

**ENVIRONMENTAL PROTECTION AGENCY'S
PESTICIDE ENVIRONMENTAL STEWARDSHIP PROGRAM
UNDER THE AUSPICES OF AMERICAN MOSQUITO CONTROL ASSOCIATION**

"PARTNERSHIP STRATEGY DOCUMENT"

for the

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I. INTRODUCTION TO THE NEW JERSEY MOSQUITO CONTROL ASSOCIATION STRATEGY DOCUMENT

This "Partnership Strategy Document" (PSD) for the Pesticide Environmental Stewardship Program (PESP) has been developed by the New Jersey Mosquito Control Association (NJMCA), a sustaining member organization and affiliate of the American Mosquito Control Association (AMCA).

Chapter VII of the AMCA PSD provides for qualified member organizations to attain PESP partnership status under the auspices of AMCA. NJMCA is the oldest ongoing professional association of mosquito control workers in the United States and heartily endorses the concept of a PESP. This document and accompanying appendices describe the current status of mosquito control activities in New Jersey. The document also details our use of an Integrated Pest Management (IPM) approach to controlling mosquitoes that is consistent with the goals of the PESP.

We, the members of NJMCA, have been stewards of the environment for more than 8 decades. This platform gives us an opportunity to tell our story, establish goals for the future and create parameters for measuring achievable PESP milestones.

II. OVERVIEW OF THE NEW JERSEY MOSQUITO CONTROL ASSOCIATION

New Jersey has a diverse ecology that provides habitat for more than 60 species of mosquitoes. New Jersey also has more human residents per square mile than any other state. At the turn of this century, New Jersey functioned as the center for mosquito research and those early workers developed many of the basic concepts used in mosquito control today. Their successes allowed creation of organized, multidiscipline mosquito control as a proper function of government. Information sharing among researchers and control workers was recognized as an important component of responsible mosquito management and was formalized by the creation of the NJMCA in 1914.

The objectives and purposes of NJMCA are to:

1. Promote and encourage close cooperation among those directly and indirectly concerned with, or interested in, mosquito control and related work.
2. Stimulate educational activities to increase the knowledge of mosquito control.
3. Advance the cause of mosquito control and related environmental concerns in New Jersey and elsewhere.
4. Encourage such other insect control programs as the association may determine.

5. Through its annual meetings and written proceedings, thereof, report and record safe, effective and environmentally sound mosquito control activities performed to protect the health and welfare of the citizens of New Jersey.

These goals stem from the philosophy of NJMCA members to target mosquitoes and/or their habitat as specifically as possible in a financially efficient manner. Minimizing pesticide impact on non-target organisms has always been vital to public acceptance and was incorporated into the goals of NJMCA when the association was originally formed. The nature of the pesticides used at that time was understood and the need to protect workers and farm animals was clear. The present day need to be species specific in the selection and application of pesticides is fundamental to the methodologies we use in New Jersey.

The sanitation and habitat modification procedures developed or enhanced by the early mosquito control workers in New Jersey form the foundation for today's source reduction activities. The water management techniques pioneered by New Jersey's early workers have been honed into the most efficient long term methods available today to reduce mosquito production. Enhancement of natural predators was deemed important in the early days of mosquito control and is now an accepted component of New Jersey's program that is funded and coordinated by our state agencies.

Surveillance is one of the best tools we have for focusing mosquito control on specific pest and vector species. Sampling and identification allow problem species to be recognized and targeted for control. Early mosquito control workers in New Jersey benefited greatly from the landmark investigations of John B. Smith, legendary taxonomist and founder of organized mosquito control. Surveillance programs to monitor disease organisms in their mosquito vectors were not available to early workers but are fundamental to New Jersey's programs today. In New Jersey, the need for control, type of management employed or alternatives to pesticides are all weighed against the surveillance data we collect.

The history of mosquito control in New Jersey shows long standing environmental awareness and the ability to select pesticides, only when necessary, from the broad array of techniques we have at our disposal. New Jersey is an advocate of environmental stewardship and the objectives of NJMCA have long been consistent with those of the PESP.

III. NEW JERSEY'S CONCEPT OF A RESPONSIBLE MOSQUITO CONTROL PROGRAM.

Mosquito control in the state of New Jersey is mandated by law under Title 26, Chapters 3 & 9 of the NJ Health Statutes. The details of the laws we follow today were written by Dr. John B. Smith in the early 1900's. Dr. Smith was an accomplished entomologist and a lawyer. His visions produced the concepts for organizing and mandating mosquito control under the NJ state health statutes.

Title 26 assigns the control of pest and vector species to county mosquito control commissions which function as autonomous units of county government. Activities and expenditure of funds are overseen by a body of commissioners appointed by the board of chosen freeholders in each county. Tax levies provide the operational budget on a county by county basis. Autonomous mosquito commissions have the powers of a local board of health regarding mosquitoes including right of entry onto public and private properties. They have the power to make a declaration regarding mosquito nuisance and can issue an abatement notice whenever necessary. Nine New Jersey counties currently maintain autonomous commissions and 11 counties have mosquito control responsibilities assigned to other agencies of county government.

The laws enacted by Title 26 mandate the Director of the NJ Agricultural Experiment Station (NJAES) at Rutgers University to function in an advisory capacity to all mosquito control agencies in the state. Specific duties of the Director include: 1) annual review of mosquito

commission plans & estimates, 2) conducting surveys for county agencies upon request, 3) investigating the life histories of individual species, 4) recommending methods for control, and 5) conducting extension related activities that educate the public and advocate responsible mosquito control. A primary objective of NJAES involvement in Title 26 is to maintain professionalism within the mosquito control community in New Jersey that is consistent with current environmental concerns.

Title 26 also provides for a State Mosquito Control Commission (SMCC) that functions in an advisory capacity to the Governor. Composition of the SMCC includes 6 public members appointed by the Governor and representatives from the New Jersey Department of Environmental Protection (NJDEP), the NJ Department of Health and Senior Services (NJDHSS), the NJ Department of Agriculture (NJDA) and the NJAES. The SMCC is mandated to carry on a continuous study of mosquito control operations in the state, recommend amounts of money deemed necessary for mosquito control purposes and allocate state aid to counties from an annual appropriation. The Office of Mosquito Control Coordination (OMCC), within the NJDEP, administers SMCC funding and expedites operational programs advocated by that body. Representation by the above mentioned departments of state government on the SMCC fosters a network of communication that recognizes the interdepartmental nature of mosquito control problems and activities in the state.

The operational aspects of mosquito control in New Jersey are conducted by the autonomous mosquito control commissions described above, mosquito control agencies within other county departments as well as federal, municipal and private mosquito control programs. Regardless of the agency, the NJMCA advocates the following as necessary components of responsible programs.

A. SURVEILLANCE. NJMCA believes that mosquito control begins with a surveillance program that targets pest and vector species and justifies the need for control. We believe that species specific records should be kept on the composition of mosquito populations prior to enacting control of any kind. We also advocate records on the composition of mosquito populations after management to determine the effectiveness of control operations. The New Jersey light trap was designed as a surveillance tool more than 50 years ago to reach that end. Most mosquito control agencies use light traps in their programs but have additional tools that provide data to guide their activities. The following list of surveillance methodologies are available for utilization by mosquito control agencies in New Jersey.

1. **LARVAL SURVEILLANCE.** Larval surveillance involves sampling a wide range of aquatic habitats for the presence of pest species during their developmental stages. Most counties have a team of inspectors to collect larval specimens on a regular basis. A mosquito identification specialist normally has the task of identifying the larvae to species. Properly trained mosquito identification specialists can separate mosquito species that cause nuisance and disease from those that are non-pests or beneficial species. Responsible control programs target pest populations for control and avoid managing habitat that supports benign species.
2. **ADULT SURVEILLANCE.** Adult surveillance measures mosquito populations that have successfully developed and emerged from aquatic habitats. The New Jersey light trap has been the standard for collecting adult mosquitoes and most county agencies operate light traps from early May through October. Portable traps baited with carbon dioxide are useful in areas where electricity is not available. Not all pest species are attracted to light and other forms of adult surveillance are frequently employed. In coastal areas of New Jersey, 1 minute landing rates are used to assess the comparative size of host seeking salt marsh mosquitoes during daylight hours. At inland areas, 10 minute bite counts measure annoyance after dark.

