THIRD ANNUAL MEETING

UTAH MOSQUITO ABATEMENT ASSOCIATION

L. T. NIELSEN

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February 17, 1950
Friday Morning

Presiding: Dr. O. Whitney Young

PRESIDING: DR. O. WHITNEY YOUNG

We are very happy to have with us E. Chester Robinson, manager and R. L. Holmes, Trustee, of the East Side Abatement District, Stanislaus County, California. Also Edgar A. Smith, Manager, of Merced Mosquito Control District and Richard F. Peters of the Bureau of Vector Control, California State Health Department.

I think that it is fitting that we recognize the President of the County Officials Association, Mr. Andrews of Juab County, and Mr. C. A. Grant, Executive Secretary of that group; Mr. Karl Josephson of Box Elder County, and Clem Toone from Magna. I would like to pay tribute to President Dixon of Weber College whom we have with us today. President Dixon is a very fine supporter of mosquito abatement. He has never objected in any manner to the activities of the district carried on here at the school. He has allowed us to hold board meetings here at the college and has been very kind to mosquito abatement.

DR. H. A. DIXON: PRESIDENT OF WEBER COLLEGE

No honor is due me for what little sacrifice we have made for the mosquito abatement project. Our interests are purely selfish. Mr. Andrew's interests here are purely altruistic. He doesn't get much out of it. He comes down from Juab County. I don't know whether Juab means dry or not, but that's where the dry farms were started down on the La-Van bench. I don't know whether they are pestered with mosquitoes the way we are here, so his interests are altruistic. I have some relatives down there and during the depression we had a drought too and that doubled our difficulty, and cousin Charlie Hall thought it was so dry and hot that summer that he had to soak his hogs before they would hold swill. So his interests are purely altruistic where mine are purely selfish.

Because I made the mistake of staking a larger garden than my wife could tend, the mosquitoes would make great welts on her and I surely had difficulty getting her to work the way I had planned until Dr. Young and his crew got busy and we certainly owe him a debt of gratitude. I certainly have a lot of respect for you folks who fight the pests. This year we had twig borers in the peaches. We had codling moth in the apples. We had squash bugs on the squash. It killed the squash almost over night. We had aphis on the broccoli. We had virus on the raspberries. I guess that is what they call it when they don't know what anything is, but this is a mosaic virus, it comes in patches. We had weevil in the strawberries. We had worms in the corn and now another new one, the mexican be tle that took all the beans. Now really the pests there got so bad that either of us was afraid to go in the garden alone, and if we had had mos-

quitoes on top of that I know my wife would have quit on me completely. In spite of it all, from a few rows of potatoes we rated fourty bushel and off a few peach trees we had peaches that would weigh twelve to fourteen ounces and so on and on. So all providence was good to us in spite of all the pests, but I have a great regard for the men who keep these things down because as you will notice I am having considerable first-hand experience on some of these difficulties.

We do welcome you here. I certainly am attracted by the program as it stands, by the wealth or experience that is brought here by the eminent people who have come here to share their experiences. After all, none of us have the answers to all the questions. I was up here in Wyoming on a dude ranch and there came an Englishman there. He had a yellow satin shirt, a red tie, cowboy boots, these whip-cord trousers, a big ten gallon hat and silver spurs, but he did not have any horse to ride. He went to the manager about the second day and asked him if he had a horse he could ride and the manager said, "No, we haven't one." The Englishman looked out to the corral and said, "What are those?", and the manager said, "Those aren't broke to ride." Then the Englishman said, "That is just what I want. We can learn to ride together."

Thank you very much, gentlemen.

DR. YOUNG

We have Mr. Boyd Sheffield of the County Officials Association of Utah. He is Vice President of this Association. We have Dr. Don M. Rees with us this morning who has followed a consistent policy of pushing mosquito abatement right from the start. He has made himself very well known throughout the United States in research along the line of mosquitoes. Furthermore, he has been a consistent visitor and supporter of such association meetings as this; in California, Nationally, and here in Utah. He is the daddy of mosquito abatement, the daddy of of mosquito abatement districts here in Utah, and in a way my intellectual daddy in regards to the study we are both engaged in, and so I take great pleasure in introducing Dr. Don M. Rees, a great fellow as well as a scholar and promoter of fine works such as this.

DR. DON M. REES
PRESIDENT OF U.M.A.A.

Thank you Mr. Chairman for those kind remarks. I am sure I do not deserve them, but I appreciate them nevertheless. I would like to thank President Dixon also, for the opportunity of holding these meetings here and to welcome all of you to the meetings. I hope that we will feel free to express our opinions and to discuss our problems. In so doing, I am sure we will be able to improve mosquito control work here in the state and to benefit by the association. I want to briefly read some of the things that I have jotted down here that I would like to bring to your attention.

This is the Third Annual Meeting of the Utah Mosquito Abatement Association. The program provides for four sessions and a business meeting. Each session, as indicated on the program, will be in charge of one of the districts comprising the Utah association. In these sessions, abatement workers of the districts have been asked to explain the programs and accomplishments, and discuss some of the problems existing in their districts. Additional guest speakers have been asked to participate in each of these sessions.

The purpose of the Utah Mosquito Abatement Association as stated in the constitution is; "to promote close co-operation among those directly and indirectly concerned with, or interested in mosquito control and related work, to increase the knowledge of mosquito abatement, and the advancement of the cause of mosquito abatement and extermination in the state of Utah, and elsewhere."

The purpose of these meetings is to; first, improve the effectiveness of mosquito abatement work in the organized districts. Let's keep that in mind, and second, assist in the extension of this service into other parts of the state where this work is necessary and approved by the tax payers living in the area.

The first can be accomplished only when abatement workers in a district are constantly seeking to improve the control program in operation within the district, and are willing to adopt new and proven methods of control as they become available. These meetings provide for an exchange of ideas that will, if applied, improve the control program of the districts. The success of mosquito abatement programs is determined by the results obtained and the lack of success in this work are only too painfully obvious.

The expansion of this work into other areas where it is needed is largely dependent on the results we are able to obtain in the organized districts. It has been definitely proven in many parts of the United States that mosquito abatement work is practical and good economy. With modern methods of control there is no physical reason why abatement work should not be successful. That places the responsibility of the success of this work on the abatement workers. I am confident mosquito control can be very effective and that the present organized districts in Utah can demonstrate this

fact. I hope you all share the same opinion and are willing to work with a single purpose in view, that of more effective control for every dollar being expended in this program.

During the past year considerable progress in mosquito abatement work has been made in the state. No new districts have been organized in Utah during 1949, but considerable interest has been shown in this work. At present South Salt Lake County is attempting the organization of a district. Utah, Davis and Cache Counties are considering the possibilities and several towns in other counties of the state are doing some mosquito control work.

It takes time and considerable effort to complete the organization of a district. This is evident as demonstrated in Weber County. To explaine mosquito control work to a group of interested citizens, I attended a meeting in Ogden in 1932, Mr. Hardy, Chairman of our Board of Trustees was with me. Later some work was done in Weber County with F.E.R.A., C.W.A., and W.P.A. funds. Then in 1943 the war activities in Weber County stimulated considerable interest in mosquito abatement work. I was asked at this time to conduct a survey of the mosquitoes in Weber County by the County Commissioners. At the same time Lt. Sampson made a similar survey for the U. S. Army. During this period mosquito abatement work in Weber County was materially assisted by Mr. Hurst and Ward of the State Health Department and the concentrated efforts of Dr. Glenn Garner and S.R. Cunningham of the Ogden Health Department. As the result of this work the U.S. P.H.S. placed a mobile unit in Ogden for the purpose of Mosquito Control, the first and only unit of this Service to operate in the state. This unit operated for two seasons in Weber County. Then through the effort of Dr. O. Whitney Young and others interested in this work the Weber County Mosquito Abatement District was organized in 1947. You are to be congratulated on the progress you have made and the results obtained. I hope you will be able to continue this good work.

DR. O. W. YOUNG
SUPERVISOR WEBER COUNTY, M.A.D.

THE CONTROL PROGRAM IN 1949 OF THE WEBER COUNTY MOSQUITO ABATEMENT DISTRICT

What I have to report on a control program in 1949 of the Weber County mosquito abatement district is simply that we have been continuing along much the same lines. We have been hampered for the most part by the lack of funds, because as Don Rees stated we are only three years old, and we had not increased to the amount that we really needed in order to carry on a control program of the proper sort, but now it is getting better due to the fact that we now have .6 of a mill appropriation which gives us about $32,000.00 and we look forward to a quite adequate control program in the future. As we build up equipment and "know how", we will have with that amount a more adequate program. Now, that may be optimism on my part but I think under the supervision and control of the Weber County Board of Trustees as it is presently constituted, we will have a wise program. However, there is one thing that this money will make possible. That is a full time man to direct the program. Like Don Rees did some years ago, he withdrew from the active supervision of the program, and that, in the last analysis is what I will have to do. I have looked forward to that all along, and it is something that will come as a surprize to some people. They have expected that I would keep this as a lucrative side-measure. However, that isn't the case. It hasn't been lucrative. I could have done much better had I gone out selling woolens or something like that, but I expect to withdraw at the end of this year. I hope that a good man can be obtained to take over this program full time and give it the time and energy that it really deserves. It can't possibly go on under the supervision of a part time Director.

You will be able to see from the slide I present that the next phase that we are swinging into is drainage. We have a great problem of drainage here as you have in your counties, as the mosquito men from California will show in their slides and talks. In order to carry on a permanent plan of control that looks forward to doing abatement in an efficient way, you will have to control water. Our big problem is irrigation. This irrigation water is from our watersheds, and from Pine View Dam, and Pine View Dam fluctuates annually. There is plenty of water in it in June and then in September it lowers.

Slide: We are looking up into the upper part of the dam here and you can well see that in the upper regions where it is flatter, that the receding water level will leave quite a few mosquito abatement problems, that is, places where mosquitoes breed.

Slide: In the canyon here we don't have any problem, of course, where the water is flowing. The water there flows rapidly away.

Slide: These are the areas of the county where we have

the most trouble, and the trouble comes because of lack of drainage. That is our big problem. The watershed land as you can see makes up about 65% of the county, and up around Huntsville and places like that we have no trouble, but non-irrigated land constitutes nearly 20% and the irrigated lands constitute another 16%, and we have the trouble of getting rid of the water which comes from irrigation.

Slide: You can see here where the people live in Weber County--not in the watershed area but in Ogden, and then in the agricultural areas west of Ogden. This watershed area is used for grazing for the most part. We have quite a salt flat area which constitutes quite a problem shown in the next slide.

Slide: We have about three hundred and fifty locations of mosquito breeding areas in Weber County. Roughly they follow the areas where there is water-logging. Here is one of our big problems. It is easy enough to get the water onto the land, but once the water is there it has to be drained away or else it constitutes a problem for us, and because of the fact that this mill-creek has not been cleaned for a num- of years, the growth there impedes the flow, and as a result the water has flooded out of the bounds of the creek. I took a dip of that very spot and got about one hundred larvae to a dipperful of water. It was only a small dipper, about a cup or a glassful of water. So if we have that cleaned out then the water would flow freely and we wouldn't have that trouble.

Slide: Here is another drain down in the lower part of the county, choked up you see, with cattails, bulrushes, and other water weeds, and the problem is to get that out. Now, I am not an engineer and I have asked a good many people, such authorities as Richard Peters and Mr. Robbins and others, and Dr. Rees and so on and they don't have an answer to this problem, except the good old-fashioned way of a pick and shovel or perhaps a team of horses or a drag-line. That is heavy equipment if we use a drag-line, and expensive. It is expensive if you use pick and shovel and if you use new chemical weed killers, so I stand before you as one willing to be taught. You can see how these drains are clogged with this material.

The beavers don't help the situation any. They have done their little bit toward holding back the water which goes out into the lake. Here is a shot of a beaver dam that gives us trouble. These dams are right down in the lower part of the county and I guess the water level is raised from two to two and one-half feet. Here is another clogged drain and in this case we have a canal across the drain. The bank has been built up and the culverts clogged.

Slide: Down here in the lower regions of the county, along the lake shore around the salt flats we have considerable breeding. Livestock are permitted in this area and every time they leave a hoof track, it forms a breeding spot.

Slide: Here we have a natural drain blocked off where the irrigation water has flowed by the side of the road and

in this case I picked up about two hundred larvae to one glassful of water. That means a lot of larvae if you multiply the number of pints times the number of larvae. In one pint you have quite a few mosquitoes to plague the vicinity.

Another of our problems here is where a canal runs along the hillside and seeps down to the meadow spot beyond.

Slide: This is rather a dim slide but here you can see on one side a canal raised up on one side to provide irrigation for the county. The barrow pit is right here, caused by the dirt that is taken to build up the canal. Consequently, seepage from the canal fills this barrow pit and constitutes one of our major problems. We have miles of a situation similar to this.

Here is a similar situation except the seepage has built up hummocks of grass and in between all of these hummocks is a quart or so of water and each one of these quarts doing its duty towards furnishing mosquitoes. The obvious answer to the situation is to have a cement-lined ditch, but all of this is costly and just what the answer is I don't know. We could line these canals with clay or perhaps asphalt.

Slide: Here we see the boys emptying fish into one of these flowing wells, and each one of these flowing wells you can multiply by hundreds throughout the county. Each one is allowed to flow and flow, and no one ever turns them off. The water flows out and forms long wrangling sloughs in this area where there is only one inch fall per mile and the result is a mosquito breeding area.

Slide: Here is a result of what the engineers left when they dug this drain. A drag-line was used to dig the drain and the dirt was piled on one side. As a result over on the side where the water could flow into the drain, it was prevented from doing so simply because the spoil dirt had been left there. Someone should have told the operator of that drag-line how to do it. He should have piled the dirt in such a way, on the high side perhaps, or in such a way that drainage would have been allowed.

Slide: Here is the low edge of pasture with the same way, poor drainage. It is a mosquito abatement problem for us. A poorly drained pasturage here and the hoof tracks left by the animals. One of the big problems in the spring is, the flood waters come down from the Weber river. Then the waters recede and the flooded areas where the water stays becomes potential breeding areas. With these three hundred and fifty places or so that we have to visit, the picture constantly changing with flood, and because of the lay of the land some of the land being porous and gravelly and other parts being heavy clay, and in all it constitutes a very grave problem, one that needs the full time attention and money that is necessary.

Most of our problems as you can see are brought about by our irrigation system. I think it is a condition that we will have to live with for a long time. As long as this is a semi-arid climate we will have to live with it. We are glad that we have irrigation, but at the same time it brings problems that have to be met by our mosquito abatement district.

DR. W. G. GARNER
CITY HEALTH DEPARTMENT, OGDEN

REQUIREMENTS AND SUGGESTED IMPROVEMENTS IN WEBER COUNTY MOSQUITO ABATEMENT PROGRAM

I think perhaps I had better give a little explanation regarding some of the features of this paper I have prepared. I am given to understand that there are many individuals here that are interested in mosquito abatement and the problems and the procedure involved. I have therefore gone to considerable effort to stress fundamentals and to give a little history of our development.

The area now known as Weber County, contains five hundred and fourty-one square miles, or approximately three hundred and fifty-one thousand acres. The eastern part, or 61% of the County, is the mountainous watershed of the Ogden River. The rough terrain is interrupted only by a circular valley at the confluence of three tributaries of the river, a gathering place for hunters and trappers in early days, known as Ogden's Hole, but now known as Ogden Valley, or Eden Valley, and is the present site of three charming communities Eden, Liberty and Huntsville. The western part of the country consists of valley lands, including bench lands of the Weber and Ogden River deltas and salt marshes leading down to the Great Salt Lake.

Weber County is bounded on the north by Box Elder and Cache Counties, on the east by Rich and Morgan Counties, on the south by Morgan and Davis Counties and on the west by Great Salt Lake.

The present western county line runs out to a point in the lake encompassing Fremont Island. Near the junction of the Weber and Ogden Rivers, the pioneers found Buena Ventura, the home of Miles Goodyear, and the first permanent white man's settlement in Utah.

The climate is semi-arid, with an average annual rainfall of sixteen inches and a mean temperature of 50° F.

Weber County has a population of approximately seventy-seven thousand. About 70% of these people, or fifty-two thousand live in Ogden City, with the other 30% or twenty-five thousand living in the eight other incorporated districts and unincorporated areas.

Weber County has approximately fifty-six thousand acres of irrigated land served by sixty irrigation companies, thirty-six of which serve less than three hundred acres each.

Irrigation water comes primarialy from the Ogden and Weber Rivers with Pine View Reservoir in Ogden Valley the chief storage basin. Surface drainage, subsurface outcrops, canal seepage, improper irrigation, and considerable flooding due to the present condition of river channels in the western part of the county has caused damage to valuable farm lands and has created numerous and extensive mosquito breeding areas.

The extent of our mosquito abatement problems may be better understood by explaining that approximately fourty-

five thousand of the fifty-six thousand acres under irrigation are in the western part of the county, nearest to centers of population and that in this same area there are about fourty-two thousand acres of water-logged land, most of which is excellent breeding and resting grounds for various species of mosquitoes. This larger area in addition to the usual seasonal areas, has created a problem sufficient to tax the ingenuity of any abatement organization, and cannot be completely solved until the facilities for adequate drainage have been supplied.

I have been informed that surveys are now under way by the Bureau of Reclamation to determine the most effective means of drainage, and that $3,000,000 has been appropriated for drainage operations to reclaim water-logged lands in the Weber River project. This program, if completed, will solve to a great extent, the mosquito problem in the areas involved.

The basic requirement for an abatement program, whether it be directed toward pestiferous insects, insanitation, or the suppression of crime is, "the need for abatement".

As the need becomes apparent, it is necessary to conduct a well directed investigation to determine the nature and extent of infestation, estimate essential equipment, supplies, personnel and funds, required to conduct a satisfactory abatement program, over a specified period of time.

Essential requirements for mosquito abatement may be stated as follows:

1. The need for abatement.
2. Availability of necessary funds.
3. Primary organization.
4. Selection of a qualified director.
5. Selection of equipment and materials.
6. A permanent organization.
7. A well formulated plan of attack and procedure, based upon comprehensive surveys to determine species, their breeding areas and the extent of infestation.
8. Public support.

The need for mosquito abatement depends upon existing facts, some of which may be obvious, while others may be more or less obscure.

Infestation of communities by great numbers of man-attacking, pest mosquitoes, and the resulting discomfort from their annoying and persistent attacks upon all age groups, establishes an obvious reason for some means of effective control.

The presence of other species, some of which are vectors in the transmission of disease to man and other animals, is an added incentive for abatement procedures, though the ill effects may be apparent in a relatively few individuals.

Heavy infestations of rural and recreational areas, limits their use for the purposes intended, reduces real estate and land values, and limits occupation thereof by either man or beast. These factors establish the need for abatement.

Numerous species and the wide distribution of mosquitoes and their breeding habits presents many problems for effective control and abatement operations, unless adequately fin-

anced, operations are necessarily limited.

Restricted abatement procedures, due to inadequate finances or other limiting factors, frequently results in undeserved criticisms and undesirable public comment.

In the State of Utah, the legislature has already provided ways and means by which mosquito abatement organizations and districts may be created and financed. It has also established a limit to which property owners may be assessed for mosquito abatement. The organization is designed to function independently and without the influence of political groups or factions.

No mosquito abatement organization with serious intent could long function without the expert guidance and supervision of a qualified full-time director. In addition to basic requirements, technical training and ability in the specialized science of mosquito control, the director should be a good organizer with considerable experience in public relations, and possess the essential qualifications of a good business administrator.

The selection of adequate equipment and materials for mosquito abatement is frequently a subject for considerable discussion, but is actually founded upon well established principles, and what may suffice for one situation or locality may be entirely inadequate for other areas.

In recently created mosquito abatement districts, control methods are usually restricted and temporary in nature. This may also be true in some well established districts, since the most effective control procedures will be governed by existing conditions peculiar to any one situation or to the areas involved.

There is, perhaps, no particular plan for abatement operations that would specifically apply to all regions, but the fundamental principles for mosquito control, ARE applicable to all regions.

This carries us back to item eight in the essential requirements for mosquito abatement. "A well formulated plan of attack, based upon comprehensive surveys to determine species and their breeding areas."

Since the breeding habits of all species are not the same, it is reasonable to assume there would be a considerable variation in the time or season of the year when larval and adult stages of the various species would first appear, and herein lies a hint to another fundamental principle for efficient mosquito control as applied to Weber County, or other districts with similar problems. Carefully conducted surveys and control procedures should be started sufficiently early in the year to catch the first broods of migratory species before they are on the wing. These early spring operations are definitely beneficial, result in much better control, and fewer problems later in the season.

Large scale topographical maps of the entire district should be prepared and carefully marked to indicate breeding areas of the various species. The maps should plainly indicate the locations of all swamps, ponds, standing water,

streams, wells and flood areas, and indicate the probable time, or season, when these areas should receive special attention. This procedure is an essential aid, especially in large districts, or where a considerable turnover in abatement personnel is anticipated.

In almost every abatement district comparable to Weber County, situations are encountered wherein primary or secondary drainage seems the only means of satisfactory control. Drainage procedure, especially if extensive, is costly, requires special equipment and the services of an experienced engineer. While the primary cost is comparatively high, the end results justifies the means, results in near permanent control, and may be less expensive than other procedures when prorated over a period of years.

Public confidence and support is essential in the creation of any mosquito abatement district and just as desirable after the district has been legally established.

Since the average person is not familiar with the life cycle or breeding habits of mosquitoes and the problems encountered in their control, some means of stimualting and maintaining public interest and support is most desirable. Perhaps this can best be accomplished by a well executed publicity campaign, designed to educate the public in the fundamentals of mosquito control and explain why certain procedures in the plan of operations are so essential, regardless of how absurd they may seem in the minds of laymen.

I have frequently been asked why so much abatement effort is put forth outside the incorporated area of Ogden City, when better than 70% of the abatement funds for Weber County is secured from tax levies within Ogden City.

We should be thankful that the administrative program for mosquito abatement, as provided by the Utah Legislature, can be kept in the hands of those who really know mosquitoes and not left to the judgement of those who think they know them.

Personally, I believe the officers and directors of the Weber County Abatement District have done an excellent job in mosquito control with the means at their disposal, and for the time the program has been in operation. I do have a few recommendations which I feel will lend additional support to the program.

I believe there is a difinite need for an expanded program within the incorporated area of Ogden City and in the county. I believe the program should be conducted on a more extensive scale and that operations should begin not later than the first of March and should be intensified as the season advances.

The tax levy should be increased from one-half mill to the one mill limit if necessary, to meet additional requirements. People will object more stronously to a tax levy of one-half mill if they are still pestered by mosquitoes than they will if there are relatively few mosquiotes.

