

vantage. For in the release of sterilized, diseased, or genetically inferior strains we may wish to reduce natural populations with insecticidal treatments without influencing the strains we release. To say the least, researchers and mosquito control specialists are confronted with interesting and challenging problems which will tax their ingenuity. Hopefully, their efforts will lead to new and even better tools for mosquito control programs.

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COOPERATIVE RESEARCH ON WATER MANAGEMENT FOR WILDLIFE, MOSQUITO ABATEMENT AND OTHER BENEFICIAL USE¹

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Since the beginning of the century mosquito abatement programs have gradually developed in many parts of the country and have now become accepted as an essential part of modern living. When mosquito control programs are first introduced into an area they are definitely on trial. The methods used and sometimes the objectives of mosquito control organizations are viewed with suspicion by those whom they are designed to serve. Gradually these programs seem to earn the respect and confidence of the public they serve and acquire a position of responsibility

and leadership in water management programs in areas where they operate.

In using a more positive approach to obtain greater support for mosquito control programs, it is essential to convince cooperators that mosquito abatement agencies are not in competition for ownership of water. It must also be established that mosquito control workers are interested in assisting in the development of multipurpose beneficial use of water and in so doing are seeking the support of water users to prevent the misuse of water that creates situations in which mosquitoes are produced. This type of an approach to water management and mosquito reduction is being attempted on the marshes bordering the Great Salt Lake in the vicinity of Salt Lake City, Utah. This program has gradually developed

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over a period of many years. Mosquito abatement districts and members of the Utah Mosquito Abatement Association have continuously conferred and worked with the representatives of other agencies and individuals engaged in or concerned with the use of water on the mosquito producing marshes in this area.

In 1960 representatives of eleven federal governmental agencies concerned with soil and water management practices were organized into a "Task Force for Cooperative Research, Field Tests, and Demonstrations on Soil and Water Management Practices." This Task Force functions under the Subcommittee on Vector Control of the Interagency Committee on Water Resources. The stated objectives of this Task Force are to: (1) "develop plans for cooperative research that can be carried out with existing resources of the agencies concerned; and (2) develop plans for the cooperative field tests and demonstrations which would be of mutual benefit to the various interests concerned with soil and water management."

Project V, selected as one of seven projects by which the second objective could be accomplished, was described as the "Development of multipurpose management techniques for waste irrigation water in the Great Salt Lake Basin." An application for supporting funds was made to NIH and approved. This grant, WP-00027, made funds available to the University of Utah to conduct a four-year continuation project to develop techniques for multipurpose management of this water. This was to be accomplished with the assistance of personnel from agencies interested in this problem and willing to serve as collaborators. I became principal investigator and three graduate students work with me on the project. The following agencies through their appointed representatives are serving as collaborators:

Federal agencies: Agricultural Research Service, Soil Conservation Service, Weather Bureau, Public Health Service Disease Ecology Section of CDC, Fish and

Wildlife Service, Bureau of Reclamation, Geological Survey Surface Water Branch.

State agencies: Utah State Department of Fish and Game, Utah State Department of Health Division of Environmental Health, Office of the State Engineer.

Private agencies: Lake Front Gun, Fur and Reclamation Club and the Wheeler Machinery Company.

The work has been in progress for three years on three selected marsh and agricultural areas bordering the Great Salt Lake. The areas are relatively close to each other and are located on (1) the privately owned Lake Front Gun, Fur and Reclamation Club (area 5,000 acres); (2) Farmington Bay Waterfowl Management Area (10,000 acres) managed by Utah State Fish and Game Department; and (3) Wheeler Machinery Test Area (900 acres) owned and operated by the Wheeler Machinery Company.

The objectives of water use on the Lake Front Club and Farmington Bay are described by the name of these areas. The Wheeler Machinery Test Area is being developed by this company in part as irrigated farm and pastureland and in part as a planned and managed waterfowl marsh. The development of the Wheeler property is under the direction of the Soil Conservation Service with the assistance of the other collaborators participating in this cooperative water management program.

The Lake Front Club and Farmington Bay contain some of the best waterfowl marshes in the state and also produce a valuable crop of muskrats each year. All three areas are known to produce, in certain areas when conditions are favorable, tremendous broods of *Aedes dorsalis* (Meigen) and considerable numbers of *Culex tarsalis* Coquillet and *Culiseta inornata* (Williston) mosquitoes. At times the mosquitoes produced in these marshes migrate in great numbers into Salt Lake City and neighboring communities.

At the beginning of this cooperative effort to improve water management practices, a survey was made of each area

to determine the importance of each for waterfowl, particularly ducks and geese, and in the production of mosquitoes. As the study progressed, major physical, chemical and biological factors were considered and an attempt is being made to determine the influence of these factors on the production of waterfowl and mosquitoes. Physical facilities in the nature of dikes, waterways, and gates were planned and installed by the owners or collaborators. Water management practices were planned, applied and evaluated. An attempt is being made to produce plants suitable for waterfowl food and cover and at the same time create situations less favorable for mosquito production.

On the Wheeler Test Area an attempt is being made to scientifically develop approximately 600 acres of unproductive waste land into productive grain and pasture land. The remaining 300 acres, which are unsuitable for agriculture, are being developed into a managed model waterfowl marsh.

It will require a number of years to fully develop this program on these three study areas and evaluate the results according to the water management practices used. The results obtained to date have been very satisfactory. All collaborating agencies have actively participated in the program and have rendered considerable service in the field of their competence. Each has had an opportunity to explain its objectives in water use and consider the objectives of the other agencies.

In the three study areas the applied water management program has to date improved the marshes as a waterfowl habitat and greatly reduced the number of

mosquitoes formerly produced in these marshes. The results have been so obviously successful that some adjacent privately owned clubs have adopted and applied on their property some of the practices used on the test areas.

In the annual meeting held on December 18, 1964, when representatives of all collaborating agencies and others participating on this cooperative program were present, it was unanimously agreed that water management practices essential for mosquito control and applied on the marshes in the study areas are compatible with the approved waterfowl management program adopted for these marshes.

It is the unanimous opinion as expressed by all participants that the program should be continued for another four years in order to be able to more fully evaluate the program over a longer period of time. The prospects in Utah at present are good for improving and maintaining this multipurpose beneficial use program of the water available on the shores of the Great Salt Lake for the mutual benefit of all concerned in the use and management of this water.

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