Resting boxes are frequently used to measure populations of *Culiseta melanura*, a bird-feeding mosquito that functions in the amplification of eastern equine encephalitis (EEE) virus. Pigeon-baited traps are sometimes employed to measure *Culex* mosquitoes that amplify St. Louis encephalitis virus.

3. **VIRUS SURVEILLANCE.** The New Jersey SMCC funds a virus surveillance program that measures the size of EEE vector populations during the summer season and tests specimens for virus on a weekly basis. Mosquito collections are made at permanent study sites by staff from the NJAES. A wide range of assistance and support is provided by local mosquito control agencies in this effort. Specimens are tested for virus at the NJDHSS laboratories by immunofluorescent antibody (IFA) and polymerase chain reaction (PCR) technology. In addition, one county mosquito control agency runs a sentinel chicken program to identify areas where EEE virus is active and tests mosquitoes for virus by PCR to keep their control activities current. Information on the status of EEE virus is disseminated to all mosquito control agencies in the state in a weekly summary throughout the encephalitis season.

- B. **SOURCE REDUCTION.** Source reduction is the alteration or elimination of mosquito larval habitat. This remains the most effective and economical method of providing long-term mosquito control in New Jersey. Source reduction can include activities as simple as the removal of used tires and the cleaning of rain gutters and bird baths by individual property owners, to extensive regional water management projects conducted by mosquito control agencies on state and/or federal lands. All of these activities eliminate or substantially reduce mosquito breeding and the need for repeated applications of insecticides in the affected habitat. Source reduction activities within New Jersey can be separated into the following two general categories:

1. **SANITATION.** The by-products of the activities of man have been a major contributor to the creation of mosquito breeding habitats. An item as small as a bottle cap or as large as the foundation of a demolished building can serve as a mosquito breeding area. Sanitation is a major part of all IPM programs exemplified by tire removal, de-snagging waterways, catch basin cleaning and container removal.

Mosquito control agencies in New Jersey have statutory police powers that allow for due process and summary abatement of mosquito-related public health nuisances created on both public and private property. The sanitation problems most often resolved by agency inspectors are problems of ignorance, neglect, oversight or laziness on the part of property owners. Collectively, they result in a major use of agency manpower and resources.

Educational information including videos, slide shows and fact sheets distributed at press briefings, fairs, schools and other public areas have information regarding the importance of sanitation. We must continue to emphasize the role of sanitation as an effective mosquito control modality that is a cost effective, low tech, high result method of preventing disease potential and mosquito interference with our ability to enjoy the outdoors.

2. **WATER MANAGEMENT** - Water management for mosquito control is a form of source reduction that is conducted in fresh and saltwater breeding habitats.
 - a. **Freshwater Wetlands Management** - In 1987 the NJ State Legislature enacted into law the New Jersey Freshwater Wetlands Protection Act (NJSA 13:9b-1 *et seq.*) All ditch maintenance, stream and stormwater basin cleaning and/or restoration activities for mosquito control are now regulated

by the NJDEP. *Best Management Practices for Mosquito Control and Freshwater Wetlands Management* (BMP), have been compiled through the cooperative efforts of the mosquito control community, the NJDEP and other state and federal environmental agencies. These practices are applicable to mosquito control activities in stream corridor wetlands, isolated freshwater wetlands, palustrine wooded wetlands, and stormwater facilities. Using mosquito surveillance data and BMP's, New Jersey's mosquito control agencies now conduct water management activities in the state's freshwater wetlands under a number of different "statewide general permits" (i.e. GP-1, GP-7, GP-15) or individual permits when necessitated by the complexity of the project.

In the past, the absence of design and maintenance standards for stormwater management facilities throughout New Jersey resulted in many of the facilities becoming major mosquito producers. In the late 1970's, a 4 year study of stormwater facilities in New Jersey showed that due to poor design, construction and/or lack of maintenance, 67% of all basins surveyed contained mosquito larval habitat with some facilities found to be suitable habitat for up to 8 mosquito species.

In 1989, a stormwater management facilities maintenance manual was produced by NJDEP. The manual is available to all developers, engineers and planning agencies statewide. This document contains specific guidelines and recommendations relative to design, construction and maintenance of stormwater facilities and mosquito control.

- b. Salt Marsh Water Management. Control of the aquatic stage of the mosquitoes that are produced on New Jersey's tidal wetlands requires a complete understanding of tidal marsh ecology. Two water management techniques were developed in New Jersey to control salt marsh mosquito larval populations through the cooperative efforts of county mosquito control agencies, Rutgers University, the State Division of Fish, Game and Wildlife, the Environmental Protection Agency and the U.S. Army Corps of Engineers. These are Tidal Restoration of Salt Hay Impoundments (TRSHI) and Open Marsh Water Management (OMWM), practices which now serve as models for water management activities world wide.

TRSHI involves the removal and/or modification of ditch plugs and other water control structures to permit daily tidal inundation to occur within salt hay impoundments. Salt hay farming was once a major industry in the Delaware Bay area of New Jersey with over 11,000 acres of salt hay impoundments located within the counties of Cape May and Cumberland. These impoundments created ideal conditions for the production of salt marsh mosquitoes and required repeated applications of insecticides each season to control the larval populations originating within the impounded areas. The daily tidal exchange as a result of TRSHI eliminates mosquito breeding and eventually restores the area to a productive salt marsh. Over 7,500 acres of salt hay impoundments in New Jersey have been restored using TRSHI. Although TRSHI is utilized extensively to control mosquito production in salt hay impoundments, the techniques are also applicable to control mosquito breeding in other impounded marshes.

Open Marsh Water Management was developed in New Jersey in the mid - 1960's through the cooperative efforts of mosquito control and wildlife agencies. OMWM standards have been established for use by county mosquito control agencies, which address how and where the technique

should be implemented. OMWM is now the major source reduction technique used by coastal mosquito control agencies in New Jersey. OMWM has been found to effectively control mosquito production on salt marshes through a combination of biological control and habitat manipulation. Three basic alterations are employed in OMWM, the construction of: 1) permanent ponds, 2) pond radials and, 3) tidal ditches. The selective excavation of the ponds, pond radials, and ditches eliminate mosquito breeding sites and provide permanent habitat for mosquito-eating killifish. In areas where OMWM is practiced, pesticide applications are substantially reduced.

Presently there is a working agreement in effect with the state, the mosquito control agencies in Atlantic, Ocean, Burlington and Cape May counties, and Region 5 of the U.S. Fish and Wildlife Service which allows the county mosquito control agencies to perform OMWM on the more than 15,000 acres of mosquito breeding salt marshes within the Edwin Forsythe and Cape May National Wildlife Refuges. As a result of county efforts, and support from the state, over 1,500 acres of salt marsh have been managed on the refuges to date. These lands no longer require larviciding by the counties or state.

C. **CHEMICAL CONTROL.** When source reduction and water management are not feasible, chemicals are judiciously used to control both adult and immature mosquito populations. The chemicals used by New Jersey's mosquito control agencies comply with state and federal requirements, as well as recommendations provided annually by the NJAES. All pesticide applicators and operators in New Jersey are required to be licensed by the NJDEP. Judicious chemical control activities, as part of New Jersey's IPM approach to reducing mosquito populations, uses the most appropriate products available to the professionals of the mosquito control community. Chemical treatments can be directed against either the immature or adult stage of the mosquito life cycle.