I believe the program has advanced sufficiently to consider the advisability of a full time supervisor, and that the yearly salary should be sufficiently high to attract

well qualified men.

An expanded program requires additional material and perhaps additional equipment. An increase in operating personnel would also be required. Plans should be made to fulfill these requirements as soon as possible. A sound public relations program should be formulated and put into effect. This should include elementary fundamentals in mosquito development and control with specific instructions and suggestions for use by individual property owners in urban communities. The people of Davis County should be induced to organize and create a mosquito abatement district. This would complete the chain for unified operations extending from one end of Great Salt Lake to the other. Reciprocal co-operation with other organized districts should be encouraged. A suitable rearing pond for Gambusia should be located or constructed to insure a reliable source of supply to meet local requirements. And last, but not least, past and present efforts should be magnified to keep the administrative functions for mosquito abatement in the hands of those who know mosquitoes and the requirements for effective control; and who possess the courage to see the program through to a successful conclusion.

Dr. D. Keith Barnes - Health Commissioner Davis County

MOSQUITO CONTROL FOR DAVIS COUNTY

When Don spoke to me I wondered why he wanted me on this program, unless it was to tell you how to raise mosquitoes. We surely do a superb job of it down in Davis County. In the early period of the W.P.A. which most of you probably have a haunting memory of, one of the programs which was initiated in Davis County was the so called mosquito abatement program. I can tell you frankly I think they did more harm than good. I think probably Dr. Rees will bear me out in that. Any program that is initiated and isn't followed up, is worse than no program at all. That is actually what happened in Davis County and that is all the program we have had up to date, other than a few localized efforts. They went down into the lake shore regions and followed along the barrow pits and opened up drainage areas, and got the water as far down as they could get it to go without getting too much mud on their gum-boots, and left it there.

As you know, you will travel through our county as you go to Salt Lake. A considerable number of cattle and horses pasture down in that salt grass area. They walk along through these creeks and step in and make impressions which make excellent breeding places for mosquitoes. The grass grows up in these areas and makes very fertil conditions for breeding mosquitoes. This condition exists all along the shore line.

Further up, land around Farmington and Layton, we are not so bothered with them, but let us move down to Bountiful, where up until this summer probably the infestation of mosquitoes has been worse than any other place unless it was right on the lake shore line.

Bountiful City and that area has been a floating cesspool for 15 or 20 years. There is no question about it. They admit it and they know it. Fortuantely last year they got over a sewer bond and they are in the process of laying sewer lines right now. Probably from the standpoint of Bountiful City once that is completed early this summer, the mosquito problem will be nil to what it has been in the past but that isn't enough or all the answers.

Water goes down in Farmington Bay which is within, not to exceed a mile and a quarter or a mile and a half distance from the heart of Bountiful City. Unless we do something down in Farmington Bay which is down in the area mentioned like the Ogden Bay Refuge for wild fowl, we are not going to do very much in the way of mosquito control for that area.

A great many of our people in Davis County take the Farm Quarterly. I think you have all seen it from time to time. Last year sometime, either the summer or fall edition, there was quite an article in it about mosquito control in Iowa. According to the article they had literally sprayed the State of Iowa with D.D.T. and to their suprise raised mild production 25% in the destruction of these pestiferous insects, flies, mosquitoes and what-not.

Well, we have down in our lake shore area quite a number of dairy herds, some of them very extensive, 40 and 50 head to the herd. Well, they got interested, and again fortunately, we had a commissioner who lived in Syracuse, and the heats on. I dont think that man had a day that he wasn't bothered many times with, "What are you going to do about these darn mosquitoes?" Well I had Dr. Rees come out with our commissioners a couple of weeks ago and I think we found them very receptive and I I think in a very short time a mosquito abatement district will be set up and we will join hands with Salt Lake County and Weber County and Ogden area right along the shore line.

I think it was two years ago that I wrote a letter to Salt Lake County and Weber County and suggested that we all do something and pointed out the futility of one area trying to do something and letting them blow in from another place. After you have been in public office for twenty years, you will find that the wheels of public opinion turn pretty slow. I think the best way to handle mosquitos is to have a bad year and you have public opinion with you without much urging and much education. In the last two years in Davis County we have had that, so I dont think we are going to have a bit of trouble from here on out.

Gentlemen, that is my message. If there are any questions I will be happy to answere them. We have no mosquito control in Davis County at the moment.

Dr. John W. Spies- Utah State Health Commissioner

THE STATE HEALTH DEPARTMENT AND THE MOSQUITO ABATEMENT PROGRAM

One thing I have noticed about this meeting, I might say two things, all others that I have attended there has been a question of some deadly disease being carried by the mosquitoes, and then I believe that there are no ladies present at this meeting. This is the first meeting in Utah that I have attended at which there were no ladies.

I dont know how much I can bring to you, because I have lived in such countries as India, where malaria has been the chief problem. Although I didn't deal with it directly, we all had to be concerned with it. Of course, we have here the potential for that. If your mosquitoes became infected, you certainly would have malaria. There are other diseases that I need not mention to you. Of course in Utah there is the probability at least that tuleraemia is carried by mosquitoes. Then the question of enchephalitis comes up and a great many people think, and in fact it has been proven, that in some places that enchephalitis is transmitted by some mosquitoes. So it may not be entirely a pest-problem with you.

I think all of us have been subjected to the annoyance created by mosquitoes. I, myself, was raised on a farm and I know that both mosquitoes and flies greatly effect the health of animals. As far as the health department itself is concerned, of course we are behind any of these programs. Anything we can do for you we will be glad to do it.

I dont need to mention the name of Dr. Beatty to you because you are more familiar with him than I, but he very early aligned himslef with the mosquito abatement program.

It seems to me that in the control of the mosquito oftentimes however, you can bring in other vectors, the fly is a common one that we have to deal with and then of course, there are rodents. Another thing that most of us know is that the larger your area, the more effective your control program is, because naturally these vectors, whether they be flies, mosquitoes or rodents will cross boundary lines and all of us have the experience I think of cleaning out a building or two and then find a month later that it is heavily infest. So I can give you the blessing of the state Department of Health, we are interested in it and any of our facilities, our people, are free to engage in your problems. As far as having an active program ourselves, you know that we don't have one, except in the advisory or healthful capacity. California has an extremely good program, at least to those of us who are not there.

I would like to say before we enter into a question and discussion period that it is the local health forces that we want to reinforce. The State Department of Health is very much against any socialization of any program

of this kind. We would like to help any local endeavors to stand on their own feet. If there are any questions I will be glad to try and answere them.

Reed Roberts: Assuming that mosquitoes in an area do not transmit any known disease, they are there merely as pests. How much of a public health menace would you be willing to say they were?

Dr Spies: I would say they come under a public health program and that they should be controled, if possible.

Mr Robert Wilkins: Some of the pests we thought harmless a few years ago have now been found to transmit disease such as the harmless Culex tarsalis, perhaps now co.sidered a vector, and we don't know all the species that are vectors and carry or transmit diseases, so therefore, we can't mark them off as just being a nuisance.

Dr Spies: T Think that is correct. I think there are some unknown factors about the vectors powers of mosquitos which we do not know as yet. I feel that there is good proof, as I said before, that the mosquitoes in this area do carry tularaemia and enchephalitis and there may be other things as you suggested.

Mr Robert Wilkins: What authority does the State Department of Health have to go on to private property where a breeding area lies and where the owner will not relent to the mosquito abatement spraying and clear up these breeding areas, especially where we have anopheles breeding?

Dr. Spies: That is one I cannot answege, but I would like to, and if you drop me a note to Salt ake I will give you and answere. However Dr Smoot is here Will you answer the question DR. Smoot?

Dr. Smoot: I think the only authority we have under the law is to prove that it is a public health nuisance. The Health Department of the Board of Health and of course the Health Department in fact, under their direction, are charged with trying to control any health menace to the people of the state. If we could prove that there was any health menace there, then we would have the right of moving into that property. We would have to have some very difinite proof. We just couldn't move in and say that just because we are the Health Department we are going to clean up the mosquitoes. We would have to show some definite health factor there. The law of course, states that we are responsible for the health of the people. Of course, if it was in a city of a county where they have an active Board of Health we would prefere it to them. Preferably we would like these actions taken by local groups because we feel there in the local groups is where the authority should lie and if they wish our cooperation or help we would lend it to them, but we don't feel just as a state Health Department you should move in on just anyone.

Dr. Spies: That brings to mind another thing, and that is this , that there are many laws of the State of Utah that need revision. For instance we have in our department, the State Fire Inspection, while we are set up to handle other fields that now come under the direction of other departments.

Mr Wilkins: Do you think Dr. Spies, that we should allow raw sewage water to be used over the surface of the ground for raising crops or the watering of cattle, which has been one of our problems in North Salt Lake for a number of years? Before your coming into this position the state said that they couldn't help us until there was an epidemic. The cost for treating these areas for mosquito breeding was terrific and it is very distracting to our employees to walk over these areas and when they are dried up the stench is terrible. So far we have had no law to check this type of water for use in irrigation purposes.

Dr. Spies: Of course I don't approve of it, but we are limited by the law, and I think as I said, the law should be changed where needed. I don't think we should wait for an epidemic to occur. On the other hand I dont think we should go outside the law.

Richard F. Peters- Bureau of Vector Control California
State Department of Health

THE MOSQUITO VECTOR CONTROL PROGRAM IN CALIFORNIA

Dr. Young, and delegation of Utah, I am extremely pleased to be here and if you will bear with me I will try to outline our program.

In California we have the so-called Bureau of Vector Control which in itself has immediately, wherever I have gone, and is the casw with everyone else, brought forth the immediate question, "What is vector control?" and you have to start right away with the definition of what is a vector. Well, we know that some people know of biological vectors and some people know of physical vectors. In biology we have to indicate that it is an animal form of transmitter, and that ordinarily vectors do act to obtain infection from a reservoir. Well, we automatically then touch upon persons who know the irriga tion aspect of reservoir. It is a big i poundment of water. Then we have got to s egregate the reservoirs and then we get to the point where we say reservoirs may or may not be hosts. Then we automatically bump into something else. Everbody knows about an innkeeper or a person who is extremely hospitable, being a host, but we don't mean that type of a host. We mean that type of host that supports an ectoparasite or mosquito and thereby sustains it. So before we get through with our program we have the people so weary and confused they feel the program is either in good or bad hands and let it rest. We are interested in the field of vector control in the entire realm of animals of nature which posses or acquire infections transmissible to man and domestic animals.

Now in regard tomosquito control which you as a group are most interested in, the reason for vector control is based on the fact that California has a few mosquitoes left, despite the fact that since 1915 very extensive anti-mosquito activities have been going on in California. I think that those who follow me from California will support that. Probably the biggest surge of mosquito control in California followed as a consequence of the war, from the standpoint of the war having caused sort of a hysteria within California as returnees were coming back to California, because after all, we are the coast line that receive persons that had become infected with malaria and encephalitis, Japanese encephalitis that is, filariasis, dengue fever, and other diseases such as scrub typhus which is mite borne and many other things which could have been introduced into California.

It became a stark reality to our legislature that we were in grave danger of getting these diseases introduced into California and something ought to be done about it. It was in 1945 when the original thinking was going on, a and I might add that our California Mosquito Control Association due to the very intensive work the state had done through the cooperation of Chester Robinson and the legisla tive body, got together and put this program across to remedy any possible situation that might arise.

There were two proposals to the assembly. Either we ought to make mosquito control a state-wide function which would involve the Bureau of Sanitation Engineering at about $10,000,000 per annum, or we ought to establish it on an amplified local basis adn that would involve $1,000,000. In 1945 the legislature considered both problems carefully and did neither. However, in an extraordinary session that was held in 1946, the matter was reopened and action was very promptly forthcoming, in which the state health picture in March or April of 1946 passed an emergency allocation of about $600,000 with specification that about $200,000 would go to the State Health Department to institute the necessary investigation into the scope and distribution and density of the vetors of mosquito-born diseases of California and $400,000 would go to existing mosquito control districts into amplifying local control program , and be administered by the State Health Department. It was a very wise decision. We have no business in mosquito control. The state doesn't have an intimate understanding and I heartilyconcur with that particular philsophy in regard to the outcome.

Anyway there were a couple of other things that were going on at the same time. We were getting a very vivid demonstration overseas, lots of it, that mosquitoes can be controlled and controlled very effectively. These words got home and people were willing to accept that mosquito control is generally practicable regardless whether you are in the tropics or in a temperate climate if you will put up the money that is needed for it. So we did get that lesson from mosquito control overseas, to profit by and to educate a lot of people. The other thing was the miracle insecticide D.D.T. which had been used in great success in various parts of the world and which looked to make mosquito control a virtual cinch in California. So the combination of those three things really set the stage for our vector control program and where in 1942 there was approximately twenty-five agencies throughout California, controlling mosquitoes in a territory of about 6,000 square miles, today there are in excess of 20,000 square miles of organized mosquito control activity and a total of 45 agencies are doing mosquito control work.

Now I mention to you that this program the state undertook was based on mosquito-born disease prevention. We have had a considerable amount malaria in the past and of more current significance, encephalitis, might very well be leveled against, and if we made an appreciable dent upon then in so doing we would have a decentralized program that would automatically suppress any introduced disease. Well, the effect of it has been very good.

I am not going to stand here and accept credit by saying we have kept any introduced disease out of California, but the idea and the organization and the way it was handled was very effectively done. The fact is that we haven't had any of those diseases which I previously mentioned introduced into California, and we have had only a minor occurence of malaria from returnees who had been

affected outside, and the number of endemic or prevalent natural indigenous malaria in California have been so f few and far between in the last few years to almost make malaria at present a very insignificant human disease. While on the other hand, encephalitis is a current problem in California. In 1945 we had our peak year, 289 cases and 49 persons died form encephalitis in California. That isn't a great many cases in comparison with the population in California which is zooming close to the 10 million mark, but nevertheless, the disease spreads terror among people who have seen a person infected with it or the consequences of a person infected with it. So there is a considerable amount of feeling about preventing encephalitis.

After all is said and done, I'm going to get down to earth and tell you this. Mosquito control in California has grown not fundamentally because of public health, but from public desire to live absent from mosquitoes. In many parts of California people have come to the point that they feel that mosquitoes are very unnecessary. Our control program has put on many demonstration right in the peoples backbards and has helped bring about this attitude so today the agriculturists who are the balance of power in California have come around to recognizing the advantage that comes with mosquito control. Public health is a lever but not the major premise. I have seen too much public opinion expressed to feel anything otherwise. The World Health Organization States that public health is anything that disturbs the normal conduct of living. Mosquitoes therefore constitute a public health problem because they decidely interfere with normal living.

In regard to our program we have in our Bureau of Vector Control, two distinct activities. We break the bureau into two sections-- the biological section and the section on operations. Some people call this our consultative service where local guidance or assistance is rendered, mostly in the picking up of an idea from one person and the planting with another person, mostly a roving service. It has been pretty well systematized of late in which California has been broken down into four definite regions and try to keep persons in circulation so that first-handed new ideas can be passed around. The bilogical section which is my personal concern is involved with assisting mosquito control to obtain the answers to its problems and there ary many problems in California mosquito control. We have this present subvention program still in effect in 1950. We have an outlook that it will remain in effect, we hope indefinitely, but at least until some major crisis takes place such as a depression or something that might undo it, but we hope not even then. The State Health Department is working cooperatively with local mosquito control agencies in investigating the problems that exist.

It has been pointed out by other persons previously that Culex tarsalis has been proven to be the important vector of encephalitis in California. We started out with D.D.T. as our main weapon to make a very dramatic

reduction of Culex tarsalis, hoping there would be a corresponding reduction of encephalitis. The program on encephalitis control , and I'm not going to take any credit on this yet bedause encephalitis has gone down in the last years and last year there were only tow proven cases, but this current year there has been an increase in number which may mean that the upward swing of the spiral is in progress, but nevertheless, we attempted to intensively control Culex tarsalis as part of the agreement between the local Mosquito Abatement Bureau and the State Health Department which manages the fiscal end of the funds, and we are experiencing something else that is going on to a point that the normal control of Culex tarsalis has been drastically interferred with.

We are experiencing in California a tremendous increase in irrigation practices. Probably some of you know about our Central Valley project which is impending--the effects of it are impending. The thing is very well into being already, but the consequences of it will be the increase of irrigated land of approximately four million acres above and beyond what we already have. That means four million more on top of the six million already under cultivation, so you will see we have a problem there, but aside from the Central Velley project there has been considerable expansion of irrigated lands, and irrigation expansion means onlyone thing to those of you who control mosquitoes, it means Aedes mosquitoes. We have had in California a phenomenal ascendency of a mosquito that has heretofore not been known previous to 1937, Aedes nigromaculis, one that you have here to deal with. That mosquito wasnt known to California prior to 1937. However, today I would be willing to estimate that although dorsalis remains as one of our important Aedes pests, today Aedes nigromaculis is the object of the maximum of attention in California and it has been more or less coincident to the increase to the total acreage of irrigated pasture of one sort or another. So I think that it is quite apparent to you and if that Aedes are present and biting severely, the mosquito control people haven't got time to control Culex tarsalis as effectively as they would lik to, or Anopheles freeborni, which is our main transmitter of malaria, as effectively as they would like to do it. They have got to prevent the mosquitoes from biting the public because after all the public doesn't care if it is being bitten by a Culex tarsalis or not. The public doesn't want to be bitten b any mosquito, so the aspect of organization there has had to be completely revised from our original plans so today, to illustrate to you by the biological project that we are working on, we have shifted our emphasis to the study of ecology of Aedes nigromaculis Now all of us know that it is very evident and thar it comes out of pastures and so forth and at the rate that it taking over California, we certainly don't yet have what we could call economical termination to it or even sublimation to it. We are trying very seriously to find some vulnerable phase to its life cycle, in its pattern of living throughout the season, from March to October.

In the background we are still thinking that is Aedes nigromaculis gets to be a mosquito that is primarily the prevalent mosquito, its chances of being a vector are correspondingly increased. So we are going to conduct a correlated project on evaluating that capacity of nigromaculis. So that plus a project on Anopheles freeborni in the Sacramento Valley where it abounds in about three hundred acres of rice, are two of our ecology studies.

We are going into the evaluation of insecticices. We have rendered services on the evaluation of airplane use in California and essentially we are trying to get as close to the needs of the local Mosquito Abatement Bureau agencies as we possibly can. We don't always succeed. I think there have been times when we have failed dismally. However, by and large the objective is still there and our purpose is to try and render that kind of service.

Chances are there are a couple of questions. There are a couple of points that were mentioned earlier today that I would like to comment on while I am up here, but might suggest that we open this up to a question period.

Mr. Merkley: In your staff do you have men that go out into the field and make these surveys for vector control? That is, are they specifically medical entomologists or economic entomologists, or just what?

Mr. Peters: We have a staff that is both entomologists and engineers. Depending upon the nature of the assignment an entomologist or an engineer would be selected to confer. However, I think that Ed Smith in his presentation tomarrow will very well outline to you one of the objectives of the bureau in regards to entomological guidance. We feel that the program of mosquito control is fundamentally a matter of entomological evaluation and we have developed through our requirements of local agencies, the need for entomological services within a local program whenever subvention relations exists. We have as a consequence a number of entomologists that are in the field performing that type of service today. In the development of the program we didn't have that and our own staff had to render a considerable amount of that service.

Mr. Smith: Do the entomologists with the mosquito abatement department cooperate entirely with the bureau in that manner?

Mr. Peters: There isn't an administrative tie, but there is a very good working relationship. Yes, they do. We don't feel that we have anywhere come near to the end of the trail in mosquito abatement work in California.

MR. HOWARD WILDISON
HOOPER, UTAH
TRUSTEE, WEBER COUNTY M. A. D.

As I told you earlier, I am a farmer. I don't claim to be a mosquito expert, but when a mosquito bites me I know it is a mosquito, but what breed or variety it is I don't know. I'm not too much interested and as the gentleman that proceeded me said, it's the fact that I am bit that makes me mad.

I would like to give you a brief history of the district in our county. In 1946 a meeting was held in Hooper, my home town. Dr. Young was invited out to speak. Dr. Rees was also at this meeting. They explained the mosquito problem and the methods of control and methods of starting up the district to handle the thing most efficiently. A discussion was held and the people were all enthused and in favor of setting up a district. How to set it up was the question. They explained that petitions had to be circulated and signed by residents of the county. At that time I happened to be president of the County Farm Bureau. I stuck my neck out and told them I thought that our local organizations throughout the county would take these petitions around and have them signed. That was fine for that meeting. Later at a meeting held by our county organization this was taken up and they accepted the responsibility. As a result the petitions were taken out to the local communities. I have friends in Ogden and Dr, Young has friends and he did a lot of work. I took the petitions out to my friends. Other farm bureaus did the same thing and eventually we got a sufficient number of signatures to set up a district. However, we were not able to get them signed early enough to get a tax levy for 1947. Our county commissioners are very cooperative and they loaned us $5,000.00 to carry on for that year.

An organization was set up with a board of trustees consisting of one member from each incorporated town of the county and representative from unincorporated areas. We have eight incorporated towns, each represented on our board of trustees. I happen to be appointed by the county commissioners to represent the unincorporated areas.

Our first move was to hire a director. Dr. Young was selected and he has been our director since that time. We purchased a jeep and went to work. We carried on a rather limited operation that year due to our small amount of money. We were just feeling our way along. Our equipment was not sufficient to do too much, but we concentrated in the worst areas and we feel that we accomplished something.

The next year we had more money and enlarged our crew. We enlarged our equipment and bought a building. We have some land there where we store our equipment and our insecticides. Our equipment at present consists of two jeeps and two model A. Fords, reconditioned and rebuilt. They are used chiefly by the inspectors that go around and inspect

the various areas. We have a three-quarter ton truck which we use a great deal. These vehicles are equiped with spray tanks and other equipment that are needed in this work. We also have a fogger. We got it through War Surplus. It was a smoke screen layer that was used during the war. It really puts out a fog of smoke and does a fine job. It is something the people can see and know that we are doing something. When that thing goes by we have at least a week of pretty good mosquito weather. This is a very fine thing in our program. Of course, it is just a temporary measure, but we like it.

We have started on a limited drainage program. We have one slough particularly, out in the northwest sector of the county, where the water comes in and fills it and then the stream goes down and leaves this water standing. So we hired a contractor to come in and dig a trench from that pond to the ditch. It is fixed so that it has a flat valve in it. The water can go out but it can't come back in. We hope that will do us some good.

One of the farmers in the south part of the county has a problem. He has a pond that needed draining, so we helped him in draining it. We felt that would aid a great deal in our program.

