for badly managed water, and that the owners of wet pasture lands should be forced to drain them. Many home owners are opposed to duck club improvements which would create flooded areas and additional ponds, while at the same time allow their own neighborhood to become infested with mosquitoes produced by sources such as lily ponds and other stagnant pools.

We find that generally there is much misunderstanding as to the nature of mosquito control work. The interest appears to lag between broods but rises to a fever heat when large broods escape and scatter. Many people have the idea that under such a situation some sort of magic should be used. Perhaps prior to this time their community had done little or nothing toward control cooperation. Luckily the organizing committee has a stock answer. Whose mosquitoes are they? There are no restrictions against the flights by mosquitoes over border lines of districts and the mosquito uses no judgment as to who it bites.

Rather a long educational program seems necessary in order to get the proper information over to the people. Control measures are not generally understood. Some areas object to increased taxes. Some indicate that they would prefer local unit control, others that there is too much power delegated to a Board by creating an organized district. Some prefer voluntary control. The weakness of these arguments and suggested approaches is that many of them will not work. Any control program requires money to operate and a stable budget is necessary. Proper timing of control measures and coordination of activity can not be made effectively under local unit operation. The highland areas will not whole heartedly enter into control projects carried on mostly in the swampy areas of the districts even though they benefit. Some communities would try to ride a free ticket if the program were placed on a voluntary basis and attempt to avoid their responsibilities while still wishing to share in the benefits.

These are a few of the general problems that arise but let us be more specific. What is the best way to organize a district? Should it be done before any control work is started or should it be done after demonstrational control work has proved its effectiveness? The Davis County Committee tried out the latter method and has operated on a limited voluntary basis for the past two years. It was the opinion of the committee that the control work should be tried out and a demonstration made to the people to let them decide the desirability of creating a district. We are not prepared at this time to state which is the better method of the two. We can state, however,

that we are meeting some rather serious problems.

The procedure to date has been as follows: The County Commissioners called a meeting of representatives from all city and town boards. At this meeting, it was decided to begin limited mosquito control work and finance it by creating a budget based on contributions from the county, cities and towns in the proposed district. The plan was to operate under a committee composed of the three commissioners and the three officers of the County Municipal League. During the second year, these three men were retained on the Committee, and three new officers were added, making a committee of nine.

Control work proceeded satisfactorily and efforts were directed toward the organization of a district including all of Davis County, except the islands of the Great Salt Lake. The County Health Department and the County Agricultural Agent assisted the committee with this program and a petition was drawn up and circulated. No difficulty was experienced in getting the 10% support by the voters necessary in the county area and the 10% necessary within most of the incorporated areas. Difficulty did come, however, in getting the necessary Resolution executed by all city and town boards. Several incorporated areas requested to be excluded and two others have failed to take official action at this date. It has become necessary because of this situation to redefine the boundaries of the proposed district, excluding these areas and to obtain the approval of those units that acted favorably for these changes.

This is where the matter stands today. The Committee must proceed to create a district on a modified scale but seriously hesitates to do so until every effort has been made to include the entire county area. The question at present is largely as to how it is possible to exclude an area within a district without creating island areas which will fully benefit by any future control work and which might also provide breeding areas which will complicate future control effectiveness.

On February 20th a bill to correct this situation was introduced before the present session of the State Legislature. No action has been taken on this bill to date.

PROBLEMS ARISING THROUGH THE JOINT OPERATION OF A FLY AND MOSQUITO ABATEMENT DISTRICT by Karl L. Josephson, Supervisor of the Box Elder County Mosquito and Fly Abatement District

The reaction produced by a subject such as fly control among a group of mosquito abatement specialists would range from fear on the one hand to relief on the other. Fear because possibly their control agencies might be asked as was ours, by a group representing the wives of farmers in the county to engage in the abatement of the flies that were so prevalent about the average farm home. Relief, because they could be sure their trustees would not be forced, so as to speak, to expose them to the added responsibilities of such a venture, since most residents of their areas are not acquainted with that portion of the mosquito abatement legislation.

There are many problems that arise from a combined fly and mosquito control program that are somewhat different from those of mosquito work, but are related in part. One rule is basic for both, that is, controlling the breeding areas. The main difference between the two types of program may be

found is the degree to which the general population can control the breeding of flies since they are a product of civilization, while we must have a specialized group to provide for the control of mosquitoes.