1. **Larviciding.** Larviciding, the application of chemicals to kill the immature stages of mosquitoes by ground or aerial treatments, is typically more effective and target specific than focusing on adults. The objective is to target the immature stages at the breeding habitat before populations have had a chance to disperse. New Jersey's IPM approach to mosquito control emphasizes larviciding only when source reduction is not feasible. Applications of larvicides encompass fewer acres than adulticides because treatments are made to relatively small areas where larvae are concentrated as opposed to larger regions where adults have migrated. The larvicides used for mosquito control in New Jersey include: *Bacillus thuringiensis israelensis* and *Bacillus sphaericus* (bacterial larvicides), methoprene (insect growth regulator), temephos (organophosphate), and petroleum oils.
2. **Adulticiding.** Adulticiding is the use of chemicals to reduce adult mosquitoes by ground or aerial applications. Adulticiding is utilized when biting populations reach critical levels. In New Jersey, adulticides are commonly applied as an Ultra-Low Volume (ULV) spray in which the small amounts of active ingredient range from 0.0035 to 0.24 lb/ac. The adulticides are dispensed through properly maintained and calibrated equipment. Adulticides used in New Jersey include pyrethroids and malathion (an organophosphate).
3. **The New Jersey State Airspray Program.** This program was established by state legislation in 1949 to assist coastal counties in the control of salt marsh mosquitoes. This ongoing program is now coordinated through OMCC within the NJDEP. Over the past decade this program has integrated a number of newer management techniques to provide for a more environmentally sound approach to pesticide applications. Emphasis is now focused on larviciding and an

increased reliance on biorational pesticides. Many of the changes in the airspray program philosophy have been fostered from relationships cultivated between NJMCA members and federal and state wildlife refuge managers.

- D. **BIOLOGICAL CONTROL.** Biological control is the manipulation of natural agents and their by-products to control pest and vector species. Biological control is advantageous because it is generally host-specific with limited non-target effects. In New Jersey, fish are the primary biological control agent used to suppress mosquito populations. Predacious fish, typically *Gambusia* species, are reared and stocked in mosquito breeding habitats.

For many years, individual county mosquito control agencies raised and released their own fish. In 1990, the State of New Jersey established a state-wide mosquitofish program with a specific protocol for use. With annual funding from the SMCC, the program utilizes the existing resources of the Division of Fish, Game and Wildlife's staff, hatchery and other facilities. While originally designed for *Gambusia affinis*, the program now offers other species for mosquito control including the fathead minnow, the freshwater killifish and two species of sunfish. The use of state resources has expanded the concept of predatory fish for biological mosquito control in New Jersey.

E. EDUCATION

1. **Continuing Education.** Continuing education is directed toward operational workers to instill or refresh knowledge related to practical mosquito control. Training is primarily in safety, applied technology and requirements for our state's regulated certification program. Examples of continuing education include: the NJMCA Pesticide Training Program, state mandated Right to Know training for hazardous substances, the Northeast Aerial Applicator's Conference, monthly meetings of the Associated Executives of Mosquito Control Work in NJ, the annual meeting of NJMCA and meetings of other mosquito control associations in our geographic area.
2. **Public Education.** Public education is directed toward the general public to teach mosquito biology and encourage citizens to utilize prevention techniques. Examples include: fact sheets and brochures, classroom lectures at schools, slide shows, films and videos on mosquitoes and their control, and exhibits at fairs. NJMCA regularly interacts with civic leaders, politicians and professionals through the annual conventions of the NJ Educational Association and the NJ League of Municipalities. NJMCA produces and distributes proceedings of its annual meeting and coordinates activities in support of the recently enacted national Mosquito Control Awareness Week. NJMCA believes that public education reduces homeowner pesticide applications and the misuse of non-pesticide toxic materials. Public education encourages support for organized mosquito control rather than crisis management which relies heavily on pesticides.

IV. NJMCA'S SUPPORT OF ENVIRONMENTAL STEWARDSHIP

Over the past 3 decades, the New Jersey mosquito control community has made great strides instituting IPM practices that enhance environmental stewardship. Throughout this period, NJMCA has strongly supported and encouraged these goals. This is evidenced statewide by:

A. SURVEILLANCE

1. NJMCA encourages every mosquito control agency in the state to maintain responsible larval and adult surveillance programs.
2. NJMCA published the results of a symposium on surveillance techniques (*Surveillance Techniques: Uniformity, Consistency and Reliability*) in the 1989

proceedings of its annual meeting. This document is used as a standard for mosquito surveillance in the state.

3. The NJAES offers a graduate level course in "Mosquito Identification and Habitat Recognition" with an examination that leads to NJAES Certification of Mosquito Identification Specialists from county programs. With 63 species of mosquitoes in the state, many of which are of negligible control importance, proper identification skills are critical when assessing the need for control.
4. Since 1975, SMCC has funded a Vector Surveillance Program at the Mosquito Research and Control Unit at Rutgers University to collect and disseminate information relative to population trends of disease vectors and the status of virus in those vector populations. Coordination of this information with the OMCC, NJDHSS, NJDEP and the county mosquito control agencies allows for proper timing and placement of pesticides.

B. SOURCE REDUCTION.

1. Open Marsh Water Management (OMWM) was developed in New Jersey during the 1960's and has become the nationwide choice for managing mosquito populations in salt marsh habitats. OMWM applied properly to mosquito breeding habitat enhances natural resources, eliminates breeding sites and reduces the need for repeated pesticide applications. New Jersey has written standards for OMWM usage that were published in the 1980 proceedings of its annual meeting (*Standards for Open Marsh Water Management*). Adherence is required by state and federal regulatory agencies to assure that mosquito control projects are properly implemented.
2. NJDEP adopted the "Best Management Practices for Mosquito Control and Freshwater Wetlands Management" in 1989 which standardize work in stream corridors, palustrine wooded wetlands, detention facility wetlands and mitigation wetlands habitats. These practices were developed through the cooperative efforts of New Jersey's OMCC, Division of Fish, Game & Wildlife, Division of Parks and Forests and the federal U.S. Fish & Wildlife Service, U.S Army Corps of Engineers, U.S. Environmental Protection Agency and USDA Natural Resources Conservation Service.

C. CHEMICAL CONTROL.

1. All insecticides used by mosquito control agencies in New Jersey are subject to annual review by NJAES at Rutgers University. Recommendations are published annually based on safety, efficiency and environmental considerations.
2. To apply a pesticide commercially, applicators and operators are required to register and be certified by the NJDEP Pesticide Control Program. They must be further certified in the specific public health category of mosquito control.
3. The efficiency of the adulticiding aspects of the NJ State Airspray Program have been maximized through frequent calibration of equipment. All application sites are monitored before and after treatment to ensure proper placement and control.

D. BIOLOGICAL CONTROL.

1. New Jersey's mosquitofish program represents a cooperative effort between state and county agencies to enhance environmental stewardship by reducing reliance on pesticides in mosquito breeding habitats.

E. EDUCATION.

1. NJMCA and NJDEP cooperatively provide annual training sessions to convey pertinent information to those involved in mosquito surveillance and control. Many of the training sessions provide recertification credits to attendees to comply with published NJDEP criteria.
2. NJMCA is developing a program at the elementary school level explaining the basics of mosquito biology and control to promote the importance of mosquitoes as a public health hazard.