One of our main problems is our drain ditches. Along the side of the street we have an irrigation ditch on one side, and a drain ditch on the other. We have miles and miles of these ditches and they are a definite breeding place for mosquitoes. How we will handle that we don't know. We would like to tile all these drains, but that is too expensive and something that we are not prepared to do. So far, we have used only the spray and I suppose that is what we will have to continue to do with these drains.

We have a very fine working organization. They have the interests of the public at heart.

Thank you for your attention and I am very glad to be here with you. If there are any questions, I would be very happy to answer them if I can.

E. CHESTER ROBINSON, MANAGER EAST SIDE
MOSQUITO ABATEMENT DISTRICT
STANISLAUS COUNTY, CALIFORNIA.

TEN YEARS OPERATION OF A MOSQUITO ABATEMENT DISTRICT

Being a native of California I will try to be very modest and try not to say too much about all the beautiful things we have down there. I have enjoyed the trip up here very much. Some of your mountains around here are just as beautiful as the ones we have in California.

The East Side Mosquito Abatement District was formed in June, 1939, under the Pest Abatement Act of California. The district started mosquito control operations January 1, 1940, and is governed by a Board of Trustees consisting of five members, appointed by the Board of Supervisors of Stanislaus County. Our district first consisted of 33 square miles, with an assessed valuation of $16,665,000.00. The successful control of mosquitoes in this small area convinced residents in the surrounding territory of the economic, healthful and comforting advantages of living in a mosquito controlled district. Separate annexations requested by these residents caused the district to increase from 1942 through 1946 to 281 square miles, embracing most of the territory served by the Modesto, Waterford and Oakdale Irrigation Districts. Within the boundries of this district 80,000 persons are now enjoying the benefits of mosquito control. The assessed valuation is approximately $63,000,000.00 which with a tax of 12¢ per hundred assessed valuation, allowing for tax delinquency, raised $72,000.00. In addition to this revenue, the State Department of Public Health, under special grant from the California State Legislature, allocated our district $12,700.00 for mosquito vector control work. The two species involved under this program are Anopheles freeborni, malaria vector, and Culex tarsalis, encephalitis vector.

Basic principles of mosquito control have not changed in the last ten years. The desire for permanent elimination of standing water by drainage, proper leveling of land and the control of irrigation water is still the first and foremost objective of a mosquito abatement district. Our drainage program has resulted in the construction of approximately fifteen miles of drainage ditches, reclaiming over 800 acres of land for profitable farming operations and giving back to the Irrigation Districts for re-use an average of 30 second feet of water during the irrigation season.

Probably the greatest change in mosquito control has been brought about by the introduction of newchimicals to be used as larvicides. From 1940 to 1945 diesel oil was the generally accepted larvicide and was used almost exclusively by us. The close of World War II made D.D.T. available to us. Four gallons of D.D.T., 25% emlsible concentrate, diluted to 1 % solution would kill larva on 100 acres of land when applied to the rate of four gallons per acre, whereas it would take 1,000 gallons of diesel oil to cover the same area. Before the advent of D.D.T. it was necessary to use heavy trucks in order to transport a volume of diesel

oil to the fields for larviciding operations. When using D.D.T. only a comparatively small amount had to becarried, and with water availabe for dilution at any farm, it was no longer necessary to return to a central depot as qhen using diesel oil. Therefore, lighter equipment could be used. During the war the jeep was developed, which made an excellent piece of automotive equipment for spraying and transporting men and materials. We have found after five years use of D.D.T. that mosquitoes have developed a resistance to it and from preliminary expdriments this last season we anticipate using one or several of the Benzine Hexachloride formulations during the cooler part of the season and Toxaphene 50% emulsible concentrate during the higher temperature.

This district now own its own building 40' x 116' which includes an office, laboratory su fficient storage for 18 pieces of automotive equipment, a small shop and storage for gasoline, oil and larvicides. The district operates one passenger car; one one and a half ton truck, equiped with bean sprayer and 500 feet of hose; one dodge 4 x 4 pickup; one ford pickup and eleven jeeps, four of which are equipped with power sprayers of our own design. We also have two York-Hession fog generators, mounted on trailers, for aerosoling, just in case a flight of mosquitoes should come into our district. We employ a manager, secretary, part time entomologist, general-foreman, zone foreman, city inspector, six regular operators and four part time operators. Each operator is assigned a particular zone, averaging about 25 square miles. During the period from June 1st to September 15th, additional helpers are employed to assist operatiors during the height of the mosquito breeding season.

After ten years of managing the operations of a mosquito abatement district I am firmly convinced that wherever mosquitoes are prevalent in sufficient numbers to be a detriment to production of agricultural corps or to the health and general welfare of the population, mosquito control is an asset toat community and will receive the hearty cooperation, appreciation, and financial aid of its residents.

Film showing equipment and operation of the district.

You noticed that we have a hand spray gun mounted on the side of each jeep. A good deal of our work is in orchards and vinyards and in small spots where larvae are breeding and we can't use any heavy type of equipment. We have constructed 15 miles of drainage ditch, a good deal of that by hand. We have worked out a cooperative deal similar to that which was worked out by the Salt Lake district. Where the ditches are inside of a farm we get a right-of-way from a property owner and the county road equipment goes inand does the he avy work and we come along and do the finish work by hand. Through the efforts of our work many fields have been converted from bulrushes to productive clover pasture.

We have found that with D.D.T. we are having trouble with the galvanized iron cans. We are now taking the tops off as they go out and we are having new ones made

out of stainless steel. It is working very well.

We have a lot of this where the water stands in the ditches between the irrigations, peaches normally irrigated every two weeks, clover and other permanent pasture from seven to twelve days. So you see we really have to get in there and work pretty fast. It use to take us two weeks to spray a hundred miles of canal and 5,000 or 6,000 gallon of diesel oil, and now we do it with 10 gallons of D.D.T. or Rothane. Just dump it in the head waters and it kills all the larvaw allong the 100 miles of ditch. This is what we call our slug dose.

Like a good many other places we very often have to go out of our own area to maintain effective control work. If we didnt we wouldn't be able to live inside the district In our rural areas we have a problem with out septic tanks. The septic tanks themselves are all right but it is the septic rank drain that constitutes the problem. In the area down along the sloughs along the river we have a situation very similar to the one that you face here in some of your areas where we get a few Anopheles and Cules breeding.

We used to get in there and brush a lot of this out by hand, but now with the use of the airplane, we can fly over and in two days we do the entire river and get good pernetration through quite dense foliage. We used the airplane for over 250 hours this last year on rivers and on medera clover fields and the rice fields.

We tried some of the new weedicides to kill the tules and they didn't. They seem to be growing more lush this year than last after we sprayed them. We clean our ditches every year but by the end of summer they are clogged up again. We find that burning off some of these tule ponds helps considerably. Under the road as you have here we have the irrigation siphone and if they do not use them at least once a week we have considerable breeding in them. Little puddles like the dead end of and irrigation ditch all have to be taken care of. Our average size farm is about 20 acres, so you can see we must have very extensive farming operations, and practically the entire area is under surface irrigation. We have tried using a fixed boom in our catch basins and gutters but there were too many obsticles and we had to use two men, one driving and one spraying. In most of our work we have had to switch to stainless steel tanks because of the use of toxiphene.

We have a city inspector that checks the ornamental ponds and all reported ponds within the city limits two or three times a year.

Our cemetary containers were a very prolific breeder of mosquitoes. With the new type of flower containers however, this does not constitute such a problem. There are no cans left lying around with little puddles of water in them anymore.

In Modesto, one of our problems is the large wineries and their disposal of the liquid wast, which also constitutes a breeding problem for us. During the war we were able to drain many areas with government aid and put them

in to good shape. In our slug dose we are just using a 25% solution. It takes about an hour and a half or an hour and fifteen minutes. Every five minutes we dump in three or four gallons of the concentrate.

This is one of the york Hession type smoke generators that we are using. With this we used first a concentration of D.D.T. Now we are using principally benzine hexachloride in a standard base weight oil. We found that down along the river it was giving us almost a residual effect and we could do a very good job with this piece of equipment. We have whittled down the mosquitoes considerable. We have rigged up a new boom on the back of our power unit with four nozzles and it covers between thirty and fourty feet at a swath. We have tried tried the power take off but generally speaking we like the auxilliary engine on the back much better.

A lot of the farmers down there have learned that farming and mosquito contro go hand in hand. With the exception of rice where water stands, we generally do not have a very good crop.

In the plane spraying we use a boom on the under part of the wing for the purpose of spraying the area with the chemicals. That plane can cover better than a hundred acres per-hour. Our new contract runs us about $27.50 per hour. That is just the flying time. The pump in the airplane is run from the propeller and operates at approximately 50 pounds pressure. This concludes my film and short talk. I hope you have been able to glean some small protion of helpful information from it, and I thank you very much.

February 17, 1950
Friday Afternoon

Presiding: Karl L. Josephson

HARRY DREW
PRESIDENT BOARD OF TRUSTEES, BOX ELDER COUNTY

ACCOMPLISHMENTS OF THE BOX ELDER MOSQUITO AND FLY ABATEMENT DISTRICT

Mr. Chairman and Gentlemen: Up in Box Elder County we have a peculiar problem. We are only one hundred ten miles long and sixty miles wide, and we have a great part of the Great Salt Lake and the bay of the Bear River. We have a great part of two large streams that come through our county, the Malad and the Bear Rivers.

In 1943 all the mayors of the area of Box Elder County met to organize mosquito abatement districts as they saw fit. Well you can imagine what all those mayors thought who know nothing about mosquito abatement work and the problems that we had to start out with in this work. We made an appointment with Dr. Rees and went down to Salt Lake and spent one day there. We spent the morning in Dr. Rees' laboratory and the afternoon with Mr. Wilkins out in the field in the area around Salt Lake County. When we got back up to Brigham City we decided we could not do anything that year and so we passed the matter up until the spring of 1944. As the Bushnell Hospital was still in operation and as the result of a survey made by Dr. Rees it was known that a good many Anopheles mosquitoes were present. We decided to start the control work. We hired a supervisor and got a one-half ton Chevrolet truck and started this man out with a sprayer on his back and a tin cup to go out and test for the Anopheles mosquito, and that was our beginning. We have gone along since 1944 up to the present time with one supervisor who is hired by the year and then we hire additional help during the summer season.

You have seen these pictures of all the ponds they have here in Weber County. If you can magnify that by ten times you will find out the conditions here in Box Elder County.

In the begining when this county was settled in 1890 they started irrigation, they laid out the roads on the mile and half-mile line. As soon as they started operating, to irrigate they found out that they had to have drain ditches and they took teams and scrapers out there and scraped the middle out of the drain ditches and put it up on the road and that was the highway. So with farmers working with a team and scraper you can imagine what grades we had on our roads and the barrow pits. That is one of our biggest problems, the farmers dropping the water in the barrow pits and using them for drains and irrigating ditches and that is where we find the biggest breeding out in the farming area.

We have been trying to co-operate with the county commissioners, getting them to send the engineer out there to lower these road bridges and in this we have had some success. We have worked with the county commissioners in some areas with the drag line and we have paid part of the money and they have paid part. We have worked with some of the

farmers in digging a drain ditch and helped them out for a small percentage of the costs. Most of our time was spent in inspection work, going around inspecting the various pools for the Anopheles mosquitoes and we think we are very lucky that we have never had an outbreak of malaria up there, although there were numerous cases in Bushnell Hospital.

Along the banks of the Bear River and the Malad River are salt grass marshes. People who own this salt grass run their cattle down there and we have the problem of cattle tracks creating puddles in the damp ground and we have mosquito breeding there all summer.

In 1947, the Farm Bureau Ladies in our county got ambitious along in January, and came into our meeting. They decided that we should take over the problem of spraying for flies. We didn't have any money in our budget because at that time we only had $8,000.00 a year to operate on, but we told them we would do the best we could, so we hired a man with a wheelbarrow spray and we paid $150.00 for that sprayer. He went around that summer and sprayed all the homes and farmyards that people were willing to pay for and we sprayed six hundred units, so that same fall the ladies came in and wanted us to spray everything in Box Elder County. We called in the county commissioners and after we discussed the problem they decided they would help us buy a sprayer and decided that we should spray the whole county for flies the next year, which we did. Of course, the people had to pay for it. It cost about $2.50 for a house in the city and $5.00 for a homestead.

About the same time we started the fly program, the people in Brigham City found that they were being carried away by the earwigs. We didn't know if D.D.T. would kill earwigs or not and in spraying for the flies and mosquitoes around the home, we sprayed around the foundations and under the homes and we controlled the earwigs in Brigham City and also the mosquitoes and flies.

I am sure up in our county you couldn't stop the program now although we have had to raise the levy. We have had to raise the levy from one-half mill to three-fourths mill which brings in about $25,000.00. Now, if you figure up the land in miles in Box Elder County, that little $25,000.00 doesn't go very far, but we are in hopes that our people will become mosquito minded and in the future we can raise the levy up to at least one mill and perhaps we can educate the people to take care of their own little problems such as tin cans and breeding places on their own farms. The program will be a success and they will be a little more willing to raise the necessary money for this extended program.

MR. MADSON
DIRECTOR OF THE CITY BOARD OF HEALTH
BRIGHAM CITY, UTAH

COOPERATION BETWEEN COUNTY AGENCIES AND THE MOSQUITO AND FLY ABATEMENT PROGRAM IN BOX ELDER COUNTY

A few remarks on the earwig situation in Brigham City. In 1947, when they started operating the wheelbarrow spray, we asked the people in Brigham City to call us if they wanted their homes sprayed for flies and mosquitoes. By beginning this program we set a precedent and so in 1948 we went to the mayor of the city and asked him to underwrite the program in case we fell down on it. I wanted to hire two or three men and send them out to contact each property owner, and we made up a little note that they would sign and apply for spraying. We figured that we could spray the home with about ten gallons of 5% D.D.T. for about $2.50 and we figured if we charged $3.00 it would give me $.50 to pay labor and $2.50 to defray other expenses.

The mayor was a little reluctant to underwrite this. He wanted to know what this earwig business was. There was an old apple tree stump in his backyard where we were discussing the matter. I went over to the stump and picked up a rag that was lying at the base of it and there were about one-half dozen earwigs there.

He said, "Is that what you call those damn things? Sure I have them". So we got by with him very nicely.

I sent three men out and we got about a 75% sign up of our people. When we came to spray, some of them got impatient and couldn't wait and did their own spraying, but we finally wound up with spraying about 60% of Brigham City. We went right around the block and took care of every block and it was quite successful. Wherever we were able to go in and spray we obtained very successful results, and the people who were heavily infected with earwigs were very grateful for the service.

Now, after this program has been going successful thus far, I don't think it would be possible to discontinue the program because of the public sentiment, and the actual results we have obtained in our work.

HONORABLE E. D. WARD
COUNTY COMMISSIONER, BOX ELDER COUNTY

COOPERATION BETWEEN COUNTY AGENCIES AND THE MOSQUITO AND FLY ABATEMENT PROGRAM IN BOX ELDER COUNTY

I have been on the mosquito abatement board as a director from the unincorporated areas of Box Elder County and also as one of the five directors chosen by the board. In the last year I have had a chance to study the program pretty well. I think one of our greatest problems we have is drainage in Box Elder County. As Mr. Drew has already mentioned, all of our drainage runs to the barrow pits and even though we survey and grade our roads and barrow pits, we have our greatest trouble with tules in these places. That is one thing we would like to find out if there is a chemical that will kill tules. I think that as far as mosquitoes are concerned in Box Elder County and the draining of property and the saving of our roads, it would be one of the greatest chemicals for our purpose. Now, if any of you know anything that will do the job we will certainly give them a job, but we want some results. You all know that when these tules grow up you might just as well put in a dirt dam. It is the same thing, and if you go in and dig them you have a big hole there for mosquitoes and the water won't drain out, so it gives you quite a bad situation.

I am sure that in Box Elder County the fly and the earwig control is the thing that I am most difinitely sold on. Personally, I don't know as I am too sold on the mosquito program. Thinking of it from the economical side, and I am sure that we have to, this money has to come through taxation. Let's look at the situation we have in Box Elder County. Our total tax levy is about 6.25 mills. That brings somewhere around $300,000.00 for us to run our county on. We had one-fourth of a mill now raised to three-fourths which brings in around $25,000.00 for mosquito abatement so you can see what proportion we have. How far can we go with the use of taxpayer's money and be justified in the control of mosquitoes in Box Elder County? It is a big question in my mind and I am very doubtful of it. I wonder whether it is economical or not, if the value received is worth the expenditure. Now, you couldn't eliminate our program in fly and earwig control because that is there to stay and it does the work.

We had an outbreak of the blow-fly last year from Willard to Perry, due to the number of dead deer. We did a spray program there hoping we would get some financial aid from the State Fish and Game which we never received. I am sure it is important that we should cooperate together in the county.

There are a lot of things in mosquito control that we can do if we do nothing more than drainage. I would say as far as the county commissioners in Box Elder County are concerned that is the number one problem, drainage. Our roads go out because of our barrow pits and we are not doing anything about it. That is the thing that is disturbing me. If we could get a spray that would kill the tules, that is our

big problem. I am very much concerned about this problem as far as Box Elder County is concerned and I would like to say that I am not entirely sold. I would hate to estimate the amount of money it would take in Box Elder County to control the mosquitoes to say 80 to 90%. Maybe you can't do that anywhere. I don't know what percent you figure that you do control.

Let me give you one more thing. As far as the people are concerned, I believe generally in Box Elder County, and I have checked it on various occasions when we spray for earwigs and flies around the farmsteads and homes and we spray our public areas. We do a great deal in the controlling of mosquitoes as far as molesting the people is concerned. We have done so well with our fly control that a number of people are taking their screens off in the area.

I thank you gentlemen for asking me here to talk to you today.

DISCUSSION FOLLOWING COMMISSIONER WARD'S TALK

Question, Commissioner Ward: I would like to know what percent of control you men from California get in your mosquito control work?

Answer, Mr. Peters: What the gentleman has said interests me very much, and I will probably say some things that are none of my business probably, but I am going to make a prognosis for you that is going to be very discouraging.

I am going to suggest to you that the two programs that have been so successful, according to our experience in California, are going to turn turtle on you pretty soon and you are going to have to probably revise the entire structure of your activity. If and when Utah reacts as California reacted because already in California we have observed and it is exceedingly manifest everywhere that D.D.T. spraying has been done, that resistance to D.D.T. by the house-fly, the same species I presume that you are controlling here, to the point that where we even put on 10,000 miligrams per square foot as probably against the 1,000 you are now putting on in your residual, we still couldn't control them with D.D.T. Consequently in the program of fly control based upon chemical treatment alone, and I wojld think that the same thing would be true with earwigs, you are going to have the same response which means that in time your plans for chemical control are going to have to be abandoned in favor of going back to what used to work, if one used it, by that I mean environmental sanitation. In other words every fly and every earwig comes out of some situation that supports it, and it means getting back to the source of it and in some manner destroying the source and rendering it incapable of supporting the fly or the earwig in the long run.

Our programs in California had to do exactly that. My comments on earwigs are more or less based on what I would expect and the way other insects react to D.D.T. over a period of time, but it has definately worked in regard to flies.

Now, in regard to mosquitoes, as nearly as I could figure, you are spending a minimum amount of money on mosquito control, so little, in fact, that you are probably giving your public a mustrust in mosquito control because a little control is much worse than none at all. If they expect mosquito control based on knowledge of mosquito control being given, they will expect all-out mosquito control.

In California the average mosquito district operates at about $100.00 to $300.00 per square mile of actual mosquito breeding water. This must be expended in order to get what we call satisfactory mosquito absence. We don't glorify ourselves with such words as extermination or eradication or anything of that kind. But we do estimate that mosquito absence constitutes about 90 to 95% control.

I do think that two other points are well worth mentioning here. I rather gather from the method of presentation that you don't have organized soil conservation or drainage districts or reclamation districts, or anything in that particular angle along the line of water management. Now, I see for your Mosquito Abatement District a golden opportunity to encompass all of these activities that I mentioned along with your mosquito control program. As such you would be spending the tax payers money on a balanced water control program.

We are getting to the point in California where we can't rely on D.D.T. or any of its homologs to control mosquitoes indefinately because one of the districts came up this year with the statement that even their mosquitoes were resistent to D.D.T.. So it means going back to the basic principle of drainage, and doing away with mosquitoes with organized eliminative programs. It looks from experience that you would soon have to alter your program of depending entirely on D.D.T..

Question, Commissioner Ward: I wonder what percentage of D.D.T. you are using? As yet we haven't experienced this process of immunity through heredity. I know it is possible, I have studied it enough to know that it can happen. I hope that it doesn't appear here, because we are having such fine results with it.

Dr. Rees: I am very happy that Commissioner Ward came down today and the other men from Box Elder County. When I asked Commissioner Ward to talk on cooperation between county agencies and mosquito and fly abatement programs, I think that cooperation is just what we are developing. I agree that you can carry things to a limit beyond which the people of that area cannot afford to provide for that service. We would like to have it, and we know that we can accomplish it, but sometimes we feel that it is beyond our ability to pay.

As far as mosquito abatement work is concerned in Box Elder County, as nearly as I can determine, most of the efforts have been directed for fly and earwig control. Very little of the $25,000.00 is for mosquito control. Now I am confident that even with the small amount of money, that if you cooperate with the County Commissioners on their roads and getting the culverts in properly you improve the roads, you improve the drainage and eliminate mosquitoes.

If there is a Soil Conservation unit you can get them to cooperate with their program. You can go out to Bear River Refuge and get them to put in weirs to maintain water levels. You can cut down mosquitoes 50% to 75% by coordinated organized work of that kind, and at no tremendous expense.

Now, it is true that we can always remember the last mosquito that bit us much more readily than the mosquito that bit us two or three years ago. But with this type of a program, you can in certain areas reduce mosquito production by 50% to 75% and in other areas alleviate the conditions materially and that is the thing I wanted to bring out.

I have perfect confidence that the people of Box Elder County in talking this program over, can arrange a program for the expenditure of the money they have available toward fly control, earwig control and mosquito control, according to what they want. We are not trying to prescribe or tell you people what to do but we would like to help you if we can in giving the best information we have and then you will have to work out your own program.

Comment, Mr. Smith, Merced County, California: I would just like to point out the impression that Mr. Peters gave on the large amount of money being spent, maybe slightly erroneous unless it is interpreted a little more fully. For instance, my own district has a problem like Box Elder County in size about two thousand square miles in which one thousand five hundred is a very bad problem area. We have a tax rate which would be comparable here to about a mill and one-half, and that gives us about $150,000.00. However, that expenditure is out of a total county budget of $7,000,000.00 so the values are somewhat different. Costs in California are a great deal higher.

Question, Mr. Madson: I should like to ask these gentlemen from California on the cost per acre of spraying from a plane and if it has been tried successfully down there. We have a lot of area that can only be reached by plane.