Our fly control activities have been limited to the spraying of buildings with residual insecticides. Control was effective for the first two or three years after the program was begun, but following that it proved only as effective as the sanitation of the premises treated. When we first started the project, sanitary conditions in relation to fly breeding were good as most people followed good practices aimed at prevention. With the advent of new insecticides, they gradually slipped away from these basic control methods, as it became easier to spray than to clean up. Now we are raising many more flies than we did previously with less control through spraying. As soon as we return to our former standards of fly control sanitation, and use the modern insecticides as an added means of control, instead of as a cure-all, we will be able to enjoy better fly control for a longer period with less chance of producing resistance in the insects to the new insecticide.

The greatest handicap I have found to the effective operation of both a fly and mosquito control district is that it is impossible to finance both projects with the amount of money allowed for mosquito control in our district and state last year. I believe that our state lawmakers are cognizant of the problem and are taking steps toward providing legal aid needed to enhance our control of both the fly and mosquitoes as shown by pending legislation. This legislation has been endorsed by the Governor. We know that we cannot legislate and force people to practice cleanliness, sanitation and good farming methods, but if we advance a good training campaign and have laws behind us that will back us up if necessary, it will help us to make a better and more healthful environment in which to live.

IMPORTANCE OF PUBLIC RELATIONS IN A MOSQUITO ABATEMENT PROGRAM by Howard Widdison, Secretary of Weber County Mosquito Abatement District.

Ordinarily when we think of Public Relations, we think of publicity and keeping in the public eye. In mosquito abatement work, however, it may be more desirable to do just the opposite. In Weber County, we wish that the public could forget that we exist because when people become mosquito conscious, it is usually a sign that the pests are after them and that someone is not doing a good job of control. That is when the phone begins ringing and the verbal "brick-bats" fly.

Our position in the field of public relation is two-fold, that of getting along with the public, and keeping peace with our elected officials who collect the money to finance our organization.

We find it important in getting along with the public, to answer all complaints that are received. A well informed and diplomatic board of trustees can be a valuable asset in this connection, as the board members often live with and know the people who are calling, and can often do more to straighten out difficulties than the expert who may be more or less a stranger.

We, who work with this program, should realize that our responsibilities are great. In our county we have a large budget and when public money is being spent, the organization doing the spending must be very careful.

The Board of County Commissioners and the various city Boards watch over our budget and may receive criticism if our program is not as efficient as it should be.

Another item that we have found to be important in our work is to employ ambitious, efficient and dependable workers. They work independently much of the time, and if they are seen loafing, or not attending to business, the entire organization is subjected to criticism. The workers should be trained in the latest mosquito control methods and should be given proper equipment with which to work and further impressed with the necessity of doing their duty. An active and interested board of trustees, a well trained, efficient director, and a hard working well equipped crew, can work wonders in mosquito control. The first law of business is "Thou shalt deliver the goods," so it is with us.

THE IMPORTANCE OF MEASURING THE RESULTS OF A MOSQUITO ABATEMENT PROGRAM

by Robert A. Wilkins, Manager, Salt Lake City Mosquito Abatement District

Accurate measuring of the results of mosquito abatement work are essential from the standpoint of continued efficiency of operation and for future planning of the control program. Records of all phases of the program should be available such as costs of the various operations, costs of new equipment, and the effectiveness of the various control measures employed. A day by day record of the activities of the unit is necessary for accurate control work and planning. It is important to know the progress being made and the problems arising that must be solved.

Evaluation should be divided into two phases; (1) consists of the basic day by day control activities and (2) the evaluation of new developments and methods of control, including new insecticides. The latter involves careful recording to obtain accurate information upon which an economical and efficient program can be established.

The extent and amount of larval breeding should be reported daily by the inspectors in the field as a means to correlate the activities of the control group and as quantative information to be used in determining the importance of an area in mosquito production. Accurate counts should be kept of the adult population through the use of New Jersey type light traps located at strategic points in the control district. A thorough analysis of light trap collections will provide information on the time of emergence of adults in the district and on the migration of adults into the district from outside the controlled area. It will also provide a quantitative measure of the effectiveness of a mosquito abatement program from year to year in the same district and the effectiveness of the program in a district as compared with other districts where similar traps are in operation.

SUMMARY

Forty-three registered and attended the meetings of the U.M.A.A. held in Brigham City. Those attending represented the principal agencies and institutions engaged in or interested in mosquito abatement in the state of Utah. The meetings were characterized by the sincerity of the participants in their attempt to promote an economical and efficient program of mosquito control in the state and in the spirit of cooperation that was expressed by representatives of these agencies.