F. COOPERATION WITH GOVERNMENT & PRIVATE ENTERPRISE.

1. NJMCA recognized the need for responsible environmental stewardship and participated in the development of OMWM Standards and Freshwater Wetlands Management Practices. In addition, NJMCA and its members helped develop standards adopted by NJDEP for Stormwater Management in the New Jersey Coastal Zone.
2. NJ county mosquito control agencies routinely work with municipalities and the private sector to eliminate breeding sites created by improper storage of tires, illegal dumping and poor drainage. Through these efforts, thousands of sites once subjected to repeated pesticide applications have been eliminated.
3. NJMCA member agencies are participants in the Public Service Electric and Gas consortium that is actively converting thousands of acres of mosquito breeding salt hay farms to tidal salt marsh along the shore of Delaware Bay. The restoration of these wetlands will result in substantial reduction in pesticide usage.
4. NJMCA members have worked with U.S. Fish and Wildlife Service, Region 5, to secure a 5 year agreement that allows surveillance and control work on the Edwin B. Forsythe National Wildlife Refuge. This memorandum of understanding permits mosquito control agencies to conduct OMWM and insecticide applications on refuge properties.
5. The OMCC has brokered Agreements of Entry and a Memorandum of Agreement with the Army Corps of Engineers that allows for proper surveillance and treatment of Corps dredge spoil sites. This allows for professionally timed applications and work performed by the state is reimbursable.

V. MEASURING PROGRESS IN MEETING PESP/AMCA GOALS

The NJMCA established an *ad hoc* committee in 1997 to investigate the feasibility of becoming a subpartner of the AMCA in the PESP initiative of the AMCA. To that end, the committee agreed to proceed and it was decided the goals of the NJMCA are consistent with those of the PESP. The formal submission of this document is a result of an endorsement by the Trustees of the NJMCA. Upon acceptance of this document by AMCA, our first goal in 1998 will be to educate the membership of the NJMCA to the content of this strategy document and goals of PESP. This goal will be accomplished by presenting this strategy document to the NJMCA membership at the 1998 annual meeting and other appropriate training sessions. The *ad hoc* committee recommends that the NJMCA establish a standing committee to continue education of its membership and develop a method of measuring the goals presented in this document on an annual basis.

LIST OF APPENDICES

1. New Jersey Statutes Annotated: Title 26 (Health & Vital Statistics) Chapters 3 & 9.
2. Surveillance Techniques: Uniformity, Consistency and Reliability. Papers from a Symposium published in the Proceedings of the New Jersey Mosquito Control Association, 1989.
3. Best Management Practices for Mosquito Control and Freshwater Wetlands Management. New Jersey Department of Environmental Protection Document, Last Revised 1997, 44pp. (Cited in N.J.A.C. 7:A-1.4)
4. Standards for Open Marsh Water Management (OMWM). Published in the Proceedings of the New Jersey Mosquito Control Association, 1980.
5. Working Agreement for Saltmarsh Mosquito Control in Ocean, Burlington, Atlantic and Cape May Counties Between Office of Mosquito Control Coordination, New Jersey Department of Environmental Protection and Energy and Region 5 U.S. Fish and Wildlife Service. Memorandum of Agreement, July, 1994.
6. Insecticides for Mosquito Control in New Jersey. New Jersey Agricultural Experiment Station Publication, Revised Annually, 14 pp.
7. How to Use the State Bio-control (Mosquitofish) Program for Mosquito Control in New Jersey. NJDEP Bulletin, 1992, 10 pp.
8. Mosquitofish Fact Sheet. NJDEP Fact Sheet, 1994.
9. New Jersey Agricultural Experiment Station Fact Sheets
Why Mosquitoes Cannot Transmit Aids FS736
Questions Regarding Eastern Equine Encephalitis and Horses FS737
Controlling Mosquitoes Around the Home FS780
The Asian Tiger Mosquito in New Jersey FS845
Products and Promotions of Limited Value for Mosquito Control FS867
10. Stormwater and Nonpoint Source Pollution Control, Best Management Practices Manual. NJDEP/NJDA Document, 1994, 188 pp.
11. Memorandum of Agreement with U.S. Army Corps of Engineers. 1990, 99 pp.
12. NJDEP Flood Hazard Area Control Act Rules (NJAC 7:13-1.1 et seq.) 1995.
13. New Jersey Mosquitoes-Biology and Control Web Page. Accessible through <www-rci.rutgers.edu/~insects/njmos.htm>

**RECENT STATE AND COUNTY ACTIVITIES RELATED TO INTEGRATED PEST
MANAGEMENT OF SALT MARSH MOSQUITO RELATED PROBLEMS**

New Jersey Mosquito Control Commission:

The State, through Rutgers University, maintains an ongoing vector surveillance program. Eastern equine encephalitis is present within the state. The 1981 report by Dr. Wayne J. Crans showed that mosquito-borne viral encephalitis generally appeared first in the area of the Mullica River drainage during the years 1976 through 1980. The mouth of the Mullica is within the Brigantine Division of the Forsythe National Wildlife Refuge.

The State has standards in place for Open Marsh Water Management.

The New Jersey Mosquito Control Association has developed or uses a number of surveillance tools to guide decisions on mosquito control, for example:

- 1)Parous landing rates as a surveillance technique to monitor mosquito populations
- 2)New Jersey light trap
- 3)CO₂-baited CDC trap
- 4)Landing rates and bite counts for nuisance evaluation
- 5)Complaints
- 6)Larval surveillance

The State Mosquito Control Commission provides funding and equipment to the County Mosquito Control organizations for OMWM on some National Wildlife Refuge lands.

Ocean County Mosquito Extermination Commission:

Ocean County has 14,227 acres of mosquito producing salt marsh. About 9,047 acres of this marsh fall within the Barnegat Division of the Forsythe National Wildlife Refuge. These areas have historically been the heaviest producers of mosquitoes and have consequently received the most aerial larvicide treatments. This was true while the lands were privately held and is still true today. The Refuge areas have been perceived as the foci of human involvement with Eastern Equine Encephalitis.

In 1987 the Ocean County Mosquito Commission began Open Marsh Water Management on the Barnegat Division of the Refuge, with financial and equipment support of the New Jersey State Mosquito Control Commission. The goals were to eliminate mosquito-producing habitat and to reduce the need for pesticide while enhancing the marsh habitat for fish and wildlife. From 1987

to 1993, 1,370 acres have been managed using Open Marsh Water Management (OMWM). To date, none of the OMWM areas have required the use of aerial applied mosquito larvicides. The data indicates OMWM allows a permanent decrease in larvicide usage at these sites.

Year	Aerial Larvicide Acreage		OMWM Acreage	
	Refuge	Non-Refuge	Refuge	Non-Refuge
1987	7,574	4,350	159	109
1988	9,047	5,180	114	207
1989	8,574	3,955	11	103
1990	8,689	4,711	287	257
1991	7,533	3,805	167	103
1992	6,779	3,191	297	100
1993	6,771	3,511	335	109
Total			1370	1021
		<u>County Wide</u>	<u>Refuge</u>	<u>Non-Refuge</u>
Total Marsh Acreage		27,579	13,721*	13,858*
Potential Mosquito Breeding Habitat (Sprayed at least occasion- ally)		14,227	9,047	5,180

*Estimated

Burlington County Mosquito Extermination Commission:

The OMWM work done in Burlington County, both on and off the Refuge property, has greatly reduced the use of pesticides.

Atlantic County Mosquito Control Unit:

Atlantic County has approximately 9,000 acres of potential mosquito breeding salt marsh. About 6,000 acres of this of potential mosquito breeding salt marsh is within the Brigantine Division of the Forsythe National Wildlife Refuge. This area contains the most prolific salt marsh breeding in Atlantic County and is has been perceived as foci of human involvement with Eastern equine encephalitis. As such, this area is the priority of mosquito control activities in Atlantic County.

The largest mosquito breeding areas on the Refuge are the areas known as "The Pristine", about 2,000-acres of unditched marsh, and the "Motts Creek/Oyster Creek tract", a 1,500-acre area of previously ditched marsh.

In 1987 the Atlantic County Mosquito Control Unit, with financial support from the New Jersey State Mosquito Control Commission, began an Open Marsh Water Management (OMWM) project on the "Motts Creek/Oyster Creek tract" to eliminate suitable mosquito producing habitat and reduce the need for pesticides. Through 1993 725 acres of mosquito breeding salt marsh have been managed with OMWM. To date, none of the OMWM areas have required treatments with mosquito larvicides.