Answer, Mr. Smith, Merced County: Our own district owns three planes, so we have had considerable experience. We started in 1946 contracting with a commercial operator and we contracted with a Sterman plane that had a boom on it, and put out the spray at the rate we desired. We were paying that man about $4.00 to $5.00 per hour. However, he was spraying approximately two hundred acres per hour and the cost was brought down considerably per acre. It came somewhere around 39¢ per acre for that operation. The next year we bought an Aronca Champion and since then we have purchased two more of this type and we find that with those airplanes owned by the district and operated by our own personnel we were able to spray at a cost of about 25¢ per acre. That is cost plus material. The material brings it into the 30¢ bracket. We are satisfied with the results attained and are not sorry that we got into the airplane business. Those districts who are still contracting with the private operators are probably just a slight bit higher than ours where we own our own planes.

KARL L. JOSEPHSON SUPERVISOR BOX ELDER COUNTY

PROGRAM OF BOX ELDER MOSQUITO AND FLY ABATEMENT DISTRICT IN 1949

We had a board of trustees meeting last friday and at that meeting there were twelve out of eighteen representatives of the unincorporated districts. Ten of the twelve expressed the idea that they were not receiving mosquito control. We started our mosquito abatement activities in the latter part of March last year, checking the water and watching where it was going to pool up for later reference and then we started our big sprayer and we purchased a jeep We mounted our old wheelbarrow spray on the jeep and rigged it out so we could use it as a sprayer both for adulticides and for fly spray as well as mosquito spray, depending on the concentration we got in the tank. We had a double nozzle put on the back and then a hand nozzle on forty feet of hose and we could operate one independently of the other.

Along about the first part of May we started our big sprayer full time. We equiped this sprayer with a hose reel and 2,000 feet of hose and it gave us a lot more coverage during the season with the two sprayers. We used the jeep only part time. We sprayed by record, 200,000 gallons of larvicide and adulticide. We used 176 gallons of 34% emulsions. For this, and the small sprayer, we used the wetable D.D.T. in the large sprayer because of the type of metal used for a screen.

We didnt attempt to cover the entire county. There is no question about that. It would be an impossibility. We tried to get over the area where the largest population is. We made special sprays for Memorial day at the cemeteries in the county and for celebrations. In Corrinne we practically eliminated the mosquitoes from their playground area for night rodeo. We also treated the ball diamond where they play night ball. We sprayed all the churchgrounds and the park in the canyon, Box Elder Canyon. We took that over as a rather special project and opened drains that were necessary and sprayed it once a week and made it a very enjoyable place to be. We hand-cleaned all drains as we would come them and try to keep them clean and keep the water running. We had a flood situation in the Miller area along in May and in the middle came an extra heavy rainfall which brought in large broods of mosquitoes along about Memorial day, and what we sprayed around the cemeteries controlled this infestation very well.

We have large areas in the county that are too large to spray with the equipment we have at the present time. I am learning to fly a plane with the understanding that we can install a sprayer on this plane and spray some of our areas as I fly. This may work out very good in the north lake area. The water is about two feet deep and about ten feet of silt, and it is impossible to get close enough to it with a ground rig to accomplish anything. We have a drainage problem. There is no question about it.

We do have some areas that can be drained and others will almost have to be sprayed with a plane.

We spent approximately $3,000 on mosquito abatement last year, and our balance on fly and earwig control. Our fly abatement program started rather early, because of the dead deer along the foot-hills from Hot Springs to an area just south of Perry. The blowflies there on buildings were so thick that a white building was literally balck.

At the board meeting that we had on May 27th, there was so much stir among the milk companies using D.D.T. on livestock the board decided not to spray any milk houses, dairy barns or milking parlors or anywhere near dairy cows. We ran into the situation where these men had been spraying with D.D.T. on their own, as well as using our facilities. They would literally take the spray gun out of the sprayer's hands and go through their buildings. Of course, that left us free, because they were all bigger than our employees. However, there were some places that were missed and it was not as effective as it might have been if there had been a 100% treatment. During the year we sprayed a little over 4,600 parcles of property in Box Elder County. In doing that we used more than 88,000 gallons of 2½% D.D.T. As to the flies becoming immune to D.D.T., I am not a professor on that , but as long as we are killing flies we are not going to have to worry about having an immunity.

At the present time we are having some of our D.D.T. samples tested at the U.S.A.C. to check for a bad batch that we might have purchased. Our D.D.T. was purchased on bids of a ton or more. During the season we used more than 17 tons of 50 % D.D.T. When this condition first appeared we were worried because we thought that maybe we were getting an immunity to D.D.T. I really don't delieve that we have an immune fly yet,however there is a possibility. The ammount of money we used on the fly program was about $ 18,000.

Comment: Mr Peters, California: In sizing up the Box Elder program on mosquito control, aside from the fact that I concur with everyone else that you are not spending enough money, it appears to me that you have got another decision to make, that is, doing the kind of control that is going to eliminate the mosquitoes. That is your most common problem and I have been led to believe that Aedes dorsalis is your most common mosquito. At least it sounds that way from your pastures and soforth, and probably Aedes nigromaculis is the other one. If it reacts at all like it does in California, your spraying of buildings is not going to do you much good in mosquitocontrol. I would suggest that if and when you are going to get a maximum return and you have a minimum amount of money to spendI suggest that you expend it to the greatest extent in the control where the larvae actually are and attempt to eliminate those sources. I would predict that they would be in ponds in your irrigated pastures and places where it is subject to repeated irrigation, and you have a constant fluxuating water level. This point seemed to be rather clearly indicated.

REED S ROBERTS
LOGAN CITY SANITARIAN

MOSQUITO PROBLEMS AND THE ORGANIZATION OF MOSQUITO CONTROL WORK IN CACHE COUNTY

For many years now public oponion in Cache County in regards to health problems has been one of indifference. The people have been indifferent because the Gods of Fate have favored them with luck. However, since the war the people have been asking more and more about sanitation, especially fly and mosquito control. Even without destructive epidemics to prod them or hoards of known disease transmitting insects, the thinking people are looking forward and they realize they can't always be lucky in regards to disease and that the presence of large numbers of flys and mosquitoes is not conductive to good health.

The people may or may not be ready for a fly and mosquito abatement program but, they are thinking more about one now than ever before.

Geography of Cache County and the need for a fly and mosquito abatement district.

Cache County is located in Northern Utah and extends to the Utah Idaho boundary line. The County is the central and south portion of the Cache Valley. The Valley extends into Idaho and is fifty miles long and from eight to ten miles in width. Mountains completely surround the Valley, the floor of which is flat and almost level. It was once the bed of ancient Lake Bonneville which extended all over Cache Valley and most of Utah and parts of Idaho and Nevada. The elevation is approximately 4,600 feet. The mountains to the East are a spur of the Wasatch and are known as the Bear River Range. The highest peak of the range is Mt. Naomi which is 9,975 feet. There are several other peaks near this height.

Cache County has an area of 1,205 square miles with 186,000 acres of imporved land in farms; 162,000 acres in pasture, 115,000 acres in range lands.

The city of Logan is the County Seat and is located in the south central part of Cache County. It has an area of six square miles and is eighteen miles South of the Utah Idaho boundary line.

Cache Valley has the invigorating climate characteristic of the mountain plateau region of the United States. The mean annual temperature of the Valley is 47.6° F. with a maximum of 100° F. and a minimum of about -20° F. The area is included in the semi-arid belt, having an anual precipitiation of about 16 or 17 inches. The United States Weather Bureau record of Logan, which was started in 1891 carries the following average monthly precipitation at Logan January, 1.58; Febuary, 1.50; March 1.92; April, 1.80; May 2.06; June .06; July 1.60; August .68; September 1.29; October 1.61; November 1.22; and December 1.20.

The Precipition from December to Fevuary inclusive,

is in the form of snow, The snow cover on the valley floor seldon remains more than 12 inches deep for any length of time.

The prevailing wind directions are south-southeasterly in the summer and north-northeasterly in the winter. Wind velocities are moderat remaining below 15 miles per hour for approximately 85 per cent of the time. The maximum wind velocities measured at the Logan Cache Airport was 40 miles per hour. The first killing fromst usually occurs in late September or early October, but the temperatures remain moderate to cold until December. Freezing temperatures are pronunced during the period December to Febuary, inclusive. The maximum temperatures during the Summer usually occur diring August. Due to the low humidity of the atmosphere, temperatures of 90 to 100 degrees are not unpleasant and the hot days are always followed by cool nights.

Cache Valley is surrounded on the east, south, and west by the Cache National Forest, an area of approximately one million acres. Several streams flow into the valley from the east, particularly the Logan River, the Blacksmith Fork River, and the Little Bear River. Summer home areas, overnight camping and picnic areas are in abundance, especially in the Blacksmith Fork and Logan canyons. There is a large marshy area west and north of Logan.

Mosquitoes can be found breeding throughout the county, especially in irrigated farm land areas and marshy pasture lands. The fact that the principal industry of Cache County is agriculture, especially dairy farming, accounts for an abundance of flies every year. Logan's famous open sewer and 150 outdoor privies also contribute to the annual fly problem.

No town in Cache County is very far from mosquito breeding marshes. In Logan City proper mosquitoes have been found breeding throughout the town, but only in great numbers near the edges of town. Some of the mosquito breeding marshes in Logan City extend right into the county proper and there is little for Logan to gain by controlling the mosquitoes within the city if the work stops at the city limits. Likewise with fly control, to be effective it must be at least county wide.

Politics And The Financing Of A Fly And Mosquito Abatement District

It is with caution the first part of this subject be brought up, yet it cannot be by-passed. The present Logan City Commission and the County Commissioners are very much economy minded--for which they are to be complimented. However, this desire to economize is so strong that any suggestion for increasing taxes would meet with little favor. Only by strong public opinion will it be possible to set up a tax program for the establishment of a fly and mosquito abatement district. However, that public opinion might be present once aroused.

The total assessed valuation for Cache County is $27,000,000. This figure of course varies from year to

year and although taxable it is not always collectable. The present tax rate is 9.8 mills on the dollar and this amounts to $264,000 or about $26,918.36 for each mill levy. Assuming that Cache County should levy a tax of .5 mills for a fly and mosquito abatement district it would produce approximately $13,459,18 which would be very close to about what would be needed. But since being here I have changed my mind and I can see that the initial outlay would run much more than that and before I leave here I want some of you more experienced men to give me some good ideas of just what it would cost us to get going up here in Cache Valley.

The amount I originally mentioned would not off-set the initial expense and capital outlay for starting the work, therefore it is proposed that the levy be .6 mills to begin with and then be reduced. A tax levy of .6 mills would net approximately $16,151,02 or an average of 46¢ per person per year, or $1.15 per working person per year.

The major expenses which would have to be considered in setting up an abatement district are listed below:

Capital Outlay
- Motorcycles and trucks
- Launches and boats?
- Power spraying equipment
- Power excavating equipment
- Office furniture and equipment
- Culverts and tide gates
- Pumping equipment
- Miscellaneous capital outlay

Cash Basis Fund
Contingencies
Salaries and wages
Special services
Maintenance and operation
Office supplies
Miscellaneous supplies
Communication
Travel expense
Water, light, heat and power
Rents
Repairs and replacements
Special services and contracts
Insurance
Assessing and collecting taxes
Board meetings
Fish planting

Past Attempts At Organizing A District In Cache County

During the depression years Dr. George F. Knowlton and Mr. J. A. Rowe made a detailed study of the mosquito transmission of equine encephalomylitis. They found that some of our local mosquitoes were capable of transmitting the disease and only a lack of time and funds prevented them from contin-

uing the work. The loss in horses in Northern Utah the first year had been #200,000 and the Federal Government under the Civilian Works Administration began a Pest Mosquito Control Program. Some of the work was done in Cache County. Mr. J. A. Rowe and Mr. Wiley Thomas worked out a mosquito control program at this time which Dr. Bishop of the Bureau of Entomology and Plant Quarantine used as an example because he thought it was very good. The program to control mosquitoes lasted only about three months and each County, including Cache operated as a separate unit.

During the war the U.S. Army did considerable mosquito control work in and around the County Fair grounds in the S.W. part of Logan. However, that work stopped as soon as the Army left.

Just after the war an attempt was made to organize an abatement district. County Mayors were contracted and some groups worked hard on the project but probably due to a lack of public support or organization, the program failed to go through.

In 1943, Mr. Evan Western, former City Sanitarian and Mr. Fred Harmston, USPHS Sanitarian surveyed for mosquitoes and did some control work in Cache National Forest. Mr. Stewart, Forest Supervisor states that the people in the canyon noticed that there were fewer mosquitoes after the control work had been done.

Mr. Fred Harmston is probably more familiar with the mosquito situation in Cache Valley than anyone else and his advise will be sought after before any control work is started.

Results Of Recent Health Questionaire Survey And Future Plans

Recently the Division of Sanitation, Logan City Health Department mailed a health questionaire to over 150 people throughout the County. The questionaire was sent to people in all walks of life including mayors, bishops, etc. Four of the questions pertained to fly and mosquito abatement. For the results of the questionaire in this regards, see the following page.

Future plans: early this Spring, a publicity program will be started in the local papers. The purpose being to let people, especially the County Commissioners, know the results of the questionaire survey. Next, articles will be published to inform the people just how much a fly and mosquito abatement district would cost, how it would be financed and operated. Simultaneous with the above, a committee will be organized to work on the problem.

As soon as possible, continued survey's will be made to locate as far as possible every major breeding area in the County.

The next and last step will be that of the organization of a fly and mosquito abatement district for Cache County.

Conclusions

The results of the Health Questionaire indicate that the public is in favor of a fly and mosquito abatement district for Cache County and that this year is the logical year for such an organization to begin.

> Each year thousands of germ laden flies and blood sucking mosquitoes plague us and our livestock. Several Counties in Utah have organized Fly and Mosquito Abatement Districts to combat these pests.

1. Should Cache County have a Fly and Mosquito Abatement District:

County (except Logan)			Logan Only			Total		
Yes	No	No answer	Yes	No	No answer	Yes	No	No answer
86%	7%	7%	93%	2%	2%	90%	4%	6%

2. Figuring about $2.00 to $3.00 per working person per year, do you think a program to control flies and mosquitoes would cost too much?

County (except Logan)			Logan Only			Total		
Yes	No	No answer	Yes	No	No answer	Yes	No	No answer
21%	68%	11%	9%	80%	11%	13%	76%	11%

3. Would you personally support, by your influence, a movement to organize a Fly and Mosquito abatement district for Cache County?

County (except Logan)			Logan Only			Total		
Yes	No	No answer	Yes	No	No answer	Yes	No	No answer
79%	7%	14%	81%	4%	15%	81%	5%	14%

4. If such a Fly and Mosquito Abatement District were organized, should it include: (check one) a. All of Cache County. b. Only the more populous areas of Cache County. c. All of Cache Valley?

County (except Logan)				Logan Only				Total			
a	b	c	No answer	a	b	c	No answer	a	b	c	No answer
36%	4%	46%	14%	15%	21%	56%	7%	21%	16%	53%	10%

Total questionaires from Cache County except Logan.....28
Total questionaires from Logan only.....55
Total questionaires from Cache County including Logan.....83

DR. A. W. GRUNDMANN - PARASITOLOGIST - UNIVERSITY OF UTAH

PRELIMINARY RESULTS OF AN INVESTIGATION IN UTAH OF ... ...y MOSQUITO BORNE ENCEPHALITIS.

One of the problems of medical importance to the people of Utah, and especially to those engaged in public health work and mosquito abatement, concerns two common neurotropic virus diseases that affect man and the horse. These two diseases are St. Louis encephalitis and western strain equine encephalomyelitis, commonly know as the brain fever of horses. In addition to amn and the horse, these virus diseases may also naturally attack such wild birds as pheasants and ducks. Because of work done in the surrounding states and because of the suggestive symptoms shown by some of the atypical poliomyelitis cases in recent years St. Louis encephalitis has long been suspected of being present in Utah. Western equine encephalomyelitis, on the other hand has been epidemic on horses throughout the state for the last half century, occuring at times as severe outbreaks which were generally followed by periods of quiescense with few reported cases. The last such outbreak of importance occurred in 1942 with but few sporadic cases having been reported since that time. Since both of these diseases follow the same clinical pattern in horses, it is assumed that both have been collectively reported as equine encephalomyelitis by veterinarians.

A short time ago, an investigation into the extent of these infections in the state was begun at the Uniersity of Utah as a cooperative project between the Department of Invertebrate Zoology and Entomology and the Department of Preventive Medicine of the Medical School. As consituted, the project has several major phases on which only the preliminary work has been completed. At the present time we are engaged in work on the first phase which is to establish the incidence, or percent infection, of the two diseases in the various communities of Utah. Later phases will include a survey of the birds and mammals that may act as hosts in nature for the virus, and a similar type of survey will be made to determine which mosquitoes and other arthropods are important as the vectors. At least some of this work will be done during the comming summer.

At the present time, the investigation invloves the collection of blood from horses and human beings from all parts of the state. This blood is being examined form the presence of antibodies that indicate previous exposure to the diseases. No regard is being given to the past record of disease in these animals and humans, since all those that have received the infection do not necessarily show clinical symtoms. In many, the course of the disease is so light that is not noticiable, while in others it may range from severe with definite symptoms that may end in death, to

light in which the symptoms may not be definite and might be confused with numerous common ailments. All such benign cases, however, develop measurable antibodies in their blood against the virus that remain for many years. In addition to the blood taken from normal persons, blood samples were also taken at the local hospitals from patients having central nervous system disease of unknown origin or etiology.

During the summer of 1949, 53 horses from the northern part of the state were examined for St. Louis encephalitis and western equine encephalomyelitis antibodies. Of these, 26, or approximately 50%, were positive for western equine, and four, or 7%, were positive for St. Louis. This is the first time that the St. Louis virus has been reported from Utah, although its presence here has been long suspected because of its occurrence in neighboring states. The high incidence of equine encephalomyelitis found is suprising in that horses of eight years of age or older are almost invariable positive. Most horses tested have not been vaccinated for at least three years and it was found in the cases of young horses that had been vaccinated the previous year, and had not been exposed to natural infection, the measurable antibodies were not present after a one year lapse. This ruled out vaccination as a possible factor in this high percentage of infection.

Thirty normal human sera were tested. Of these, two showed antibodies against western equine, demonstrating that they had been exposed to the virus at some time during their past lives. Of 15 human sera tested from patients having central nervous disease of unknow etiology, one was positive for western equine. The human sera was not tested against St. Louis because of insufficient time, but this will be done this comming summer.

Since little organized investigation has been carried out on transmission of these diseases in Utah, the epidemiology of them is not definitely established or understood. In all probability, as was shown by Harmmon and his co-workers from the Hooper Foundation in California, on work done in the Yakima Valley of the State of Washington, the disease is largely mosquito borne, at least as far as the horse and man are concerned. In many respects, northern Utah is similar to the Yakima Valley region, and it seems logical to assume that similar conditions will be found to exist. The Yakima Valley studies indicate that several species of mosquitoes were involved. Of these Culex tarsalis was found to be the most important. Other species shown to harbor the viruses of both diseases were Culex pipiens, Culisota inornata, and Anopheles freeborni. Since all of these species are present throughout Utah in considerable numbers, it is not difficult to see the implications of the potential situation that exists. Culex tarsalis is one of our most common mosquitoes, breeding in standing water throughout the summer in all localities.

Other phases of the cycle of the diseases, as worked out in the Yakima Valley indicate that these mosquito species were found infected in nature and carrying the disease to humans and horses during outbreaks. It was also found that

the mosquitoes do not become infected by sucking the blood of infected persons or horses. Further investigation showed that the domestic chicken was the source of virus for the vectors. Chickens, temporarily have virus in their blood and act as reservoirs although they show no symptoms. The chicken gets its infection through the agency of certain species of mosquitoes that feed upon it and also upon certain other wild birds such as the English sparrow and the house finch which are thought to be the natural reservoir of the disease when it is no present in epidemic form. The chicken mite, Dermanyssus gallinae, is also of importance as it was found to transmit the virus from bird to bird.

Losses among horses have been considerable in some localities of the state, and with the ad of factor of human cases occuring, it is desirable that the advantage of available measures to control the ravages of these diseases should be taken. We probably cannot ever eliminate these from the community although we can probably prevent all, or almost all human, and equine cases through the agency of effective mosquito control. While the mite to wild bird cycle continues indefinitely in nature it will not become apparent unless the mosquito vector gets out of control. Thus, through a well developed and directed mosquito abatement program, we can control these two ravaging diseases.

Dr. Rees: Dr Grundman would you be willing to make a statement as to what percentage of polio cases might be encephalitis?

Dr. Grundman: That is a hard question to answer at the present time. We have checked some of the cases primarily those that have atypical symtoms and there are only 14 or 15 of them that occured during the last summer. Most of them were considered to be typical polio and were treated as such. From those showing atypical symtoms we obtained blood samples and these were run through a serum neutralization test against western equine, and we are going to run the same samples against St. Louis this summer.

Dr. Rees: What percentage have they found in other areas that were diagnosed locally as polio and later under laboratory diognosis turned out to be encephalitis?

Dr. Grundman: Quite a high percentage I think. In California, it ran up as high as 30 to 50 percent. I won't swear to those figures but just as an off hand estimate I think that is just about right.

Dr. Rees: In other words a good many cases diognosed as polio they have found to be encephalitis. I think that you are right 30 to 35 % they now find under laboratory diognosis to be encephalitis.

FRED C. HARMSTON
S. A. SANITARIAN (R) U.S.P.H.S.
INSECT VECTOR CONTROL PROGRAM IN UTAH

The discussion here I see is entitled Insect Vector Control in Utah. Well that title is a little bit misleading. The public service operating in a state does not operate as a public health service. In other words personel assigned to a state lose their identity. They are assigned first to the state health department and then in turn they may be reassigned to local health departments and there operations at all times are under the direction of the state health department.

A little background on the work that has been done in Utah during the war. We did the malaria mosquito control around the prisoner of war camps and the general hospitals. With the termination of the war and the moving of the prisoners of war from the state, and closing of the general hospital at Brigham city, our work was pretty well liquidated in that respect. In the next year or two after that, there was of course a lot of intrest in mosquito control work. At the direction of the state health department, we made surveys in various parts of the state. As Mr. Roberts indicated we did assist in some demonstrations and surveys in Cache County Utah, in the vicinity of Logan. We made some surveys in the southern part of the state where state personel were not available, in the redman area, also the Uintah basin and in Washington County. We also worked very close with Dr. Ross and kept him informed of our findings so that he could take over the follow up work on these surveys.

However, in the last two years our emphisis has been placed on rodent control and it is that subject that I will treat in the presentation of a colored film.