Year	Aerial Larvicide Acreage		OMWM Acreage	
	Refuge	Non-Refuge	Refuge	Non-Refuge
1987	2,700	260	155	0
1988	4,450*	250	200	0
1989	3,385	484	115	0
1990	3,325	683	140	0
1991	3,328	618	80	0
1992	3,180	502	35	0
1993	3,154**	767	0	3

* East Pool - 700 Acres

** West Pool - 800 Acres

	County Wide	Refuge	Non-Refuge
Total Marsh Acreage	44,000		
Potential Mosquito Breeding Habitat (Sprayed at least occasion- ally)	9,000	6,000	3,000

Cape May County Mosquito Extermination Commission:

In 1969 the Cape May County Mosquito Extermination Commission began Open Marsh Water Management (OMWM) projects as part of an integrated mosquito control program of water management, biological control and chemical control. The program has been based on surveillance data collected by the Commission and the Vector Surveillance Program conducted by the Mosquito Research and Control Unit of the New Jersey Agricultural Experiment Station, Rutgers University and New Jersey Department of Health (funded by the State Mosquito Control

Commission). The surveillance program provided Eastern equine encephalitis virus information and a vector potential index to guide control methods. To date, the Commission has eliminated about 6,000 acres of heavy *Aedes sollicitans* breeding areas.

	<u>County Wide</u>	<u>Refuge</u>	<u>Non-Refuge</u>
Total Marsh Acreage	53,000	3,526 ¹	49,474
Potential Mosquito Breeding Habitat (Sprayed at least occasion- ally)	8,000	100 ²	7,900

¹ Within 16,765 acres approved acquisition boundary.

² Within **currently**-owned refuge lands.

ATTACHMENT 1

NEW JERSEY STATE AIRSPRAY PROGRAM GUIDELINES

AND

**NEW JERSEY STATE MOSQUITO AIRSPRAY PROGRAM PROTOCOL
FOR ADULTICIDING**

FROM: FISH, GAME, AND WILDLIFE

TO:

16094631667

MAY 5, 1994 3:20PM #320 P.02



State of New Jersey
Department of Environmental Protection and Energy
Office of Mosquito Control Coordination

CN 400

Trenton, NJ 08625-0400

Tel. # 609-292-3649

Fax. # 609-984-1414

Scott A. Weiner
Commissioner

Kenneth W. Bruder, Ph.D.
Administrator

NJ STATE AIRSPRAY PROGRAM GUIDELINES

1. There will be a pre-season meeting with all program counties, the Experiment Station, and state personnel, the purpose of which is to discuss program procedures, review aerial application and insecticide usage, and resolve any questions or problems arising at that time.
2. Treatment areas within each county shall be inspected and mapped by the county and a representative of the Office of Mosquito Control Coordination, D.E.P., and maps placed on file in the State's Airspray Office.
3. Each county mosquito commission is required to submit to the Federal Aviation Administration in Philadelphia (or Teterboro for Monmouth County), and to the Office of Mosquito Control Coordination, D.E.P., copies of signed municipal agreement forms granting permission to conduct aerial spraying within the municipalities. Municipal agreement forms shall be submitted to the Office of Mosquito Control Coordination, D.E.P., on or before June 1.
4. The County Notice used in the media, for notification of the public, for aerial applications, will be published according to Subchapter 9 of the State Pesticide Regulations. A copy of this notice will be forwarded to the Office of Mosquito Control Coordination. Prior to flying, verbal notification should also be provided to associated municipalities, state/local police departments, and other interested persons, groups, organizations, or establishments. Operations must comply with N.J.A.C. 7:30. Updated proof of notification must be submitted to the Office of Mosquito Control Coordination as they are renewed.
5. The superintendents or director of each county commission or agency shall submit to the Office of Mosquito Control Coordination, on or before June 1, a letter indicating knowledge of the locations of beehives within the county. Attached to the letter shall be an up-to-date list of all known beekeepers in the county. It is suggested that markers be used to identify beehive locations in target areas.

FROM: FISH, GAME, AND WILDLIFE

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6. Placement of aerial applications will be the responsibility of the county mosquito control agency. The actual application will be guided and observed by a representative of that county. These individuals must be certified in Category 8B of N.J. Pesticide Applicators Certification, and should be certified in Category 11 (aerial application). The individual is responsible for mapping the exact location of each application, and recording associated data.

7. The name of the representative(s) from the county designated to fly with the aircraft and guide placement of the spray must be submitted to the Office of Mosquito Control Coordination by June 1. Designated crew members must be knowledgeable in airspray procedures. Acceptable crew members may include: (1) Superintendent, (2) Assistant Superintendent, (3) Pilot, (4) or a regular inspector or employee who has participated in the program in the past and has demonstrated competency in the placement and execution of the airspray program.

8. Each county mosquito control agency shall provide on-the-ground personnel in radio contact with the aircraft, at all times during actual aerial treatment. Such personnel will be responsible for maintaining communication with the on-board observer with regard to weather, mosquito activity, observation of aircraft operation, etc.

9. When the county determines that an airspray is necessary (via established surveillance, landing rates and/or upon the advice of the Director of the State's Vector Surveillance Program), the superintendent or director of the mosquito control agency shall notify the Office of Mosquito Control Coordination. Upon approval, the Office of Mosquito Control Coordination will coordinate necessary aircraft to the county involved. Mosquito Control Coordination telephone numbers: (609) 292-3649, 1054, 1059.

All aerial applications will be restricted to the period from sunrise to one half hour following sunset (at pilot's discretion). Use the sunrise/sunset schedule to properly time adulticides (i.e., close to sunset as possible). Temperature and wind restrictions should be closely recognized.

10. Insecticides available for use include the following:

- a. Malathion 91%, 0.9 fl. oz. + 1 qt. #2 fuel oil/acre.
- b. Malathion 91%, 3.0 oz./acre.
- c. Resmethrin/PBO, @ 3.0 oz./acre.
- d. Abate 4E 1.5 fl. oz. + up to 8.5 oz. H₂O/acre.
- e. Abate 2G, at recommended rates.
- f. Altosid SR-10.

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TO:

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formulations.

h. Experimental formulations as directed by the State Experiment Station, and the N.J.D.E.P. Office of Mosquito Control Coordination.

11. Airstay Program Report sheets to be completed according to "Instructions" on work sheet packet.

- All signed reports and attached maps (with bite count stations, and size scale indicated) must be delivered to the Office of Mosquito Control Coordination within ten days following time of treatment.
- Be sure to indicate if the acreage recorded is determined by mapping or calculated from gallons of material used. Notation of the number of swaths laid down will confirm acreage plotting configuration.
- Superintendents (or representatives) should be in attendance at all Associated Executive meetings. This will allow counties and state to exchange information and application records.
- Although final tach-time will include ferry-time, the observer should note tachometer time during flight for comparison. **BE SURE TO NOTE TIME-OF-DAY ACCURATELY ALSO.**
- Control (untreated area) site data should be indicated on bottom of back page data sheet.
- Report sheets must include E.P.A. registration numbers for insecticides, in order to comply with N.J. regulations.

12. The State of New Jersey will continue to offer field-scouts to certain counties to aid in data collection and non-target research associated with the program. Individuals are available for week-end hours, or those other than "county" hours. They are supplied with daily work records and hourly sheets. The daily work record/data sheet is meant to contain beneficial information to superintendents.

13. In the event of viral activity, communication is paramount. Improved contact between the Office of Mosquito Control Coordination and counties, the N.J.A.E.S., and the N.J. Department of Health, is extremely important at this time.

FROM: FISH, GAME, AND WILDLIFE

TO:

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MAY 5, 1994 3:22PM #320 P.05

14. The University will be conducting data collection as part of the N.J. State Commission supported "Airspray Technology" project. Counties are requested to supply airspray program data, past and present, to be utilized in bioassays, efficiency studies, and the development of the Nuisance Level Index. State and county personnel-collected information will be increasingly important in these studies.