Sound film with commentary.

February 18, 1950
Saturday Morning

Presiding: Robert W. Wilkins

ROBERT W. WILKINS - MANAGER - SALT LAKE CITY. M.A.D.

PROGRAM OF THE SALT LAKE CITY M.A.D. IN 1949.

Mr. Chairman and members of the Utah Mosquito Abatement. The program of the Salt Lake City Mosquito District began in 1949 on January 14th. The employees constructing a nine stall garage for the housing of equipment. The manager bringing the maps up to date, and planning the seasons program.

Plotting on a map and numbering field and resident pools, has been found of first importance in an effective mosquito control program. Without this knowledge of location and the how of finding them the employees would be entirely lost. These maps hang in the office for the inspectors to designate by a pin larvae infected water. The spraying crews depend upon these marked areas for the days activities.

The field operations consist first, on inspection by one of the key employees assigned to one of the four sectors into which the district is divided. His findings, wether it is trouble in the drains or water infested with mosquito larvae are reported each evening.

Second, the draining of impounded water if possible or the application of the most suitable larvicide for the immediate prevention of mosquito emergence follows.

Third, the planting of Gambusia (the little larvae eating fish) in all the drains, and permenant ponds, and lakes is a general practice. From May through September two employees were assigned to this type of control work, as well as inspecting and spraying the 1,421 ornamental residential pools. 5,371 visits were made to plant fish and to apply other methods as required. 358 house pools were sprayed during the season to prevent mosquito hatching. A total of 53,714 Gambusia were planted, and must have aided greatly in the seasons successful results. About 60 residences were visited each day, in the residential section as far south as 48th south.

The equipment of the District consists of two Fords, one International, one Studebaker half ton trucks, two Dodge weapons carriers, two modified Dodge ambulance type trucks, to Harley Davidson three wheeled motor cycles, one Willys jeep, one Willys station wagon, one half track, a D4 tractor and two ditchers. Six of these cars are equiped with power sprayers or pressure tanks for larviciding, three with ground aerosol attachments, and two with booms for ground larviciding. Two cars used by the drainage crews. The D4 tractor and ditchers are used in cleaning old drains and the construction of new laterals. In 920 tractor hours, and 8,141 man hours, 31 miles of old drains were cleaned and 3,641 feet of new drains constructed, as well as the removal of blown weeds from all drains. The Essick and Hudson power sprayers under 150 to 200 lbs. pressure performed without much trouble, under intensive service.

The presto seal Hudson hand spray cans of 2 - 3 gal.,

capacity, as well as the Meyeres knapsack four gallon capacity were used for field pools out of reach of the power sprayers. Of the 2,066 field pools located, 1,290 were constant and active producers of mosquito larvae. 15,216 visits were made to inspect these field pools, before and after treatment, to know when the work of elim nation is accomplished. A record was kept this year of the number of pools containing larvae and pupae. The total of 2,674 in all, required 3,227 visits and revisits to spray and respray. I say respray since it was found that D.D.T. in allowable precentages did not kill pupae. When pupae were found, a return visit to spread the (old reliable) fuel oil and Rielly flotation activator was applied.

528 gallons of 25% D.D.T. emulsion, dilute with free water to 17,816 gallons, 7,592 gallons of fuel oil 227 gallons Reilly flotation, 2,000 gallons 5% Thanite in kerosene, and 1,000 tossits, the latter being placed in inaccessible holes and sloughs were used to stop the life cycle of the mosquitoes. Ground areosols containing 7½% D.D.T., and thanite were blown through the parks, over the fair grounds, and along the river banks to check adult migrations. Assistance was also given in the program of gnat larvae destruction in North Salt Lake. For the first time the Airplane was brought into service on three special occasions. A great deal of time was spent by the manager in the preperation of maps and in outlinning the program of seasonal work, under the cooperative drainage committee County Commissioner Ray P. Greenwood is here today to explain the operations of this most extensive program, not included in this report.

The details of operational costs and accomplishments will be found in the summary as published by the Salt Lake City Abatement District, and will be avilable at the conslusion of the afternoon session.

DR. JAMES Z. DAVIS
CITY HEALTH COMMISSIONER

THE FLY CONTROL PROGRAM IN SALT LAKE CITY DURING 1949

About five years ago we had a rather sever polio epidemic in Salt Lake City and there was considerable talk about some sort of fly control because the fly had apparently, in some investigation, been indited as the carrier of the polio virus. You recall at that time, that the war in Europe was apparently over and the war in the Pacific was continuing. However, we had started to hear marvelous things about the new insecticide D.D.T., and there was a certain amount of this substance made available through the U. S. Public Health Service for civilian use.

From this rather modest begining we started a spraying campaign to control the flies. At this time we also did some trapping. We set about twenty-five traps throughout the city in various areas. We felt that if this campaign of this program was to be a permenant one, we would have to know more about what we were accomplishing. Dr. Rees and the personnel in Dr. Rees' department very obligingly helped us with counts and identification of these various types of flies. Therefore, the summer of 1949 gave us somewhat of a base line to compare our other and subsequent programs.

We started out then with hand sprays that looked more like these large fire extinguishers. We hired a crew of three men. We had a truck at that time that was not too dependable, as most motor vehicles were ready to break down after strenuous war years use, and they could not be replaced, and we couldn't get parts for them. We went ahead with this, and we determined rather than doing some of the more spectacular things like aircraft spraying and large power spraying that we would spray the garbage cans. We felt that there was good reason and that we were more or less using the garbage cans for a fly decoy, the odor from the garbage would bring the flies. We felt with the rather modest beginings that this was about all that we could do quite effectively at this time. We did cover the city that summer and I think that we used a 5 or 10% suspension of D.D.T.

We have continued this program. It has evolved considerably since then. We have a jeep now. We have a pressure tank on this jeep, and we were able to thoroughly cover the entire city last summer plus the picnic area in City Creek canyon. I know that a lot of you here are aware we were asked to go into a lot of the other canyons, but we felt that we would probably be critised even through there were a lot of our citizens from Salt Lake City using these canyons. However, City Creek, you understand is city property and we felt that we could go in there with some justification. The year before last summer we trapped again. Interestingly enough we found that we had reduced our fly population and in every instance possible we tried to use the same trap, baited with the same bait, in the same area. We used chicken offal as bait. We acquired it from one of our poultry

producing plants in Salt Lake City. We were unable to put a trap in the same place in a few cases because, they had built a building there in the meantime. But, in general, we tried to have a comparable picture and we found that by spraying the garbage cans alone that we have reduced our fly population to from 60 to the highest of 82%. That is the difference between the '45 trapping and the '48 trapping. This seemed to be a very good result. In fact, Mr. Hickey and I were a little reluctant to report and we called in the men who were taking care of the trapping and told them to make sure that they hadn't been negligent in the care of their traps and so on, and we had one man that did nothing but keep the traps baited and bring in the catch.

Therefore, we do feel that this moderate expenditure is a fairly effective way in the control of flies, and do recomend it to other areas as being relatively inexpensive and being quite effective. We also do this and it gives us an opportunity to inspect garbage cans, we also put a tag on the can that tells the housekeeper that this can has been sprayed and not to wash the outside of the can.

We come then to the spring of 1949. We have been reading about D.D.T., apparently from laboratory experiments they were certain that there were flies that could build up a relative immunity to D.D.T.. We have now personal experience with this. We did get in touch with the communicable disease control center of the U.S. Public Health Service and they gave us quite a bibliography on various work that had been done in various entomology laboratories that did seem to show that certain flies were able to develop some immunity to D.D.T.. Last year, we used the 5% suspension of D.D.T., and a special light oil that we were told would help stick this on the cans better, then we added 2%chlordane to this mixture, and we sprayed with that. We covered the entire city and it gave us an opportunity to inspect the garbage cans. It gave us an opportunity to check on some of our garbage disposal problems and we have presented that material to the City Commission.

In short, what I am trying to say is that there are other uses in this campaign, there are other values that come from this program. So I think that all of us should understand that it is simply not a question of spending this much money for the fly alone. It helps in other sanitation matters and gives one an idea how effectively we are carrying out other sanitation programs. We also sprayed all the garbage cans in the picnic areas and the areas themsleves in City Creek canyon. We did that and this is our total expense. A $96.00 pressure tank with gauge, hose and nozzle; miscellaneous supplies, rubber gloves and etc., D. D.T. and chlordane spraying materials $508.00; labor June, July and August, $2431; gasoline and oil, $49.50, that $49.50 of course, is the rate the city has to pay for gasoline. We sprayed this aforementioned area at a total cost of $2,054.00. Now, we estimate that there are about 35,000 homes in Salt Lake City, each of which have one garbage can and possibly more. I think that possibly you know that City Creek canyon is prob-

L. T. NIELSEN

ably the heaviest used picnic area, and we think that this is an extemely modest cost for such a desirable and effective method for the people of Salt Lake City. Not only to reduce the nuisance of flies, but also to reduce the potential danger to the citizens and their health, not only from the standpoint of polio, of course, but probably more likely and more effective from the standpoint of protection against dysenteric infections which are probably more commonly carried by the fly than is polio. We feel then, that with this modest expenditure, under $3,000.00, for a city the size of Salt Lake that it represents a very fine and on the whole a very economical program. We feel that our trapping of 1948 indicates that the program is effective. We plan on trapping every three years to give us a good idea of our effectiveness or lack of effectiveness in controlling the fly.

We have, in general, hired college students for this work. It fits in very fine with our program. They are usually getting out of college at the time the flies begin to appear in number. It is seasonal labor and you can get a high type of person to do seasonal labor, and then, of course obviously it stops about the time school starts again in the fall. We have paid them by the day rate the same as other people working for the city.

I would like to recomend it to all of you as an effective method of fly control. Now, I am aware of the fact that we have got considerable advantage from the house holder, who sprays his or her porch or around screen doors. I am sure that collectively we have probably killed millions of the flies. We don't pretend to claim the complete or exclusive credit for this rather marked efficiency in fly control that we have attained. But we do feel that for a workable type of program, and a program from the figures quoted here, it surely is not an expensive program. This thing of using the garbage can for fly decoy and putting the D.D.T. and chlordane suspension on it represents about the most effective way of controlling the fly for the money that it costs. I was very happy when Dr. Rees asked me to come here and speak to you regarding this subject, because we have read about a number of other programs. We have followed ours up with trapping and I believe that we can give you quite a creditable figure on that.

I think it also fits in with the work a few people have done and are doing, and that is the control of the other great insect pest and carrier of disease, the mosquito. It does show that cooperative efforts and thoughtful analysis of the problems of insect control does bear fruit. I know that the Salt Lake City Board of Health, and the mosquito abatement throughout the state, also in my opinion, operate on a very economical level for the benefits the citizenry receive.

I think that often in public work or places of public work, there is a feeling among many people that there is a little more waste and a little more deferance to waste and so on. I have seen the public records, particularly of the

Salt Lake Mosquito Abatement District and it seems to me that the cost is very, very modest compared to the saving in nuisance value alone, let alone the obvious saving in disease and so on. Therefore, I do feel that if you in your community have the fly problem such as most communities have, that this method of ours would be quite worth while for your trying. I think people in your area would be quite happy to have you try it.

Again, I am very happy to have been here and to have been able to tell you about our experience with the control of flies. Thank you.

Question, Dr. Rees: Dr. Davis, have you noticed any appreciable difference in the results of using chlordane other than the results you previously obtained from D.D.T.?

Answer, Dr. Davis: No, I believe it is a little too early to say. I think we are always a little too easily impressed with something new or something different. I do know this, that I was talking with a manager of one of the large chain stores, he said,

"Do you know that it has got to the point where we never even stock fly paper or fly-swatters any more?"

I believe, probably that the average Salt Lake City citizen is saving as much in the expenditure of fly-swatters and fly paper as it is costing to maintain this program.

I think we would like to return in a couple of years, Dr. Rees, and we will have another fly trapping program under our belts and I think we can tell you quite definitely. We hope after one more trapping to compile our results and our methods, and probably publish a paper on the experience we have had.

HONORABLE RAY P. GREENWOOD - COMMISSIONER SALT LAKE COUNTY
A COOPERATIVE DRAINAGE PROGRAM IN SALT LAKE COUNTY.

Mr. Chairman and gentlemen. I deem it a pleasure and an honor to be here this year to say a few words to this group. I am not going to make you a speech, I just want to talk to you a few minutes about the work that is carried on in Salt Lake County in regards to flood control and mosquito abatement.

After I was elected to the County Commission a few months ago, I found that my job had nearly as much to do with water control as it did with roads and bridges. As Mr. Wilkins has told you, I have the flood control work and I nearly feel that sometimes I am on your mosquito abatement board. It does resolve itself in somewhat of a peculiar position in our commission. We have a great flood of water running into the lake, water that we are trying to control and get rid of without doing damage, and we all know that we are in need of two sources of culinary water. But, I am happy to be able to cooperate with the mosquito abatement people.

In Salt Lake we have a problem, in the lower region especially, in the Great Salt Lake area, also in the area south to Murray, in the Magna region and in the Copper Co. area. This whole area is more or less of a swamp country and of course, in that particular area when it was necessary to travel through it, it was almost impossible due to the unbearable presence of mosquitoes. It was a very undesirable place to live on account of mosquitoes and I am very happy to see that something is being done about it. I know that in recent years they haven't been half as bad as they used to be. I know that the Board of Health in Salt Lake City is doing a marvelous job of fly control. You hear comments on it all the time, and I think Dr. Davis is doing a remarkable job in the city. It is just like Dr. Rees has said, when the pest is eliminated, they wonder why they need control, because they are not bothered by that particular annoyance.

Now in this area, that I have been speaking of the old Jordan River has been the natural drainage for the county for generations past and also taken care of the run-off in Utah County. Utah Lake is fed through the Jordan river to Great Salt Lake. In the spring, when they have the run-off in Utah County and we have the run-off in Salt Lake County and, of course, any surplus Utah Lake can't carry or hold comes out of Utah County to the Great Salt Lake through the river. During the dry cycle we have gone through in recent years which reached its peak in about '34 of course, Utah Lake was down. We didn't need to worry about any particular run-off in Utah County. In fact, it was so small in Utah County that that river had actually grown up in vegetation and a lot of that tract was used for pasture. The stock had tramped the banks in, the willows grew up in that channel and it was just not adequate to carry the water when a wet cycle began to come into being.

So, that is one of the problems in Salt Lake County at the present time. Just a few days ago the lake and river commissioner called me and said, "I thought I had better let you know that tomorrow we are going to turn 200 acre feet out of the lake into the Jordan River."

Now, that is something gentlemen that I am mighty glad to hear. We have done a lot of work on the Jordan River and we were able to take care of that extra water. The reason that I am glad to hear it was that we all realize that water is the life blood of our country and we are all very happy to hear that Utah Lake is up to the point where they have to turn some out to take care of the spring run-off.

Our work with the Salt Lake Mosquito Board has been very agreeable. There was an agreement between Salt Lake City and the County and the mosquito board, to each participate to the extent of $10,000,00, and it was generally agreed upon that it was mutual, a mutual problem.

Salt Lake City has drains running out through the west area between the lake and the city. The mosquito abatement has some which they have made to control mosquitoes. The county has some that takes care of water that accumulates in the county. There is quite a network of drains and large channels going through this area. When I first came on the scene I had a man take me out through this area and he showed me around and as we came upon this maze of drains he said, "This is the Salt Lake City sewage drain, this is the county drain and it was put in in the year so and so." We are only to take care of certain conditions south of 33rd south, etc, etc. That is why I think it is very advisable to have a joint agreement so that we can go out there in a body and work on these drains and not have to worry about whether we are working on a city drain or a county drain or a mosquito abatement drain..I think we shouldn't draw the line too closely between whose responsibility it is on the various work projects taken..Ithink we should take into consideration the tax payers money, who are receiving the benefit or the work done. In that case they are all paying their tax to the project and if it is benefiting enough people I think we are justified in pooling our efforts and pooling our funds and doing a job that is going to be beneficial to the people. Now, we have done that this year, and we expect to put the project into practice again this comming year.

I was going to read you a lengthy report but I wont. I will tell you that there has been a great amount accomplished with this amount of money. I think that I can honestly say, and I think that the officials of the Salt Lake District will bear me out in this when I say, the least amount of money has been spent for supervision possibly of any project that has ever been put over. On our part there was no money spent for supervision. Our supervision on flood control also supervised the qquipment along with the help and cooperation of Mr. Wilkins, and that money was spent with very little going for supervision.

I would like to say a few words in regards to the mosquito abatement board. We have two mosquito abatement districts at the time in Salt Lake County and they are working hard to create another. I think that the people on these boards should realize that they are servants of the public. I think that we should realize that the public is watching us, and every man that pays a tax feels that he is their boss. I think that we should strive to the utmost to accomplish the most with the money that we have to spend. I had a committee come to me the other day and they wanted to know why the work had been curtailed in a certain mosquito abatement district. He didn't know, of course, that we had no control of supervision over mosquito abatement projects. However, it gave an inkling that there was a district where they might be bogging down just a little. So, I think it would be wise if we could keep that one thing in mind.

I want to tell you again that I am pleased to be here, and appreciate the invitation very much and I want to wish you success.

Mr. Wilkins: For the benefit of the record only I wish to state the totals only of the work accomplished under this cooperative plan, which was operated for the first time last year. The mosquito abatement districts other then the work reported on, used a bull-dozer, a ditcher, and some man-power on this job throughout the summer removing spoil banks. Thirty-five thousand and eight hundred and nine feet of spoil banks were moved in preparation of the ground so that the drag lines could proceed along the work. Removing 58,538 yards (cubic yards) and 16, 12 inch culverts 16 feet long were placed under the spoil banks to admit water into the main drain.

The man labor cost them $1,589.00 Total expenditure was $6,129.59. Of the mosquito fund, $3,870.50 was spent on hired drag lines. Salt Lake City Streets Department spent $10,000.00 in cash. Salt Lake County furnished one drag line throughout the season, never taking it off the job except once or twice for a day or two on emergency work. In all they cleaned 35,900 feet of drain, that was too large to clean by hand, at a cost of $8,134.00. Man labor, trucks, and so forth, moving trees, hauling, and so on was $2,056.52. They were generous enough to run over their allotments, spending $10,991.05. The hired drag line ran into the county drain and Salt Lake City drain. The county drains and everything that runs into it was handled by the Acme Construction Company. This took 12,050 hours which cost us $10.00 per hour or $12,500 for moving 56,347 cubic yards. That was quite a lot of work along the more permenant methods of mosquito abatement.

Comments by Dr. Rees:

When Commissioner Greenwood first took over his office and saw the problem, as stated, it seemed so confusing to him, and he suggested that we might be able to work

jointly on a drainage maintainance program. That is exactly what mosquito abatement was in favor of and in harmony with. We went out and looked the thing over and decided what should be done and it was never taken into consideration whether it was mosquito abatement drainage or county drainage or a Salt lake City problem. The work was done where it was needed.

Outside of regular salaries being paid, I dont think anything was paid for extra supervision. Mr. Greenwood volunteered for one of his men to go by and check the work in progress. I want to say that we certainly appreciate the cooperation and the help we have received from him and I know that he accomplished an excellent drainage program at very small cost.

DON R. MERKLEY - CHIEF INSPECTOR - SALT LAKE CITY M.A.D.

AIRPLANE AND PRE-HATCH TREATMENTS USED IN THE SALT LAKE DISTRICT

At a time like this I feel that I am truely an Entomologist. I have butterflies in my stomach. I was asked to discuss the topic, "The Airplane and Pre-hatch Treatments Used in the Salt Lake District". After seeing the film shown by Chester Robinson yesterday, I feel that a discussion on this subject would be of more value to the group than an organized talk. However, I will outline the program as it was carried out last year and then leave the problem open for more discussion.

The year 1949 marked the first time the Salt Lake Mosquito Abatement District has used an airplane in applying insecticides. During the month of June, the migration of Aedes dorsalis invaded Salt Lake City and caused much annoyance to the population. As a result, we hired a plane to carry out an experimental project of spraying the adult form in order to try and stem the migration in the city. The plane used was a piper cub owned and operated by the Midvale Flying service. This was equiped with a 40 gallon aerosol Spray King Spraying Unit and powered by a 85 horsepower engine. The spraying unit used a 20 foot boom attached under the wing and the insecticide was released through 15 spray jets.

On June 20, 1949, an area of 20 acres was sprayed along one of our canals with the hope of steming in part the mosquito migration mentioned. The adultacide used for the first application was a mixture of number 3 fuel oil and Thanite, in porportions of 3 Thanite to 1 oil. The airplane flew at the apporximate altitude of 15 feet, and covered a swath of 40 feet in width. The insecticide was despersed at the rate of 2 gallons per acre.

There is little if any residual effect produced by the Thanite and oil, so it was very difficult to determine the result of the spray. Great numbers of the mosquitos were along the canal prior to the spraying and a few hours later there was still a great number there. Some undoubtedly came in from areas further out from where we were spraying and followed along the canal seeding shelter in the high weeds and grasses.

On June 28, 1949 the airplane was used to spray immature forms, going over an area of 40 acres of the Harrison Gun Club. This area was treated with an application of 3 fuel oil and D.D.T. at the rate of 2 gallons per acre. Due to the heavy growth of salt grass it was decided that D.D.T. should be applied in the amount of .4 pound per acre. The results of this larvaciding were very gratifying in as much that there was a 100% kill in spite of the fact that heavy winds were blowing at that time.

The cost factor is one that I would like to have discussed by those present, in view of the fact that much of our breeding area could be sprayed by air and controlled in that way. It is fairly evident in comparing the cost

factor of airplane spraying with that of spraying by hand with ground equipment. We have to take into consideration; first, accessability to the area; second, the length of time it would take to cover the same acreage; the third fact, that an airplane can cover certain areas that a ground crew cannot; and fourth, the rate at which an airplane can spray the insecticide when needed as compared to the rate of application by hand. These factors plus others must be weighed and compared before a definate dicision can be made

The year 1949 also marked the first time in the history of the Salt Lake Mosquito Abatement that an organized program of pre-hatch treatment was carried out. The history of pre-hatch treatment covers the treatment of several areas in different parts of the United States. In many cases it has become a popular method of mosquito abatement. Until the advent of D.D.T., little of this type of work had been done. However, D.D.T. has made it possible to spray probable breeding areas and know that the residual effect of this chemical will be lethal to most of the larvae that may hatch on the treated area. Now this is in deference to the discussion brought out yesterday by our friends from California who stated that most larvae are becoming resistant to D.D.T. However, I believe that we will be able to carry on a program of this type for a period of maybe two or three years, and longer if necessary, before we have any effects of resistance according to a discussion and statements made by these people from California. The spraying equipment used in our pre-hatch treatment consisted of an Osage Power Spraying Unit mounted on a four wheel Dodge truck, with a spray boom 12 feet long. This was used with jet nozzles dispensing the insecticide. The boom was 24 inches from the surface of the ground. The pre-larvicide solution was put out at a pressure of 50 pounds per square inch, driving at a rate of 3 miles per hour. It is estimated that the coverage would be at the rate of .4 of a pound of D.D.T. per acre. At this rate it was estimated that a 100% kill would result even though there was a heavy cover of salt grass. Now, there were various areas covered that I am not going to mention because they would not be pertinant to the group here.