15. As of July 1, 1992 the Program will no longer purchase, and maintain inventory of larval control formulations. The delivery and storage of insecticides or biolarvicides applied through the Program will be the responsibility of the using county. This change does not apply to federal "dredge spoil areas", or state "natural areas".

FROM: FISH, GAME, AND WILDLIFE

TO:

16094631667

MAY 5, 1994 3:22PM #320 P.06



State of New Jersey State Mosquito Control Commission

Department of Environmental Protection and Energy

Aaron H. Rappaport
Dr. Leonard E. Spiegel
Ralph W. Evans
Dr. Thomas E. Murray
Thomas E. Sellers
Scott A. Welner, Ex Officio
Bruce Siegel, M.D., M.Ph., Ex Officio
Dr. Daryl Lund, Ex Officio
Arthur Brown, Jr., Ex Officio

Dr. Kenneth W. Bruder, Secretary
Office of Mosquito Control Coordination
CN 400
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(609) 292-3649
Fax # (609) 984-1414

N. J. STATE MOSQUITO AIRSPRAY PROGRAM

PROTOCOL FOR ADULTICIDING

ROBERT KENT

N. J. OFFICE OF MOSQUITO CONTROL COORDINATION
DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY
TRENTON, N. J.

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FROM: FISH, GAME, AND WILDLIFE

TO:

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MAY 5, 1994 3:22PM #320 P.07

1) **SURVEILLANCE:** all should be performed in compliance with those guidelines published in the "Proceedings" of the New Jersey Mosquito Control Association's 76th annual meeting held in 1989, which may be found in the "Symposium-Surveillance Techniques: Uniformity, Consistency, and Reliability".

2) **PROCEDURES:**

a) **pre-spray landing rates:**

-minimum three days.

-3-4 sites per 1,000 acres treated.

-timing and site selection consistent day-to-day; site-to-site.

-rates to be collected consistent with the hours of the proposed application (not to exceed 2.0 hours pre-sunset).

b) **pre-spray collection for caged adult mosquitoes**

-six cages must be utilized per airspray operation.

-aluminum window screen cages of consistent mesh; 8 inches in length; 4 inches in diameter; with aspirator access.

-each cage is filled with twenty adult, field caught Aedes sollicitans, not more than four hours pre-spray

-all cages are placed into an appropriately sized clear plastic, sealable, bag with moist paper towelling, and with a cotton dental wick soaked with 10% sugar solution for mosquito-feeding

-cages are unbagged, and placed as follows:

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- i) tacked at 3 ft. above ground via wood lathe.
- ii) two in open area; uncovered immediately prior to aircraft fly-over.
- iii) two in canopied area; uncovered immediately prior to aircraft fly-over.
- iv) two remain in uncontaminated protected environment, in the bags.

-mortality is observed at the following intervals:

- i) one hour post spray
- ii) twelve hours post spray
- iii) twenty-four hours post spray
- iv) forty-eight hours post spray

-cages are emptied, washed in soap solution, rinsed and either baked at 200 degrees fahrenheit, or placed in direct sunlight for 12 hours; then stored for use.

c) weather

- i) temperature
- ii) wind velocity
- iii) precipitation
- iv) humidity
- v) cloud cover (%)
- vi) inversion
- vii) sunset/sunrise

d) droplet collection

-all droplets should be collected as described in "Modern Mosquito Control", Sixth Edition, Cyanimid, Agriculture Division, VPCo Ventures, Wayne, N.J., 1986

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-droplet readings may be evaluated as described in the above document, or via computer program as described by Sofield and Kent, "Mosquito News", -Vol 44, Number 1, March 1984.

e) paint panels

-select automobile paint panels shall be available with portions to be uncovered sequentially, 20% at a time.

panels are placed at three foot elevation, the horizontal surface parallel with the ground.

-a 20% section shall be uncovered and exposed to the aerial application during the initial operation.

-another 20% is uncovered and exposed on each subsequent operation, with the prior surfaces also remaining exposed.

-the last 20% is never uncovered (control).

-after each aerial operation the panels are observed under 10x power of equipment such as a Bausch and Lomb "Stereozoom 7" microscope, Model BV-1070.

-panels are not washed, but are stored for use.

f) other

-radio-contact: one person (minimum) shall remain in radio contact with the aircraft at all times prior to, and during the operation. Communication is paramount in the event of any event which may occur during the flight.

-on-the-ground personnel must note beginning, and ending time of day

-on-the-ground personnel should record observations relative to the flight, including altitude, direction, deviation, nozzling, swath, etc. also, non-target impacts on resident wildlife/ domestic animals/ cultured organisms (i.e. beehives, shellfish, organic garden).

FROM: FISH, GAME, AND WILDLIFE

TO:

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MAY 5, 1994 3:23PM H320 P.10

UFG-032
692

New Jersey Department of Environmental Protection and Energy
Office of Mosquito Control Coordination

AIRSPRAY PROGRAM REPORT

INSTRUCTIONS:

1. Complete form with all available information.
2. Obtain appropriate signatures.
3. White Copy — Complete reverse side. Attach map of area.
Send to Office of Mosquito Coordination.
- Canary Copy — Air Service
- Pink Copy — County Copy -
Complete reverse side.
Attach map of area.

COUNTY _____

AIR-SERVICE _____

<u>AIRCRAFT TYPE</u>	<u>USE (Aapl. or Insp.)</u>	<u>N-Number</u>	<u>TACH-TIME</u>

MATERIAL: Formulation _____

Rate _____

AIR SPEED: _____

EPA REG. # _____

BATCH _____

<u>LOCATION</u>	<u>ACREAGE</u> (Mapped Calc'd)	<u>SPRAY-TIME</u>		<u>GALS. USED</u>
		Start	Finish	

EQUIPMENT:

Nozzles (type - size) _____

#/Ship _____

Pressure _____

WEATHER: Temp. _____

Wind _____

CONFIRMATION:

County Superintendent _____

Pilot(s) _____

Crew/Observer _____

Date of Spray _____

FROM: FISH, GAME, AND WILDLIFE

TO:

16094631667

MAY 5, 1994 3:24PM #320 P.12

PROCEDURES FOR ADULTICIDESPRE

1. Pre-spray landing rate (3 days).
2. Pre-adult collection for research/parody.
3. Pre-adults in cages for control (2), open (2), and canopy (2).
4. Note air temperature; humidity, and precipitation; windspeed, direction; and inversion potential.
5. Lay out paint panels.
6. Observe beehive activity.

DURING

1. Note time airspray operation starts.
2. Observe aircraft for nozzle clogging/deviation in spray pattern/procedures.
3. Wave teflon coated slides (2-4), and store for collection.
4. Observe beehive activity.

POST

1. Note time airspray operation ends.
2. Post bite count 1-2 hours, 12 hour, 24 hour, 3 to 5 days post.
3. Collect paint panels, and store for observation.
4. Note wind speed, direction, inversion potential, air temperature, humidity, and precipitation.
5. Collect cages; bag; observe according to #2.
6. Return 24, 48 hours and collect landing rate.
7. Observe beehive activity.

Maintain radio contact (w/aircraft) when necessary through county personnel.

FROM: FISH, GAME, AND WILDLIFE

TO:

16094631667

MAY 5, 1994 3:25PM H320 P.13

PROCEDURES FOR LARVICIDESPRE

1. Take pre-spray larvae dip counts.
2. Take pre-spray larvae/water sample
3. Take pre-spray water temp.
4. Take pre-spray air temp.
5. Take pre-spray wind speed measurement.
6. Observe wildlife activity (waterfowl/fish/invertebrates).

DURING

1. Note time airspray operation begins.
2. Observe aircraft for nozzle clogging/deviations in spray pattern/procedures.
3. Observe material/marsh water contact.
4. Note time airspray operation ends.

POST

1. Note air temp.
2. Note water temp.
3. Note wind speed.
4. Take post spray larvae/water samples.
5. Note wildlife activity (waterfowl/fish/invertebrates).

FROM: FISH, GAME, AND WILDLIFE

TO:

16094631667

MAY 5, 1994 3:25PM H320 P.14

N. J. STATE AIRSPRAY PROGRAM

DATE OF AIR SPRAY _____ LOCATION _____

CHEMICAL USED MALATHION _____ DIBROM _____ NONF (CONTROL) _____

WIND: SPEED _____ DIRECTION _____ TEMP. _____

OPEN

CANOPY

Date	PRE SPRAY	BITE COUNT
	_____	_____
	_____	CAGES _____
	_____	SHEETS _____
Date	1-2 HRS. POST	BITE COUNT
	_____	_____
	_____	CAGES _____
	_____	SHEETS _____
Date	12 HRS. POST	BITE COUNT
	_____	_____
	_____	CAGES _____
	_____	SHEETS _____
Date	24 HRS. POST	BITE COUNT
	_____	_____
	_____	CAGES _____
	_____	SHEETS _____
Date	48 HRS. POST	BITE COUNT
	_____	_____
Date	72 HRS. POST	BITE COUNT
	_____	_____

COLLECTORS NAME _____

COUNTY _____

COMMENTS _____

FROM: FISH, GAME, AND WILDLIFE

TO:

16094631667

MAY 5, 1994 3:25PM #320 P.15

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF MOSQUITO CONTROL COORDINATION
AIRSPRAY PROGRAM SCOUT DAILY REPORT

County _____ Date of Collection _____

Municipality _____ Exact Location _____

Time of Day _____ Collector's Name _____

Air Temperature _____ Windspeed _____ Precipitation _____

LARVAL
SURVEILLANCE

ADULT
SURVEILLANCE SPECIES
OR INSTAR

Plot	#/Dip	#/Minute	
Plot _____	_____	_____	_____
Plot _____	_____	_____	_____
Plot _____	_____	_____	_____
Plot _____	_____	_____	_____
Plot _____	_____	_____	_____
Plot _____	_____	_____	_____
Plot _____	_____	_____	_____
Plot _____	_____	_____	_____
Plot _____	_____	_____	_____
Plot _____	_____	_____	_____
Plot _____	_____	_____	_____

Comments _____

FROM: FISH, GAME, AND WILDLIFE

TO:

16094631667

MAY 5, 1994 3:26PM #320 P.16

Parameters of Guidelines

1. Light traps
2. Landing counts
3. Weather conditions
4. Complaints
5. Truck traps
6. Co₂-baited CDC traps
7. Larval surveillance
8. Past history of application
9. Socio-economy of target area
10. Virus (presence or absence) as indicated by virus isolation, horse cases
11. Risk: Benefit in populated area; amplifying the benefits and reducing the risks of the program.

1. Light traps. (each of 3 days before & 5 after) sunset to sunrise.

Calibration, e.g. maintenance

There should be 2 N.J. light traps per 1000 acres.

Accompanied by weather information (T°, moon phase).

2. Landing counts, sites, method, time.

3-4 sites/1000 acres depending on size of area and travel.

Times at as consistent times as possible.

It is recommended i.r. to be taken at dusk.

3. Weather conditions and time of day.

Weather conditions are mainly governed by label. Timing should not be during those times when convection currents are present (i.e. daytime) when applications are prevented from descending to target area. Applications should be made as close to

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TO:

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MAY 5, 1994 3:26PM H320 P.17

2.

sunset and sunrise as possible, with accommodation for safety of application and acreage to be treated. Since nonresidual insecticides are applied, specific attention should be paid to the fact that the adult mosquitoes are actively flying (generally at Temp. of 60-82°). The upper figure conforms to labeling for malathion, but may be higher for other materials. For aerial application and according to label, wind speed should not exceed 10 mph. Some attention should be given to weather forecasts, and applications should not be made during precipitation.

4. Complaints - Are a valid indication of the public's perception of mosquito populations.

Chronic versus acute

Computerization

Confirmation and identification of species

5. Truck traps - 1 mile route/target area

6. CDC-traps - No light on trap

Battery operated

Clearly define isolated populations

To confirm

CDC - traps considered to be an option to confirm populations

7. Larval surveillance - As a preparation for data collection in #1, 2, 3 and 4 and anticipation of their timing.

Benefit of larval surveillance in correct timing and identification of species.

8. Past history of the need for and efficiency of aerial application.

Most target areas have a long-term or recent history of the need for applications and have been mapped for size and dimensions. This record has value in more exactly anticipating the problem and making applications even more efficient.

FROM: FISH, GAME, AND WILDLIFE

TO:

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MAY 5, 1994 3:27PM #320 P.19