The total estimated acreate treated was approximately 125 acres. A total of 3,400 gallons of solution was used at a cost of $121.50, which was the initial cost for the 25% D.D.T.. Due to the fact that ground spraying equipment was able to cover all the area while it was dry, the large factor in the cost in over-all opperation, much more time is involved when these areas are flooded and breeding mosquitoes and they have to be sprayed by men using hand equipment. The result of the pre-hatch treatment can not be judged until these areas are flooded during the earily spring and summer when these broods make their appearance. So far this year, many of these areas have not yet been flooded, and it will be another month before we can determine any results.

In the per cent of D.D.T. used, we used .4 of a pound per acre in most cases. We cut that down to nearly .2

pound per acre where there was no heavy growth of salt grass or in one case where we burned the salt grass off before we treated.

Now, if there is any disucssion I would like to entertain it as this time. Are there any questions I might answer or any questions that might be brought up by the group?

I would like to find out more about the cost-matter question. Maybe I didn't hear the figures right, but the cost of airplane spraying in California as compared to the cost against the fow minutes we had a plane in the air here in Salt Lake, I wonder if we could get someone from California to make a comparison with what it cost us here. Of course, this is the first time we used a plane here, and after equiping the plane with the unit, we ask them for the cost of spraying the various areas. Now, the rate that was charged for the spraying we had done was about $2.00 per acre, which seems to us, after hearing the remarks yesterday a very high rate. We have talked it over with the owners of the plane, and they thought they had to charge that much because they didn't have their plane up on a contractual basis. We could could use that plane much more effectively if we didn't have to pay so much for the spraying. Of course, you fellows, have your own planes for spraying but what would be the actual cost?

Comment, Mr. Smith of Merced County, California:

I think the thing in your condition here you had this man build up his peice of equipment and he just went out as a single experiment. You cannot judge that on the condition where you make the contract on the years basis. The man knows that he is going to get, for instance like Turlock in Modesto District where he gets a $16,000 to $20,000 a year contract. He is all set up he has his pilot and his equipment. He then can cut his costs because he knows where his contracts put him. Last year our contract was $1.25 more than it is this year. There is no reducing his figure was a voluntary reduction. He said "well I found out that with the amount of work that you are doing in these districts I can still make good money at the figure of $27.75 per flying hour." That figures out roughly in the district of 30¢ an acre. Now they vary. We had the figures from Bakersfield who own there own plane and some of there spots cost them 2 or 3 dollars an acre, where they had to run way out and spray 10 acres, but the average I believe is 29¢ to the acre.

So your condition here where this man charged you $2.00 per acre to go out and spray 100 acres and that is all he got out of it, after building that piece of equipment it would cost him more than that to do the job. I dont think that is unreasonable at all. I do believe it would be unreasonable if you gave him contract and said there, we want you to spray that whole salt marsh down there 2 or 3 times a year where he's got a beautiful set up of open ground with no high tension wires around. Why I think he can get in there and ought to be able to even whittle our costs.

Dr. Rees: Is that cost to and from the job?

Answer: Yes, from the airport to the job and back again. It is the actual flying time that the plane is in the air.

Dr. Rees: He loads only at his airport?

Answer: He loads only at his airport with us, but over at Turlock he has another airport over on the west side. He carries his own insurance and own compensation and everything

Don Merkley: Yesterday you said that the total cost was $27.00 per hour and in an hours time they covered approximately 100 acres.

Answer: That is true as an average. But where he has a large patch like doing a river, then he does many more acres, we have a lot of places where we may have 2 or 3 patches close together of from 10 to 20 acres and that takes more time.

Don Merkley: That is the thing I wanted to have straightened out because we can very effectively use airplane spraying and equipment in various large areas of our mosquito abatement district. After talking to Mr. Kent he thought that this year he could equip a helicopter he has there, but after talking to some people it looks like that would run into too much expense.

Edgar Smith: We usually don't send a plane out to spray anything less than 40 acres unless we use the smaller planes, but if you use the larger planes you spend so much time making turns that it isn't worth it to send a plane out for less than 40 acres. Sometimes we have sent them out for as little as 20 acres in some isolated spots, that have been inaccessable. Where we own our own plane the cost runs about 21¢ to 22¢ per acre, that is without the insecticide. But to spray with a truck it runs anywhere from $1.50 to $2.00 per acre, and by hand with a hand can it runs even higher than that. In some cases where you run the plane up for a few small acres it may well be worth it.

Don Merkley: What amount of insecticide can be taken up on your plane?

Edgar Smith: Our small size plane carries the same size tank, 40 gallons. Actually though, we hardly ever fill it with more than 30 gallons. So at about a half a gallon per acre of 10% D.D.T. we get our .4 of a pound to the acre and cover about 70 acres to each flight.

However, there are many other factors that determine the cost, such as the distance you have to go and swath you can get with the equipment you have. For example, the first year we operated, we were getting only a 35 foot swath, however, we improved our boom the next year and we were able to get a 50 foot swath with a small plane and that also cut down on the cost.

Dr. Rees: Would you suggest then that the gallons per acre be cut down under 2 gallons per acre which we sprayed?

Edgar Smith: Well, at the rate of 2 gallons per acre, of course you are going to have a lot higher cost, because you are going to have a smaller pay load. The object is to get it down as small as possible. Of course, with airplanes equiped with aerosol equipment they get down to a pint an

acre. Of course you can't use that very well on Aedes mosquito because that isn't a high enough dosage, but it is very effective in rice fields against Anopheles mosquito, where only .2 of a pound per acre is necessary.

I would like to give you some of my own experience on the treatment of pre-hatch areas. My first experience was in Arkansas in the rice fields. There, it was a problem of spraying the ground before the first flooding, to control that initial brood of mosquitoes.

Experiments carried on by the Army in Arkansas showed very definite promise for that method, but at that time the war ended and it wasn't carried on any further. When I first started working in Merced County I remembered that experience and so in setting our control dosage for Aedes mosquito in pastures we arrived at .4 pound per acre for a larviciding dose. We also were treating pastures where part of a field was dry and part was flooded and so we were spraying the dry parts also and we discovered we were getting some larviciding effect on the next irrigating of those pastures. Those pastures were irrigated every 7 to 10 days. We were not able to carry on basic research at that time to find the results we were getting so we were very glad when the State Department of Health through the Vector Bureau offered to cooperate with us on a research project in the field to determine just what the best dosage for pre-treatment would be against Aedes nigromaculatus and Aedes dorsalis. That was carried on summer before last by Dr. Basil Marcosse in cooperation with our district and we discovered that at the rate of .4 pound per acre we were only getting about 80% control on that initial application and so we went higher. We tried various dosages all the way from lower than .2 up to a pound and a pound an a half and in a few cases 2 pounds to the acre so we could find out just where the break would come. We did find that in most cases with a pound to the acre we were able to get 100% kill with the first irrigation. In many cases on the second irrigation and in some cases on the third irrigation. That would be over a period of a month and a half depending on how often they irrigated those fields. We found that with anything lower than that we got just a little less than 100% kill on the first irrigation and on the second and third irrigations it broke down very rapidly to 80% and 70%.

That brings up a very interesting problem with the relationship of resistance of the mosquito larvae to D.D.T.. It may very possibly be that is the best method to develop resistance on the part of the mosquito in a hurry. Because you are killing off the weak ones each time and leaving the stronger ones, so possibly that complicated the problem in getting the mosquitoes resistant to D.D.T.. But we also found resistance on mosquitoes in other fields we haven't pre-treated so it isn't the whole answer to it. But right now we are rather skeptical about the advantage of pre-treatment because we are afraid that we might speed up the resistance in mosquitoes that are not already resistant to D.D.T.

Mr. Nielson: Do you have any resistance on the part

of your agriculture industry in the use of D.D.T. in any method such as the use on the pastures or in any fields where they are raising agriculture crops?

Edgar Smith: There has been a few cases, only a very few however. Most of the farmers say, "We have been using D.D.T. for 4 or 5 years now ourselves and we know that it does a good job on flies and it seems to be killing mosquitoes and we are going to keep on using it and we don't care if you do or not." Of course, there are a few farmers that don't want any D.D.T. around the place.

Most of the districts in California have taken to using 3 or 4 insecticides. Last summer we ourselves used D.D.T., Rhothane and Toxaphene, and the gamma isomer of benzene hexachloride.

Mr. Josephson: Do you have any objections from the government or Agricultural College or any creameries?

Mr. Peters: Actually there have been no cases where it has become a serious problem but the potential is present. The matter of whether to use D.D.T. or not is one which the state can't very well take a stand on. That is in conflict with the Federal Government Marketing and Production Administration. There is a law in California that states that beef being finished for market and products going directly for immediate consumption cannot be sprayed with D.D.T.. However, to my knowledge this has not been strictly enforced.

One of the things that has made it difficult is the ability of the laboratories to differentiate between D.D.T. and its homologs. Consequently the whole matter is in a state of uncertainty. Right now there is a meeting going on in the Capitol that some of you may know of, to determine whether or not the chlorinated hydrocarbons can be used on food stuffs, chiefly fruits and vegetables. It is suspected that when they complete the inspection on fruits and vegetables they will move over to forage milk and related items.

However, the situation is so fouled up at the present time that we are waiting for more information before we take an official stand.

NED WARNOCK - ATTORNEY
ORGANIZATION OF A MOSQUITO ABATEMENT DISTRICT ON SOUTH SALT LAKE COUNTY

Mr. Chairman and gentlemen thistalk of mine is one more or less of frustration. It doesnt have a happy ending so far. In the summer of 1948 some residents of the Cottonwood area decided that they had too many mosquitoes and that they would like to form a mosquito abatement district. They ask me to contact Dr. Rees and define the boundries of that district. To start with we know nothing about mosquitoes and mosquito abatement districts. We weren't very ambitious; we were just going to form a small district of our own out there in a relitively small area. I contacted Dr. Rees and he pointed out to me in the first place that the permissible tax levy in an area such as we contemplated wouldn't raise enough money to kill more than 4 or 5 mosquitoes. I learned something out about migratory habits of mosquitoes. Dr Rees proposed that we organize a district that included most of of Salt Lake County out side of the two existing mosquito abatment districts, that is the Salt Lake City and the Magna Mosquito abatement districts.

This program was sponsored entirely by the Cottonwood area. In laying out the proposed district we ran into the situation where we had 7 incorporated municipalities. So of course we would have to get a sufficient number of signitures in each municipality and also the permission and the signiture of each town board in the municipality. I thought and Dr. Rees thought that the place to start was with the Town Boards themselves. Because we didnt want to go out and get all the signitures and then have the Town Boards turn us down. We did that and we didnt get a great deal of encouragment from them. They said they would pass the necessary resolution if we got the signitures. They offered us no help in geting the signitures or in promoting the project. It was really quite discouraging except for Mayor Hansen in Murray; who helped us obtain the signatures in Murray. Surprizingly enough where the mosquitoes were the worst the Town Board were very reluctant to even give us any definate word at all, that they would be willing to pass the necessary resolutions. Having done that we went ahead and obtained the signitures. We had a very limited budget and we tried to work through the service clubs in the area.

I took a seminar on mosquitoes from Dr. Rees and we went to the service clubs and they assured us while we were there that they would help us get the required number of signatures. These clubs were very enthusiastic while we were there but so far they have down absolutly nothing We have met resistance in these communities some of them because of the tax levy and they say they want absolutly no more taxes. We have met with such things as community jealously. We have not given up and now we have only two places where we are having difficulty. Dr. Rees has informed me that he has a man that will go on a house to house canvas and we hope that by this time next year that

we will have Salt Lake County blanketed by a Mosquito Abatement District.

Comment: Dr. Rees, I might say that in working this over from the begining, South Salt Lake has been getting a lot of benifit because they are right adjacent to Salt Lake City more than other areas, and they are very much in favor of it and immediately were willing to start a district.

We go out now as far as 48th south, and Murray said they would go alon with us if we would go to Midvale. So it went , from town to town out to the point of the mountain. Actually that is the only way to set up the district. You have a natural situation, mountain on the each side; your drainage goes down through the valley. The district should include the entire south end of the county. Now I dont know how this will work out but I am confident t that most of the people , I would say about 90% are in favor and are urging such a program. If we can show them that mosquito abatement is not just mosquito control but a matter of improvement, drainage, roads, and other improvements I will believe they will all be in favor of the program.

LEWIS T. NELSEN

MOSQUITO STUDIES NOW IN PROGRESS AT THE UNIVERSITY OF UTAH

The title of my paper might better have been "Mosquito Studies past and Present at the University of Utah" because any discussion concerning Mosquito reasearch now in progress there would be incomplete without some reference as to how it all started. Most of us here are aware that the progress accomplished in mosquito control work in Utah is due primarily to the efforts of our Association president, Dr. Don M. Rees. Such is also the case with mosquito research at the university. It was back in 1928, when Dr. Rees, then a student in Zoology at the University of Utah, first became interested in mosquitoes. At that time Salt Lake City was having difficulty organizing an effective mosquito control program. A control district had been started, but had been unsuccessful die mainly to a lack of experienced personnel. It had become apparent that a scientific approach to the problem was necessary and that an accurate determination of the mosquito pests present in the Salt Lake Valley and information regarding their breeding habits was needed before any effective control work could begin. The Biology Department at the University of Utah was asked for help and Dr. R. V. Chamberlin, head of the department, approached Mr Rees , the student and offered him the problem. As Dr. Rees now tells it, he was then no more interested in mosquitoes than in any other group of bugs, but it sounded like a problem with possiblities and he decided to take it. He finished this problem and received his Masters Degree in 1929. His thesis was titled "An Investigation on Mosquitoes of Salt Lake County." In 1930 he became supervisor of the Salt Lake City Mosquito Abatement District. He continued at this job during the summer months until 1938 and responsible for setting the high standards by which the local abatement district now operates. All during this period Dr. Rees continued his research which he soon expanded to include the mosquitoes of the entire state. In 1936, he received his PhD. degree from Stanford University, thesis titled "On the Biology of the Mosquitoes of Utah." Thus the ground work was laid for future mosquitoes research at the University of Utah and it is easy to see why the emphasis has been on studies of a practical nature.

One of the first projects undertaken by Dr. Rees and some of his students was to gain a better understanding of the biology, structure and hbits of Utah's most important pest mosquito, Aedes dorsalis, the common gray mosquito which most abatement workers recognize in the field and the mosquito which requires the most abatement funds to control. Four graduate sutdents, including myself have received Masters Degrees for research problems dealing with this mosquito. Some of these studies were on the internal structure of the species and some were on its biology and habits. This is one mosquito that we can say we know inside

and out and even something about its personal life. This study is one of the most complete ever undertaken by any University or College in the United States on one species of mosquito. The information gained, has helped us to control Aedes dorsalis more effectively than before. Population surveys and comparisons of light trap collections throughout the years substantiate this.

Two Utah students have just received Master Degrees for mosquito research, Mr. Richard Hayes and Mr. Koichi Onishi. The work of Mr. Hayes is of special interest to mosquito control workers. His research was to determine the effects of D.D.T., on the eggs of Aedes dorsalis and A. nigromaculis, two extremely important pest mosquitoes. It was hoped that D.D.T. would prove effective in destroying the eggs of mosquitoes as well as the larvae and adults. This would have given us another weapon against the mosquito and would have made it possible to destroy an entire batch of eggs in a breeding area and would have avoided to a great extent the necessity of spraying the larvae after each flooding, with some eggs always remaining to hatch at the next flooding. Mr Hayes results, however were negative. Concentrations of D.D.T. spray up to 10 pounds per acre had no noticeable effects on the viability of the eggs and Mr Hayes was forced to conclude that D.D.T. was not effective, at least under practical concentrations, on the eggs of Aedes dorsalis, and A. nigromaculis. Additional work of this nature, however, is needed before we can apply these results to the eggs of all pest mosquitoes.

Mr. Koichi Onishi completed his research on the mating habits of Culiseta inornata. This is a large brown mosquito, very common to Utah and the western states. It does not commonly bite man, but seems to prefer stock and large mammals, against which it may sometimes become a serious pest. It is also a possible vector of disease - it has been found naturally infected with the virus producing brain fever in horses. Mr. Onishi's work was mostly concerned with the anatomy and physiology of the external and internal reproductive systems and habits of this mosquito, but some of his work may prove useful to mosquito abatement workers if ever a concerted control program is necessary against this species.

At the present time six student are actively engaged in mosquito studies at the University of Utah.

Mr. Frank Arnold is doing a masters study on the Philippine Island mosquitoes of the genus Culex. We were fortunate to receive a large collection of philippine Island mosquitoes, collected mostly during the war by former university students. Mr. Arnold will organize, study and classify the Culex mosquitoes in this group. Such a study should be of considerable interest to a number of mosquito workers throughout the world.

Mr. Glen Collett is working his Masters study on the biology of Aedes nigahapsis, a common Utah mosquito. As a matter of fact we might call it Utah's own mosquito for it was first described from the area near Becks Hot Springs in Salt Lake County. It has been found out of the

state only in southern Idaho and eastern Nevada. It is a one brooded species whose larvae appear earlier in the year than any other Utah Mosquito. Mr. Collett has actually found larvae around the margins of ice covered ponds in late winter. Aedes nipbadopsis is a vicious biter and is an especially severe pest near the marshes along the shores of Great Salt Lake. This seems to be its typical habitat. It is a stronger flier and has been found biting several miles from the nearest breeding area. Mr. Collett's work, even though incomplete at the time, has resulted in giving us information about its habits which should greatly aid control measures against it.

Mr. James McCloy is studying the Chaoborine Mosquitoes of Utah for his Masters Degree. This is one group of mosquitoes that we can safely cultivate a friendship with, for they do not and connot bite. They are found chiefly in mountainous regions breeding mostly in lakes and more permanent bodies of water. At times the adults may become numerous enough to be annoying, but only because they are attracted to lights and may become of their large numbers. They are more important froma beneficial standpoint because the larvae of some of them feed on the larvae of pest mosquitoes. Perhaps Mr. McCloy's work will enable us to put this beneficial habit to a practical use as a natural or biological control of certain pest mosquitoes.

Two of our graduate students, Mr. Harold Newson and Mr Robert Warnock, are doing their Masters Degree sutdies on bird malaria in Salt Lake County which are a capable of carrying bird malaria. Mr. Newson's problems are to determine the species of mosquitoes in Salt Lake County which are capable of carrying bird malaris. He has examined over a thousand specimens of seven species of mosquitoes and has found an unusually high number of them carrying the malarial parasite. Some of the infection rates are the highest ever recorded in mosquitoes by any worker. Mr Warnock's study is concerned with the presence of bird malaria in the common English Sparrow. He has examined the blood from over two hundred sparrows and preliminary results tend to indicate a high rate of infection. We should emphasize the fact that bird malaria is not capable of infecting man and seems to be harmless as far as we are concerned. A study of this nature, however is very important from the standpoint of medical entomology and disease transmission. We are hoping that Mr. Newsons and Mr. Warnock's stucies will give us information regarding the feeding habits of the common pest mosquitoes of this area and in this way supply us with information that may prove valuable to us in devising additional methods of control.

As for my own research, I am now engaged in a doctorate study on the biology and control of the mountain Aedes mosquitoes of the intermountain states. These mosquitoes appear in early summer at the higher elevations and are extremely annoying pests capable of turning our most enjoyable fishing and camping areas into places of misery and torment. My research has been in progress since 1947 and I have obtained considerable information on the biology and habits of these pests. Much of this information has been

valuable in pointing out possible control techniques. At the present time I have been conducting control tests weth the Salt Lake City Mosquito Abatement District at Brighton in Big Cottonwood Canyon and at Camp Cloud Rim near Park City. Control work in these areas has been in progress for a number of years and has generally proved very effective. We are now experimenting with the use of D.D.T. in both powder and liquid form. We are hopeful that these applications will destory the larvae as soon as they hatch this May and June.

Dr. Rees beside directing us students is also doing considerable research himself. He has published papers with Fred Harmston of the U. S. Public Health Service, who spoke yesterday, and he recently published a paper with Dr Marshall of the Medical school on the History of malaria in Utah. He has also been working on the mosquitoes of Idaho and Wyoming.

In conclusion I would like to state that we have a large number of mosquitoes research problems that are as yet unworked and we are hopeful that more students will become interested in these problems and will help us in arriving at better and more efficient methods of mosquito control.

JAMES V. SMITH
ASSISTANT IN ENTOMOLOGY, UNIVERSITY OF UTAH

PICTURES AND COMMENTS ON EFFECTIVE CONTROL METHODS USED ON BITING GNATS IN NORTH SALT LAKE CITY.

At the meetings of the Utah Mosquito Abatement Association held in Salt Lake City last year, it was my pleasure to present a paper entitled, "An Attempt To Control The Biting Gnats In North Salt Lake City". The report consisted mainly of control measures used against the adult gnats in the spring of 1948. In the spring of 1949, a more complete investigation was made of the problem which I will present today.

For those of you who are not acquainted with the gnat, it is a small, blood-sucking fly belonging to the family Ceratopogonidae. Scientifically this gnat is referred to as Leptoconops kerteszi var. americanus, and was described by H.F. Carter in 1921 from specimens collected near Salt Lake City. The single generation of gnats is active for about six weeks in the spring of each year. Unfortunately, the biting gnats, sometimes called punkies or no-see-ums, are active during the hottest part of the day which coincides with the working hours of men engaged in outdoor occupations. The workmen constructing the Salt Lake Refining Company Plant in North Salt Lake City were seriously annoyed by the gnats in 1948. Officials of the construction company estimated that working efficiency of the men was reduced as much as 20% because of these pests. With the idea in mind of determining, if possible, a practical and economical control for these annoying pests, we began our investigation.

The program started early in March 1949, with an attempt to locate the area, determine the type of habitat in which the gnat develops. On March 12, the small worm-like larvae of the gnats were located in the soil. At this time they were barely visible, only 2 to 3 mm. in length and seemed to be concentrated 4 to 6 inches beneath the surface of the soil. These larvae worked their way to the surface where they pupated, and from the pupal cases emerged the small, black gnat. Having located the larvae, it was necessary to determine the extent of the breeding area, therefore, we began our investigation with a survey of the general area.

Slide 1. (View of the ground around the Refinery)

This is a view of the ground around the construction site of the Salt Lake Refining Company. A large portion of the area was earth filled for purposes of construction, which eliminated several acres of what undoubtedly was a gnat breeding area. The ground remains very moist until around the end of May due to the high water table at that time of the year which is from 2 to 12 inches beneath the surface of the soil. There is very little surface water after the first of April.

Slide 2. (Taking soil samples)

In making a survey of the general area to determine the extent of gnat breeding, we took uniform samples of the soil.

The soil was taken to the laboratory and tested for factors which might limit the breeding places. In the laboratory the soil was run through a series of fine mesh strainers to remove the larvae if present.

Salide 3. (Map)

Information thus obtained helped us to determine the area where it would be necessary for a control program. As is indicated on the map, samples were taken at 200 yard intervals on transects running North and South for a distance of 5200 yards and East and West for a distance of 3400 yards. Where larvae were found is indicated by a black square, and where they were not found by a black circle. Additional samples were taken then in several directions from the places where larvae were found, thus outlining the principle breeding area. The shaded area is where the larvae were concentrated, and where the final spraying program took place.

Slide 4. (Experimental Plots)

After the survey, and before a general treatment of the entire area it was necessary to determine, experimentally, the concentrations of the insecticide that would produce an effectivw kill. Seventeen test plots, each containing 60 square feet were sprayed with different amounts of D.D.T. and the Gama Isomer of Benzine Hexachloride. The insecticides were applied on a per acre basis in amounts ranging from ,' of a pound to 1 pound per acre. These amounts were also applied in 10 gallons, 25 gallons of solution per acre. Uniform samples were checked for the numbers of living and dead larvae and pupae at intervals following the application of the insecticides were determined from the results One pound of D.D.T. in 25 gallons of water per acre gave a high percentage of immediate kill and remained high through successive samplings. A high percentage of larval kill can be obtained with D.D.T. in amounts as low as .2 of a pound per acre and in any of the dilutions tested, however, the immediate kill of the pupae dropped rapidly and proportionately to the amount, when the less than 1 pound of D.D.T. per acre was used. The plots treated with B.H.C. show a high percentage of killin the first 24 hours but the killing power of B.H.C. showed a decline in subsequent samplings. As a result of this information, one pound of D.D.T. in 25 gallons of soultion was used per acre to treat the soil in an attempt to destroy the gant larvae and pupae before the adults emerged.

Slide 5: (Vegetation) From a check on the experimental plots it was noted that a dense growth of vegetation interfered considerably with the insecticide reaching the surface of the ground. This also reduced the percentage kill of the larvae and pupae. It was, therefore, considered necessary to remove as much of the vegitation as was possible.

Slide 6.: (Burned Areas) This was accomplished by burning the vegetation on the major breeding area. Many tracts were burned quite successfully, however, some areas were too wet to burn, particularly where the vegetation was lying flat on the ground.

Slide 7:(Equipment used) A Dodge truck with four wheel

drive equipped with a Bean 150 gallon spray pump was used to spray the area. An 8 foot spray boom was attached to the pump at the back of the truck about 18 inches from the ground. Six,"teejet nozzles" were used along the boom and the insecticide was applied to the ground under 150 to 200 pounds pressure. The truck was driven at about 2½ to 3 miles per hour when possible, which regulated the application of the insecticide from 25 to 30 gallons per acre. A 200 foot hose was used to treat certain areas inaccessable to the truck. Other inaccessable areas were sprayed by hand with Hudson Knap-sack spray pumps.

Slide 8: (Residual treatment) Five percent D.D.T. obtained from a 25% emulsion concertrate was used on a residual on buildings, oil tanks, and other shelters were treated on the outside from the surface of the ground up to a distance of 3 to 4 feet. Near the ground seemed to be the principle resting places of the gnats, although at times they would alight on any part of a structure.

Slide9 : (fogging) A smole aerosol consisting of 7½ D.D.T. in fuel oil was used when necessary to destroy the adult gnats. It was produced by a thermal aerosol smoke generator on the exhaust of the vehicle, and was very effective in killing adult gnats when climatic conditions were favorable. This equipment was used occasionally during the day where there was a report of, and in some instances merely a suspicion of, the presence of gnats.

Slide 10: (Fogging at Night) The principle use of the aersol was to apply it in early mornings and late evenings to areas where the adult gnats were known to spend the night. It was generally more effective at this time since atmospheric conditions tended to hold the fog close to the ground and let it remain there for a longer period of time. At the time this picture was taken it was still a little early in the evening to obtain the best results from the fog.

Slide 11: (Headnets) Headnets were used in 1948, before any attempt had been made to control the gnats at their source. They were not very effective and under some conditions were more troublesome than the gnats themselves. During the 1949 season, after the control at the breeding site the working men did not find it necessary to wear headnets.

To summarize our investigations, first, it was necessary to locate the immature forms and then make a survey to limit the breeding area. This part of the investigations is very essential, but due to the manner by which the presence or or absence or larvae was determined, it may be considered as the most difficult part. The time and men invloved makes it desirable to find a better way to determine the breeding area. In the long run, even the method used would appear to be more practical than spraying numerous acres of ground without knowing for certain the extent of an existing breeding area. Second, the experimental work gave considerable information toward choosing choosing what amount of insecticide to use on the general area. With this work little doubt was left as to what concentrations would give a control when applied to the proper place and at the proper time. Third, the general spraying of the entire

area was complished with a minimum of lost time and material due to the original survey.

Slide 12: (Trap) The actual value of the control was determined in several ways. First personal observation of many interested individuals who were able to compare the 1949 season with previous seasons. Residents, workmen, and others made many comments concerning the freedom from the annoying gnats this year as compared to other years. Second uniform samples were continually examined showing a high percentage kill of the immature forms. Third by the use of traps on the area and comparison of the numbers of emerged adults. The traps were rectangular boxes 18 inches wide, 24 inches long and 8 inches high. The tops were covered with a finely woven black cloth and the bottoms were open to the ground. In one end of the traps small holes were made in which the neck of a small bottle, partially filled with water was securely fastened. As the gnats emerged as adults from the ground area covered by the darkened trap, they attempted to escape through the hole where the bottle was attached. Upon entering the bottle they were eventually drowned. In this manner they were trapped in the water within the bottle where they were available for counting and further study.

One trap was operated throughout the season in the same position in the untreated check plot. Three other traps were placed on different parts of the breeding grounds on areas that had been treated for control with one pound of D.D.T. per acre. The concentration of larvae under each trap was essentially the same. The gnats were counted and percentage kill was computed from the resulting figures. From the trap on the untreated area, 5710 gnats had been counted at the end of the season. The average figure from the three traps on the treated areas totaled 594 gnats at the end of the season. These figures indicate a 90% kill for the entire period during which the gnats emerged.

The total cost of the experimental control program was about $1200,00. Undoubtedly the cost of similar gnat control programs in the future will be reduced considerably. Since the control in North Salt Lake City were considerable effective and practical by individuals directly concerned, it is believed that it should be continued. It also seems probable from information now available that more effective and permanent control measures may be developed as a result of experiments now being conducted in this area.

Mr. Hale: Where are they located, any where near water?

Mr Smith: In the area we had the only water we could consider , was ground water, which was, as I stated , within a half inch of the surface in some places. There was only one ditch running through the area which was dry a large part of the time. It had some water in it during the early part of the season, but very little movement of the water in it.

Mr Wilkins: Where you took tests did you find any larvae in dry ground?

Mr. Smith: No, not absolutely dry ground. However we tested very early in March, when there was very little dry ground.

We did find larvae in an area where there was water on the surface, and it was there at the time we made the survey however, it wesn't there very long.

Dr. Young: What about the relationship of emergence to temperature?

Mr. Smith: Well undoubtedly there is some relationship.

Mr. Peters: What effect did th burning have on the killing of the larvae?

Mr. Smith: Actually I dont believe it had very much effect. The reason I believe it didn't have to much effect on this is because it was wet close to the ground. What was burned was down to about an inch of the ground. That is about as close as the vegetation would burn and the larvae at that time, were still protected by enough moisture and siol that they didn't seem to be affected at that time. The purpose of the burning was to enable us to get our larvacide down to the ground. We couldn't otherwise hope to do so with the heavy density of the salt grass.

February 18, 1950
Saturday Afternoon

Presiding: Dr. Don M. Rees

CLEM TOONE SUPERVISOR, MAGNA MOSQUITO CONTROL DISTRICT.
THE MOSQUITO CONTROL PROGRAM OF THE
MAGNA MOSQUITO CONTROL DISTRICT

Mr. President and fellow workers. If you had said "Dynamite Toone" they would have known who you were talking about. I have enjoyed working in the mosquito control work. It has been very interesting. I appreciate the efforts of Dr. Rees especially, and I appreciate the gentlemen from California who have come here on their own, and who have given us information that will help. Due to extenuating circumstances, I have been unable to prepare my written report this year for the Board. So, I will have to give you an oral report from memory.

I might explain what brought us together to organize the district in Magna. We had a sever epidemic of polio out there. I don't know if it has been a stroke of good fortune, or the work that we have done, but in talking to some of the doctors, I can't find one case of polio in Magna or Garfield during the past season. I am mighty glad that polio was checked in our community whether or not our work had anything to do with it.

For our report this year, the big thing as you have heard, and what I think is the most important, is drainage. Dr. Rees stressed that as being the biggest problem, so I started on drainage first.

We have only built 2 miles of permanent drainage of new construction this year. I might state that all the drainage we have done has been through the cooperation of either the county with their drainage of roads or the State Road Commission with their drainage of highways or the flood control.

The Hoglo Investment Co., that is our stock brokers here in Salt Lake City, have bought up a lot of property on the west side that is apparantly worthless but if, and when, industry comes, that property will all be valuable ground.

The gentleman who keeps this area as partial farm land made this statement last fall that, "If we keep up our work that whole country will soon be suitable again as good farm land." If this does become a good farm area once again it will just mean more revenue for the county and we will have more money to operate our county.

The canals and ditches in this area are all grown up with salt grass and tules. They fill up with water and sometimes break out and flood hundreds of acres of land that is covered with salt grass and makes a splended breeding area for mosquitoes. In this kind of work we have gone through the salt grass and through the bottom of the ditches and we have cleaned 16 miles of that kind of drain. The Hoglo Investment Company have cooperated with us in this kind of work.

We found something very interesting in the bottom of these ditches. We found there is a hard pan formed from the minerals from the water, which is about 6 inches thick in most cases. I found that same condition where I did some dynamiting west of Bountiful. This mineral hard pan is one thing that helps to hold our water from going into the soil.

You can auger through it and prime it with laces of prima cord then give it a shot to loosen it up. Then the drag line can come in and break it up and go on through. But out in this country where there is so much mineral you are going to find underground lakes.

Our 27 South road, back to 3500 South is one of our big problems. The farmers in years past have dug drains and the W.P.A., and different agencies have worked on those drains and all have gone over the top of this hard pan. In order to get the drains that are necessary for good drainage in this area we have to break that hard pan. I got the big compressor that belongs to the county and we tried to drill holes to shoot it but the drill would bounce off like working on a hard rubber tire. I thought maybe there was something wrong with our equipment so I went up to the Copper Company and got a couple of hammers from them, they have been very helpful to us in many ways, but their hammers did the same thing. We tried different drills, most anything we could find to break through this material. Finally by means of flash powder and dynamite placed beneath the hard pan we were able to remove it. You could take a piece of this and beat your teeth out trying to break it, but place it in the sun and it would all go to peices in a couple of days.

We cleaned the 16 miles of ditch and got 2 miles of permanent ditch. We cooperated with the State Engineers and had 9 wells capped permanently. With the cooperation of Dr. Rees, we got a lot of mosquito fish and planted them below Garfield. Mr Anderson got a lot of these fish and planted them many years ago. They winter in this warm water and really thrive. They are in there by the millions. We did loose all our fish a few years ago by a leak of some crude oil getting into the water from one of the plants. But now again we have a good stock of fish. A lot of them winter kill in the hard winters but where they do winter kill and can't re-stock, we have transplanted a great number of them.

This year we have used 3,000 gallons of diesel fuel oil. Claude Andersen had some old pine oil and when they changed his locality he had 300 gallons of this left and we mixed it with our diesel fuel and it makes a more potent oil, stays longer and makes better kills. We have used 700 gallons of 25% D.D.T.. I bought a large amount of pyrethrum with 1% D.D.T. which some of the companies were salvaging and we have used it in water. We haven't sufficient money to do much work outside our own district. As a matter of fact, if we could do the job in our own district, I would be well satisfied.

As a result of migration we do get some flights of mosquitoes. We have a fogger similar to the one here in Ogden. Not knowing too much about the machine we ran the chemicals for which it had been originally designed to put out a smoke screen. It made for good public relations and we found out in some cases it was making a kill and some cases it did not. We finally found out why, it seems the boiler tubes were so clogged with this chemical being cooked into it that we

practically blew it up, and then we gave it up. We chiseled some of the stuff loose that was in these tubes and took it up to the company chemist and he said he could give us something to eat it out but it would eat up the iron pipe before it would eat the chemicals out.

We did give some good kills at the ball games and the public demanded that we come back. It did some good for a while, after they had been eaten up a couple of times they did appreciate the fact that we were accomplishing something.

We have had very good success with the smaller fogging machine. I don't advocate a fogger as it is just admitting that you have done a poor job of mosquito control. In our case we have had to have it for relief at the games where there have been large crowds.

One thing that I have against the tax assesment is that when these people go to pay their taxes they are confronted with this, "It is going to cost you extra because you are in the Magna mosquito abatement. Your tax will be so much more." It is a very unfortunate thing. If there is some way possible that we could get an itemized statement when it is sent out, I know it would satisfy a great many people who don't understand the facts behind the mill basis. If there was just some way that this could be broken down and itemized it would help break down the feeling that many people have that they pay a lot of extra money, because they live in the mosquito abatement district. Another thing that gave us a bad start is that our district was organized the same year that the people were asked an additional tax on the school district. Then to make it look worse, stamped right across the form was, "Magna Mosquito Abatement District" so as to make it look as if that was where the big increase came from. This made for bad public relations.

Dr. Rees: Let me say that whenever you start a district or whenever you start anything new, there is a period of adjustment and some opposition. I do not know of a mosquito abatement district or any public improvement program that has been started anywhere that did not have these problems to work out in the begining. We are on the spot and we have to prove to them that we can do the job. It takes a little time to do it, but I am confident that we can accomplish a good job of mosquito control in the Magna area.

They have done a good piece of work in Magna. They have done excellent work in drainage and basic mosquito control. Now, with that foundation in the Magna District and a little careful inspection and larviciding where necessary, I am sure mosquito control will be successful in that district and the public will be more than satisfied with this service.

DR. DON M. REES

ORGANIZATION AND ASSIGNMENT OF DUTIES OF A MOSQUITO ABATEMENT DISTRICT

As mosquito abatement work has expanded in the Salt Lake City District, the duties of the supervisor has increased until it is impossible for one man to adequately and personally supervise all of the different functions of this program. In recognition of this fact the Board of Trustees of the Salt Lake City District reorganized methods of administration and supervision at the begining of the 1949 season. At this meeting Mr. Wilkins was given the title of Manager of the district. This is something again that we have taken over in part from California where it is the usual thing to appoint a manager of the district. The position of Chief Inspector, that this year will be charged to Field Supervisor, was created and Don M. Merkley was appointed to this position with the responsiblity of directing all field operations other than drainage. The accompaning organization chart and specific assignment of duties for each position was adopted and put into operation during 1949. We prepared a chart in an attempt to show relationships of different individuals operating in the district and to specify rather definate functions.

Often we acquire certain duties and functions just because we do them but when specific responsibilities are delegated to certain individuals they know what is expected of them, and we can hold them responsible if they accept such an appointment.

I am sure that all companies that operate successfully spend considerable time organizing their personel to meet their particular problems. What has been set up for Salt Lake City may not be adaptable to other districts especially smaller districts. We tried to work out a plan for our own district to see how it would function and I believe that the men, and Mr. Wilkins, will agree with me and the Board of Trustees that it has worked very well.

In this organization with specific assignment and duties we were not able to cover all phases and emergencies that arise, but at least we took care of daily routine work which helps in establishing a smooth functioning organization. I think it has contributed a great deal to the success or let us say, the improvement in our mosquito control program, that we attained last year.

EDGAR A. SMITH
MANAGER, MERCED COUNTY MOSQUITO ABATEMENT DISTRICTM CALIFORNIA

ENTOMOLOGICAL GUIDANCE OF A MOSQUITO ABATEMENT PROGRAM

You were warned yesterday not to believe anything anybody said about California. I was warned a good many years ago by my father that when I left California that I should keep my mouth shut about California because nobody will believe anything you say anyway. I think he was mistaken. I think that it is well illustrated by the fact that our population has recently jumped up to 10,000,000 people. So, either a lot of people believed what the Californians said or a lot of people were curious enough to go out there and find out for themselves. In addition to that we had another large group that was curious about California starting about 10 years ago, the Aedes nigromaculis mosquito went out to see if those stories were true. Apparently they decided they were because they have adapted themselves to our central valley and have settled down in our irrigation system.

Now, I think that there are a great many more Aedes nigromaculis mosquitoes than there are people in the state of California. Recent investigations have shown at least 400 eggs per square foot in some of that pasture land. So starting from there it wouldn't take very long to get more than the 10,000,000 people that we have in California.

First, a little about my own background in the field of bug chasing. I have been chasing bugs as a hobby since I was a sophmore in high school which was about 18 years ago. I guess it was at that time that I amde my first trip to Ogden. I came through here on a bug collecting trip. I collected a good many bugs in the hills in this area. I have been collecting bugs ever since.

I didn't get into chasing mosquitoes, however, until I got into the army. I started chasing mosquitoes then and did so throughout south Florida, South Carolina, and Arkansas. I thought I had seen enough mosquitoes sometimes, but three weeks after active duty in the army, I was back at it again. I accepted a job as entomologist for Merced County Mosquito Abatement District. I filled that position for about 3 years and then about a year ago I took over the administration of the district also and have been manager for about a year. So I have had the experience of a district entomologest.

Mosquito control is by nature an entomological problem and to be successful must be based on sound entomological principles. Organized mosquito control efforts in California have always had an advantage of the advice of the University of California. Such men as Woodsworth and Quayle and Herms in the early part of the 1900's and from Herms and Freeborn and Reeves in the more recent years. Also more recently benefited from the advice of the State Department of Public Health through its Bureau of Vector Control.

The hiring of a full time entomologist in a Mosquito Abatement District is not new in California, but the increase

of the number of entomologists in local districts in California since the close of World War II is nothing short of phenominal; first due to the war a large number of entomologists especially trained in mosquito control were for the first time available and looking for work. I was one of them. Second, because of war time development and the large scale use of D.D.T. and other insecticides mosquito control has become more exacting in its development and requirements. In addition to all of this, the California State Health Department in 1946 provided $400,000.00 for the subvention of mosquito control programs. Mr. Peters went into that rather throughly yesterday. This was to avoid any possiblity of mosquito vector born diseases which might result from the large influx of veterans returning from the disease ridden Pacific islands and the already present threat of encephalitis in California. The State Public Health Department in administering this subvention money, have consistently encouraged the full time employment of entomologists in local mosquito control agencies to provide the technical guidance deemed necessary to carry out a well balanced mosquito vector control program.

Before the war only one out of the 25 mosquito districts in the state of California employed a full time entomologist in addition to the administrators of local mosquito control programs. Now, in the 45 local active agencies throughout the state there are 12 full time entomologists, 9 part time entomologists, and a total of 9 entomologists that are acting as administrators of local mosquito control programs. This makes the total of 30 entomologists in the 26 agencies out of the 45 in California.

Just what does this technical entomological guidance consist of? Perhaps the memorandum published on the subject by the Mosquito Control Association of California in April of 1948 will give a basis for discissing this matter. I don't mind bringing it into this paper because it was written by Dick Peters and myself after a series of meetings comprised of a number of the managers of the mosquito districts of California. As a follow through to the requirement by the State Department of Public Health that any agency needing subvention assistance in the control of mosquito vectors of disease, possessed adequate technical guidance through the services of an entomologist on the staff.

Now, why are these merely activities of an entomologist in a mosquito program? Naturally, I will relate some of these as I go along as they apply to our Merced County Mosquito Abatement District. It is one of the largest in California. It is about 2,000 square miles with about 1,500 square miles of actual problem area. The rest is foot hills and very dry. The 1,500 square miles is actual irrigated area. The biggest problem is the Aedes nigromaculis in the irrigated pasture. We also have some 300 duck clubs covering 72 square miles. The first point the enotmologist may render is an acurate appriasal of the exixistance and potenital mosquito source. With such informations systematically recorded on appropriate maps and records, these to

be obtained by the survey of mosquito occurance through properly chosen and slected resting stations, light traps, and biting collections. Also through systematic larval dipping collections through field operations intergrated to understand the mosquito species ecology. Now that in a general way pretty well describes what I was called upon to do druing the first year I spent as entomologist in Merced County.

I started first by finding out what mosquito we had and where we had them. But first let me finsih one or two points in this report. An active identification and a systematic recordin of species distribution thru hout the district and observation of species habitat both aquatic and adult was used to guide control operation. Now that required the development of a lot of forms. You might call it red tape but I think the records we have kept from that time have become very valuable and become more valuable with each year.

We tried several kinds of froms but eventually we found a need for a more stenderdized procedure of maping our mosquito problems and this led to a series of committee meetings which terminated in the committees turning over the recomendations to Dick Peters and myself and we prepared the which has since been called the collection survey concept for use in California Mosquito Abatement Districts. It is a system of recording all of the availabe information of the mosquito source and potential source, water presence, [illegible] agricultural development, irrigation ditches. All of it is based on a single section or a square mile of land. Fortunately in a great deal of our area the roads are running down the section lines, and in some sections the half section lines made a convenient method of mapin our mosquito problems. The recomendation was made to all of the districts in 1947 and since that time it has been adopted by at least a dozen districts. Some using only a part of the method and others carrying it a good deal farther than either Dick or I ever conceived of at the time. I hope that information will be published in the future. In our own work we have tried to key all of that work to our permanent control program. In other words basing our permanent or illuminative measures of drainage very definately on the entomological information that we have complied both as to species or mosquitoes and to frequency of occurance. We have developed along with that what we have called an inspectors treatment card, that is filled out in the field by the operator, as he does the work so that we have a chronological record of what was done to each individual plot in our district. When we get around to eliminate that source we compile that data and find out how much it is costing us each year to control that particular area and then we can put down what it will cost to eliminate it through drainage and many times we find it is cheaper to eliminate through drainage than it is to control the mosquitoes there for even one season. It was the case in a few hundred acre places there it cost us $400 and $500 to control that one pasture in one season because the irrigation cycle starts in early April and those fields are flooded

every 7 to 10 days until the first of October, making in some cases 10 to 12 broods of mosquitoes which require control. The cost running up to $500 where drainage of that field whould cost only $300 and that would last not only one season but several. I just point this out to show that we are trying to achieve eliminative control work. To the entomological data we have accumulated over several years, we were not yet ready to start on that type of program until this last year. Because we had not yet accumulated enough data that was reliable.

I could go on to number two, the evaluation and the adequacy of the control program. In this light of paragraph one the coordination of this routine survey, and the section survey maps, with the overall control program and through the coordination of the observation of the Inspectors with the observations of the control crews, next the entomologist may render a service through the training of the organization of the service personnel. That job was pretty well turned over to me after I became district entomologist. At that time in 1946 the district had been using D.D.T. for a short time. I dug through the records to see just how much D.D.T. the district had been using. I found that they got the first sample of D.D.T. in May of 1945, 10 gallons. In the following September they got a shipment of 145 gallons of D.D.T. and that was all until June of 1946 and that was all until war surplus came on the market. That season the District used approximately 45,000 pounds of D.D.T.. The next season the district used approximately 48,000 pounds and last season we used about 49,000 pounds.

In June of 1946 although the Army and the Navy and the Public Health Service had been using D.D.T. for a number of years then as far as the lay public was concerned it was still quite a mysterious insecticide. I found on the part of the operators using it that they still didn't trust it. They couldn't see how it was possible to kill a mosquito with such small parts of liquid, so they were wasting it wholesale I would go out in the field that had been sprayed and I found that not only was it killing the mosquito larvae but it was also killing the large hydrophilid beetles and all the rest of the aquatic life in the ponds and I knew from experiments that we had carried on in the Army that when it got up to that high a dosage that it was way beyond what was necessary to kill mosquitoes and larvae. So that was one of my first responsibilities to train our crews in the proper use of D.D.T.. At that time they had not calibrated any of the equipment and they had no idea how much they were putting out on any one area. That was one big job to get all of the crews to using D.D.T. in exactly the same manner, and to know exactly how much they had put on each time they used it.

In addition to that type of training we also organized a regular class session through out the winter in which we conducted classes once every week. Those classes included everything from mosquito identification right on through control, and drainage work. We have conducted those classes every winter since, reviewing everything first, and then going right into it a little deeper. By now we have most of

our personnel trained as entomologists, at least we have them to the point where they are able to identify the common problem mosquitoes. We have out of the 21 species of mosquitoes in the county about 8 to 10 that become a problem at one time or another and we insist that all of the employees be able to recognize all of those mosquitoes, also the vulnurability of species as determind by a knowledge of the ecology.

I don't think that I can pass by that particular point without bringing up a point that was made in our conference in California a short time ago, by Dr. William C. Reeves. Dr. Reeves was reporting on a symposium of mosquito ecology in California over a period of 15 to 20 years. He discovered that a report had been made in the early 1930's on the Aedes varipalpus, in which it had been pointed out to all the mosquito Districts personnel at an Annual Conference just what the life cycle of this mosquito was and how it could best be controlled. That was in the early 1930's. Early in 1940, two districts in California ran into difficulties with mosquitoes. They had complaints in Fresno and in Bakersfield about mosquitoes and the District Personnel were unable to solve the problem. They went out and killed a few mosquitoes in a fish pond in the area and they found a few pools but they still had a lot of complaints on mosquitoes in that area. They finally called on the state for help and Dr. Reeves was sent out as a consultant.

He walked down the street where they were getting the complaint and a mosquito landed on him. He didn't even have to get out his hand lens. He could recognize the varipalpus as soon as he saw it, because of the white legs.

He said, "Let's take a walk across the street in the park." They walked across the street in the park and he said "This is where the mosquitoes are coming from. Have your men climb up that tree and look in those holes." Sure enough, the mosquitoes had been coming from those tree holes for the past couple of weeks.

In that particular case a little technical knowledge of the mosquito of that particular species would have saved a lot of trouble. They had the same thing down in Bakersfield, only their mosquitoes were coming out of olive groves. Well, that sort of put the mosquito district managers on the spot.

Next, the entomologist may help out in the testing of control methods, materials, and techniques, to determine their reliability in control. This may involve such things as comparison of methods, such methods as aerosoling versus spraying, ground spraying versus air spraying, adult control versus larvae control. It might be the testing of materials and the determining their capacities, one against another.

The next point the entomologist may assist in planning and carrying out public relations and educational programs. This may be accomplished by visual education matter such as graphs, maps, photographs, exhibits, and educational phamplets. I have done a great deal of that in the past.

The entomologists may also assist in the release of

publicity to the newspaper and magazine publications of the entomological aspects of the district's operations. I have also had to do a great deal of that in the past 4 years.

The people continue to be interested in mosquitoes and learning about what makes them tick. Preparation of talks to schools and service clubs, of their life histories and habits, is one of the important aspects of the district entomologist. We also have our other district workers doing this public relations work. Personal contacts help promote better appreciation of the entomological problems and the scope of the entire control program.

The entomologist assists in district administration particularly in decentralized districts. That applied particularly in the case of my own district. After the first year as district entomologist, I was also working as district manager.

That covers the outline that was prepared 3 years ago and sent to interested parties. Thank you for your attenti...

ALBERT C. LEEDS
SALT LAKE CITY M.A.D.
TWENTY YEARS AS AN EMPLOYEE IN A MOSQUITO ABATEMENT DISTRICT IN UTAH

Mr. Chairman, fellow workers. I don't know how to address you on this occassion. This talking is not in my line of business. In fact, I felt that if I had come up here today with my boots on, in my work clothes and a dipper in my hand I probably would have felt more at home.

My experience has been entirely out in the field. I have never taken a course in entomology nor do I know any of these fancy names of mosquitoes, so I won't bore you with trying to twist my tongue around them. I have been working around these pests for so many years and been bitten by them so many times I could probably call them names that would be more expressive than the ones we already have.

My mind goes back to February 1927. I was out of work and I contacted Mr. Harold Christopherson, who at that time had been recently appointed as supervisor of the Salt Lake Mosquito Abatement District. He asked me if I had a car, and I told him that I had a little 5 passenger model T touring car. He said it would be better if I had a pick-up truck to carry oil in to the flats and various places to spray with, but if I was willing to take my model T out and use it for that purpose, it was alright with him. So, after explaining a little bit about the work, although he admitted that he didn't know much about the work himself, he had just been appointed, he told me to report to the city barn the next morning, March 1,1927, soon 24 years ago.

After arriving there, I got in a car with Mr. Christopherson and we headed out to the west flats to find mosquito larvae. I didn't know what they looked like. We dipped around North Temple and Redwood road which is now all occupied with building, and he dipped in a hole there and picked up a number of very large larvae, in fact, they were ready to pupate. He explained to me that this was a little "wiggler" that would soon turn into a full fledged mosquito. I had seen those "wigglers", but never knew what they were.

We next went north along Redwood road to about 1400 N. Mr. Christopherson dipped in there and found similar conditions that we found in the first place. We carried some oil with us and a spray gun and he filled up the can and went out. There were a number of acres flooded, probably a foot deep in places. He took one can and sprayed back and forth out to the end of the pond and back and came in and brushed his hands off and put the can back in the car and said, "That ought to take care of that."

I got quite a laugh out of it now when I think about how little good he could have done on that big territory on less than 5 gallons of oil.

We jumped in the car and went out to the Rudy Gun Club. That is one place where we have a good deal of trouble, and we found the same condition. I had agreed with Mr. Christopherson that I would work only a half day on the first day out. It was a Sunday. He drove me back to the city barns.

This was the actual begining of spraying for mosquito control in Salt Lake City for the State of Utah.

I understand that a season or two before, they would take sacks of sawdust saturated with oil, I don't know what kind, and toss them out in the breeding ponds. I am not prepared to say if they got any results or not.

I believe that I am about the oldest man in the State of Utah from the point of service in working on mosquito control. It didn't take me very long to find out what a mosquito wiggler looked like and as we only had two districts mapped out, A and B, he told me, "I'll give you charge of district A. Now, go out and take charge of it and keep it clean."

Now, there was another laugh. Here was a district that was about 4 or 5 miles wide and from the foothills to Great Salt Lake , with 2 men to inspect and spray and keep it clean.

I rigged the old model T and fixed it to carry 15 tall milk cans in the back seat and 5 on the side, and 2 spray cans. Thus equiped, I started out to spray mosquitoes. That was a pretty good load for and old model T, but it groaned right along.

Nearly always we would spray out 2 loads a day. Conditions were so bad at that time, we didn't have to go far to find larvae to spray. Let me remind you, the passenger car was my family passenger car for Sunday rides. How I baptized that car with that stinking oil! We used some kind of acid in the oil at that time as a killing agent.

After using the model T for a few years, I traded it in and got me a Chev. coupe. I tore the back off so I could put in a barrel of oil at a time and a few additional cans. We went out with that and we were never satisfied if we didn't take out at least 2 loads a day. We really worked very hard. I often wonder if that isn't the reason that I am so skinny and drawn out right now.

I have always enjoyed my work on the mosquito abatement job. It has always been very instructive and interesting and at times quite humorous. We have been threatened to be shot at and to have our heads cut off with a shovel and threatened with being thrown into ditches and canals. But very fortunately, I have been able to escape all of those things so I have lived through it all right. Although there are still some times now that we have to take a sheriff along to convince certain people that we have the right to go in and spray. I remember that we did an awful lot of good and a real good job of spraying in those days.

Conditions were terrible west of Salt Lake City. I remember driving a team of horses west of the Jordan River one day and you couldn't see the horses for the mosquitoes and they were actually the biting kind, Aedes dorsalis. But it has changed a lot since then. I remember once working in old Bailey lake, now drained, but it was not unusual to dip in and pick up from 500 to 2,000 in one dipper. It was a good sized dipper but it was just solid with larvae. I remember bringing a can to Dr. Rees who was our Supervisor at that time and there must have been between 5 and 10 pounds of solid larvae in it.

I feel that we did a very fine job at that time and we did receive some fine compliments on our work at that time. Those days we didn't have any drainage system. That was really bad, nothing to take care of the surplus run-off water in the spring or to take care of the irrigation water. Since then, by the use of large drains we have been able to eliminate several breeding places that we used to spray regularly. These large drains were first taken care of by hand, but now, they are being taken care of by drag-line, and tractors and ditchers.

After Dr. Rees became our supervisor, the department purchased a power spray and we were able to cover a considerable larger area with this spray. We had about 500 feet of hose attached to it which we would unwind and take out and spray that area and then we would wind it up by hand and then move on to another place.

Now, that was another job that was really hard work. I have put in some hard licks on that too.

During the depression years of '34 and '35, Dr. Rees and I helped with the W.P.A. workers, who dug by hand over half the drain begining at Williams Lake on out towards the Great Salt Lake and connected with the old Epperson drain. During the winter we did it by hand where as other winters it would have been impossible to get beyond the Airport with a truck. But that winter it just seemed to be in our favor. We could go out although we would get stuck a lot. There were 3 or 4 older men and Dr. Rees who put us in charge of 25 to 30 other men.

By constantly pegging along year after year, we kept the mosquitoes down to a minimum in Salt Lake. With a few exceptions of the times we have had migrations from the different gun clubs.

I have always enjoyed my work. I have worked under about 6 different Supervisors including our present Head Inspector, Mr. Merkley. I was always taught as a youngster that what was worth doing was worth doing well. I have tried at all times to give my best on the job. I have always received fair treatment from my Supervisors.

Thank You.

Charles Guerts
Office Secretary Salt Lake City M.A.D.

RETIREMENT PROGRAMS OPEN TO MOSQUITO ABATEMENT EMPLOYEES IN UTAH

I would like to talk to you informaly on this subject. It is more facts than theory, and I hope it will build up the hopes of mosquito abatement workers. This opportunity of a retirement program is surely deserving of mosquito abatement workers.

There is a social security retirement benefit which at the present time does not include mosquito abatement workers. However, at the present time there is a bill before Congress tha will include all employees of all industres, as well as municipalities, who are not participating in a retirement system. It is a question whether the social security pension is adequate and if it will meet the needs of our particular type of work.

In mosquito abatement work especially in our district, there are so many transient workers, in fact, 50% of our pay roll represents men working through the summer or who are through after about 5 or 6 months work. In the last session of the State Legislature, a bill was enacted which provides for the retirement for mosquito abatement workers, The terms seem to be very favorable.

I want to give you some facts on this bill which the legislature has passed and is now in operation. The state has set up and administration for this retirement system and have already made a survey to obtain the information necessary to determine rates. They expect to operate this system on a 3% contribution from employees with a matching 3% contritubtion from the employer. However, that isn't definate and it may be changed, For that reason they have sent out surveys to all concerned to obtain the number of employees, the amount of service they have had, and when they expect to retire, so they will be able to set up actual rates that will be sound and take care of the needs of this pension system.

In the provisions enumerated, all employees will receive credit for any municipal work whether it be City, State or other governmental agencies within the state, also military service is counted for credit towards retiring. Now, this money contributed by the employer and the employee is set up in a fund toward which charges for pension are made. The 3% the employer contributes to the fund remains there and if an employee that has contributed his 3% leaves the service of the employer he is entitled to a 3% refund of that deduction that has been made. However, that is the difficulty which we have and we think that there may be another possible way of retirement that may be more desirable.

For example, our pay roll here in Salt Lake averages $55,000 a year. The employees will contribute 3% of their pay toward the retirement fund and the district will contribute a like amount. At the end of the year there will be about 50% of the employees left who will remain to participate in benefits of retirement. The other 50% will leave.

The district will have no recourse to that 3% of the 50% of the employees who have left. That is the method they have of building up the fund so we are loosing each time we contribute to that fund about $500.00 and that is quite a sizeable amount to contribute to a fund of which we have no benefits in a s much as the employees have left the service. Now, this fund takes into the consideration the amount which will be paid as about 1/50th of the average ten years of service. The maximum amount of pension would be about $100.00 This retirement program is dated back to July 1, 1947, retroactive, and the cost to our employees to December 31,st, 1949 will be on the average of about $140.00 as ther contribution from which they will receive credit. Then from then on, if we adopt this program, we will have 3% deducted from wages to go into the state fund. The method for adoption is by election of the full time employees. They are called together and asked to vote as to whether or not they want this particular plan, and if so, the Board of Directors will indicate this to the State Administration.

The credit due an employee is divided into two catagories There is the full time employees, and part time. Full time, if he has worked ten months with a total of 250 days is given credit for one year for retirement. If he is only a part time employee, wich most of our men are, working a minimum of 15 days a month, he is given credit of 1.12 toward pension retirement. In our particular district we have not had up to last year any full time employees, because our work only takes in about 9 months of the year. But, this year it looks like there will be a full 10 months period for which the employees will get full credit for their retirement If this plan is a dopted for the full time employees, it also applies to all employees of the district. It is compulsory for an employee to be retired at 65, but he may be granted five additional years employment by agreement of the State Pension Association.

Those are the facts regarding this pension plan which the state has provided. It has been considered now by the board of directors of the Salt Lake City Mosquito Abatement District, a nd they have also considered the possibility of Federal Social Security. The employees of the Salt Lake City District indicated they prefer the state plan to the federal plan. The state plan will give them a better pension and a retirement plan at an earlier age and for fewer years of service. Anyone can operate a retirement plan the way the social security does, because if you have to wait until you are 65 to retire or put in 30 years of service you can certainly build up a fund large enough to take care of all employees.

I have made a study of the figures in regard to that and I have submited a pla n to the Board of Directors of the Salt Lake City District, whereby a self-operated plan of retirement can be accomplished, and thereby save this $500.00 a year that builds up the state fund. This $500.00 would take care of our first employee that would be retired and every succeeding year, of course, the fund would become enlarged. I have worked our chart showing the employees in our service

now, who will retire, and when they will retire, and the lengt of their pension payments until they are 75. So at the end of that period for which all of our present employees are taken care of by the pension, will have a balance in that fund of about $12,000.00. That is from our own deductions and retaining the 3% which we would have sent to the state.

That, in substance is the plan for retirement pensions. I am sure that you all agree that the employees of the mosquito abatement district are certainly deserving of this program and they are probably some of the last ones to be provided for in the pension movement. I thank you.

Mr. Heeps: What is the retirement age limit on thisnew plan that you are figuring on? Would that be retirement at 65? If it is 65 what is going to happen to me? I am nearly 7 years over that retirement age. I would like to know just where that puts me.

Mr. Geurts: Well, the state retirement like I mentioned plans for retirement at age 65, also for an additional 5 years. However, if we adopt our own plan that would be decided upon by the Board. Of course, Mr. Heeps would be elegible for a pension under the terms of the state plan which would be operating in our own plan, that is what the substance of it would be. And it would very likely apply in the independent plan. At least I have submitted those figures to the Board of Directors on the terms and provisions of the state plan. Retirement at 15 years service at 65, 20 years service at 60, 25 years service at 55, or an optional 30 year retirement. Men are elegible according to 4 different periods. Mr. Heeps will be elegible according to how much service he has put in. It is believed by the officials at the State Capitol that the rate of 3% employee and 3% employeer will have to be increased somewhat for the program to be carried out effectively.

Mr. Merkely: Under this retroactive payment if a person should quit the retirement program would he receive the back payments he contributed, that is from July 1947 up to December 31, 1949.

That is right, you would receive everthing you put into it when you leave the service.

Is this plan similar to some others where the retirement pension is provided, providing that is, unless the porson has an independant income of his own. Supposing by thrift or something like that he has an independant income more than his pension. Would he still receive the pension?

Mr. Geurts: There is not clause, that calls for any lein or any property or any consideration for what assests he may have. This is strictly an annuity for which he has made payment. There is one more point I would like to add. The question has been raised why don't we participate in the Salt Lake City Employees pension plan? The mosquito abatement is of course an independant taxing unit. Therefore we are not entitled to appropriations from the Salt Lake City Budget.

QUESTION AND DISCUSSION PERIOD

Reed Roberts: I am interested in trying to get a mosquito abatement district started in Cache Valley and yesterday when I gave my talk I thought that $16,000.00 was a good start. I would like to get some suggestions from the gentlemen here who have had experience in setting up a district as to what they think about that amount of money. We have got approximately 35,000 people in the county. There is 1,000 some odd square miles. Only about one third of that is a real problem area. If any of you have any suggestions to offer I would sure like to hear them.

Mr. Smith: It is rather hard to comment without having first seen the area and knowing their conditions. You can have a place with 300 square miles and it would cost you $100,000 and you could have another place of 300 square miles and it would only cost $5,000 or $6,000.

Dr. Rees: That is the important point. You must determine the extent and kind of breeding area. Then try and guage the program accordingly. Likewise, is it going to be mosquito abatement or mosquito and fly abatement and are you going to branch out into other phases of control? To make any statement as to the amount you can operate on is difficult without this information. It may be $2,500 up to many times that amount, depending on what you have to contend with.

Mr. Roberts: One thing I would like to bring out and note is; for $16,000 what can you buy? Can you get one good 1½ ton truck with a spray outfit on it, and a jeep for survey, get a garage set up, have one fellow on regular and maybe three part time workers during the summer? That is what I am driving at. About how much can you accomplish for $16,000.

Mr. Wilkins: It is very hard to make an estimate without first making a survey. No one is going to stick his neck out and tell you how much it is going to cost without making a first hand estimate. But a fairly good over-all general estimate would be about $300 per square mile.

Mr. Peters: Might I submit myself again. There is probably one subject with which I have had more experience in mosquito control than any other one and that is the one just raised. So I could not resist. Since 1940 in California I have been on the inside of virtualy all the development that has occured in the state. It is very difficult to compare your problem against ours, particularly when we have not had an opportunity to see it first hand. But I get the impression that yours is not the intensified problem that ours is. Now there is one fundamental attitude that I try to convey, I try to tell them this very fundimentally, dont underestimate your cost. It is better to overestimate it and not have them come back on you and say "Here you told us it would be this much now it is costing us more." So I would urge you if you are going to start on a fixed budget, dont guarantee any more for that fixed amount than you can possibly render. And I would suggest this; offer them in the first year of operations an entomological evaluation of your problem so that you can adequately in the future perform the

type of control required. That means actually working it up to the point where you have an operating proceedure set down, so that your cost can be very well measured and estimated.

Now in California to give you a rough estimate of cost. We figure that it takes about $5,000 to equip and put into field operation one man.. That will pretty well provide for year around activities for that man. That is the basis that would require a jeep and other general incidentels necessary for his conduct in the territory. Now there are some areas of California where one man may be able to only handle 15 or 20 sq. miles. There are other places where one man can handle up to 100 sq. miles. But the two areas cannot be adequately compared. I think one of the most important things to be considered in estimating cost is the approach to be followed. Is it going to be a service relationship in which the district is going to render all of the mosquito control, or are you going to begin to organize the assests available to you in the community that you are dealing with.

Now there is one point I want to bring out and have not had a chance to do it so far and I think is is worth thinking about in mosquito control work. Maybe the people in Utah dont fimd any of the members of their society in penitentiaries and so forth I dont know, but in California there are lots of people behind stone walls. There remains considerable manpower behind those stone walls if properly used and supervised you can conduct a lot of constructive work at little cost to a mosquito abatement districts.

If you are going to make it a service relationship, you must make it a strict service relationship. In California we have organizations that render a minimal service relationship and get a lot of cooperation from the outside. I think you have got to take those points into consideration. One last pint, in forming a mosquito abatement district dont ommit the man from the Farm Bureau. He is the key to the success of any mosquito abatement district, in any agricultural community. Dont omit your Farm Bureau. They are going to sink, or make your organization. There you have largely all your work done in agriculture, in order to quell mosquitoes you have got to get their sup ort, because they are going to get the impact of the thing in the long run. The other groups are in the cities, make use of the Chamber of Commerce. They are looking for programs where they can strengthen their community and they are a good medium of support. Also service clubs and similar agencies.

Dr. Rees: By way of closing I extend the thanks of the members of this association to President Dixon of Weber College for the use of these facilities and for his adress of welcome. I would also like to thank Dr. Young for the arrangements he has make. For those who have participated on the program, and so faithfully attended all of these meetings we appreciate your assistance and support.

Now to the supervisors of the districts; Whit Young, Carl Josephson, Bert Wilkins and Clem Teone, who have taken

part in arranging and conducting these sessions, we appreciate your efforts. Finally to our visitors from outside the state. We are in our infancy and are not very strong. Your coming and giving us the benefit of your advise and experience is very helpful and stimulating. If we contribute through these meetings even a small measure to mosquito control, we will be happy and satisfied with our efforts.

If there are no other comments; We will stand adjourned.