DAY	JAN.		FEB.		MAR.		APR.		MAY.		JUNE.		JULY.		AUG.		SEPT.		OCT.		NOV.		DEC.	
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
1	7:18	4:45	7:05	5:19	6:31	5:50	5:43	6:21	4:59	6:51	4:33	7:19	4:34	7:28	4:57	7:13	5:26	6:29	5:53	5:41	6:25	4:57	6:58	4:35
2	7:18	4:46	7:04	5:19	6:30	5:51	5:41	6:22	4:58	6:52	4:32	7:19	4:35	7:28	4:59	7:09	5:27	6:27	5:54	5:39	6:26	4:56	6:59	4:35
3	7:18	4:47	7:03	5:20	6:28	5:52	5:39	6:23	4:57	6:53	4:32	7:20	4:35	7:28	4:59	7:08	5:28	6:26	5:55	5:37	6:28	4:54	6:59	4:35
4	7:18	4:48	7:02	5:21	6:27	5:53	5:38	6:24	4:56	6:54	4:32	7:20	4:36	7:28	4:59	7:07	5:28	6:25	5:56	5:36	6:29	4:53	6:59	4:34
5	7:18	4:49	7:01	5:23	6:25	5:54	5:36	6:25	4:55	6:55	4:31	7:21	4:36	7:28	4:59	7:06	5:29	6:24	5:57	5:34	6:30	4:52	6:58	4:34
6	7:18	4:49	7:00	5:24	6:24	5:55	5:35	6:26	4:53	6:56	4:31	7:22	4:37	7:28	4:59	7:05	5:30	6:23	5:58	5:33	6:30	4:52	6:58	4:34
7	7:18	4:50	6:59	5:25	6:22	5:56	5:33	6:27	4:52	6:57	4:31	7:22	4:38	7:27	5:02	7:05	5:31	6:22	5:59	5:31	6:31	4:51	6:58	4:34
8	7:18	4:51	6:58	5:26	6:20	5:57	5:32	6:28	4:51	6:58	4:31	7:23	4:38	7:27	5:03	7:04	5:32	6:21	5:59	5:31	6:32	4:50	6:58	4:34
9	7:18	4:52	6:57	5:27	6:19	5:58	5:32	6:29	4:50	6:59	4:31	7:23	4:39	7:26	5:04	7:02	5:33	6:20	5:59	5:31	6:33	4:49	6:58	4:34
10	7:18	4:53	6:56	5:28	6:17	5:59	5:29	6:30	4:49	7:00	4:30	7:24	4:39	7:26	5:05	7:00	5:34	6:19	5:58	5:31	6:34	4:48	6:58	4:34
11	7:17	4:54	6:55	5:30	6:16	6:00	5:27	6:31	4:48	7:01	4:30	7:25	4:40	7:26	5:06	6:59	5:35	6:18	5:58	5:33	6:35	4:47	6:58	4:34
12	7:17	4:55	6:54	5:31	6:14	6:01	5:26	6:32	4:47	7:02	4:30	7:25	4:41	7:25	5:07	6:59	5:36	6:17	5:58	5:34	6:36	4:46	6:58	4:34
13	7:17	4:56	6:52	5:32	6:13	6:02	5:25	6:33	4:46	7:03	4:30	7:25	4:42	7:25	5:08	6:58	5:37	6:16	5:58	5:35	6:37	4:45	6:58	4:34
14	7:17	4:57	6:51	5:33	6:11	6:03	5:24	6:34	4:45	7:04	4:30	7:26	4:43	7:25	5:09	6:58	5:38	6:15	5:58	5:36	6:38	4:44	6:58	4:34
15	7:16	4:58	6:50	5:34	6:10	6:04	5:23	6:35	4:44	7:05	4:30	7:26	4:44	7:24	5:10	6:58	5:39	6:14	5:58	5:37	6:39	4:43	6:58	4:34
16	7:16	5:00	6:49	5:35	6:08	6:05	5:22	6:36	4:43	7:06	4:30	7:26	4:45	7:23	5:11	6:57	5:39	6:13	5:58	5:38	6:40	4:42	6:58	4:34
17	7:15	5:01	6:48	5:37	6:06	6:06	5:21	6:37	4:42	7:07	4:30	7:27	4:46	7:23	5:12	6:57	5:40	6:12	5:58	5:39	6:41	4:41	6:58	4:34
18	7:15	5:02	6:46	5:38	6:05	6:07	5:20	6:38	4:41	7:08	4:30	7:27	4:47	7:22	5:13	6:57	5:41	6:11	5:58	5:40	6:42	4:40	6:58	4:34
19	7:14	5:03	6:45	5:39	6:03	6:08	5:19	6:39	4:41	7:09	4:30	7:27	4:48	7:21	5:14	6:48	5:42	6:10	5:58	5:41	6:43	4:39	6:58	4:34
20	7:14	5:04	6:44	5:40	6:02	6:09	5:18	6:40	4:40	7:09	4:31	7:28	4:49	7:21	5:15	6:47	5:43	6:12	5:58	5:42	6:44	4:38	6:58	4:34
21	7:13	5:05	6:42	5:41	6:00	6:10	5:17	6:41	4:39	7:10	4:31	7:28	4:48	7:21	5:16	6:47	5:44	6:13	5:58	5:43	6:45	4:37	6:58	4:34
22	7:13	5:06	6:41	5:42	6:00	6:11	5:16	6:42	4:39	7:10	4:31	7:28	4:49	7:21	5:16	6:45	5:44	6:15	5:58	5:44	6:46	4:36	6:58	4:34
23	7:12	5:07	6:40	5:43	6:00	6:12	5:15	6:43	4:38	7:11	4:31	7:28	4:49	7:21	5:17	6:44	5:45	6:16	5:58	5:45	6:47	4:35	6:58	4:34
24	7:12	5:09	6:38	5:44	6:00	6:13	5:08	6:44	4:37	7:12	4:32	7:28	4:50	7:18	5:18	6:44	5:47	6:17	5:58	5:47	6:48	4:34	6:58	4:34
25	7:11	5:10	6:37	5:45	6:00	6:14	5:07	6:45	4:36	7:13	4:32	7:28	4:51	7:17	5:19	6:40	5:48	6:18	5:58	5:48	6:49	4:33	6:58	4:34
26	7:10	5:11	6:35	5:47	6:00	6:15	5:06	6:46	4:36	7:14	4:32	7:29	4:52	7:16	5:20	6:39	5:49	6:19	5:58	5:49	6:50	4:32	6:58	4:34
27	7:09	5:12	6:34	5:48	6:00	6:16	5:04	6:47	4:35	7:15	4:33	7:29	4:53	7:15	5:21	6:37	5:50	6:20	5:58	5:50	6:51	4:31	6:58	4:34
28	7:09	5:13	6:32	5:49	6:00	6:17	5:03	6:48	4:35	7:15	4:33	7:29	4:54	7:14	5:22	6:35	5:52	6:21	5:58	5:51	6:52	4:30	6:58	4:34
29	7:08	5:14	6:32	5:50	6:00	6:18	5:02	6:49	4:34	7:16	4:33	7:28	4:55	7:13	5:23	6:34	5:52	6:22	5:58	5:52	6:53	4:29	6:58	4:34
30	7:07	5:16	6:32	5:50	6:00	6:19	5:01	6:50	4:34	7:17	4:34	7:28	4:56	7:12	5:24	6:32	5:52	6:23	5:58	5:52	6:54	4:28	6:58	4:34
31	7:06	5:17	6:32	5:50	6:00	6:20	5:01	6:50	4:33	7:18	4:34	7:28	4:56	7:12	5:25	6:30	5:52	6:24	5:58	5:52	6:55	4:27	6:58	4:34

Add one hour for Daylight Saving Time if used when in use.

Prepared by
 NATIONAL ALMANAC OFFICE
 UNITED STATES NAVAL OBSERVATORY
 WASHINGTON, D.C. 20390
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 101222

FROM: FISH, GAME, AND WILDLIFE TO: 16094631667 MAY 5, 1994 3:27PM #320 P.18

3.

9. Socio-economy of target area. (Development of area, resort values)

Although the previous parameters define mainly the involvement of mosquitoes, a very important consideration is the human population, whose protection against the nuisance and health effects of mosquitoes is the objective of the application. People served may be long-term or recent residents and/or visitors. Target areas themselves may be important for their resort, industrial, residential developmental or conservation value.

10. Virus

Based upon strong scientific evidence that New Jersey is a major focus of EEE transmitted by the salt marsh mosquito, the objective of selective aerial insecticide applications to some of its adult habitat is to prevent a repetition of the disease outbreak of 1959, which claimed 22 human lives. Since then human and horse cases confirms that an absolute alertness to the presence of virus be maintained. Data from the vector surveillance program may outweigh data of other parameters.

FROM: FISH, GAME, AND WILDLIFE

TO:

16094631667

MAY 5, 1994 3:28PM #320 P.20

UNCLASSIFIED



State of New Jersey
STATE MOSQUITO CONTROL COMMISSION

Department of Environmental Protection

Aaron H. Rappaport
 Dr. Leonard E. Spiegel
 Ralph Evans
 George Rue
 Thomas Sellers
 Judith A. Yarkin, Ex Officio
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 Dr. Roger E. Wyso, Ex Officio
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Dr. Kenneth W. Bruder, Secretary
 Office of Mosquito Control Coordination
 CN 400
 Trenton, New Jersey 08625 0400
 (609) 292-3619

N. J. STATE AIRSPRAY PROGRAM

WEATHER STATIONS

FLIGHT SERVICES (MILLVILLE)	609-399-8096
FLIGHT SERVICES (TETERBORO)	800-932-0835
NOAA (ATLANTIC CITY)*	609-646-6400
NOAA (WILMINGTON)**	302-328-7596
NOAA (PHILADELPHIA)**	215-627-5875
NOAA (NEWARK)	201-624-8118
USCG (ATLANTIC CITY)	609-344-6594
USCG (BARNEGAT)	609-494-2661
USCG (BEACH HAVEN)	609-492-5751
USCG (CAPE MAY)	609-884-8419
USCG (OCEAN CITY)	609-399-0119
USCG (FORTESQUE)	609-447-4422
FARMERS FORCAST*	201-828-3091

*recording...**with ring-through to office 30 seconds after completion.



STANDARDS FOR OPEN MARSH WATER MANAGEMENT (OMWM)

County mosquito commissions, Rutgers University and the New Jersey Division of Fish, Game and Shellfisheries have been perfecting one technique, Open Marsh Water Management (OMWM) for the control of all genera of salt marsh mosquitoes on open tidal marshes for over two decades. Perfection is achieved by continued improvement and evaluation. In order to ensure the finest quality and identify this management technique, certain standards are a necessity. These standards should be included in any riparian or other permit. Improper adherence to these standards would be a violation of the permit and infringement on the quality of the management technique. The following standards shall be utilized and strictly adhered to in any OMWM project:

- I. NEED. OMWM will be based entirely on need and utilized on breeding marshes only.
 - A. OMWM will be confined to the Spartina patens or mixed S. patens, short S. alterniflora or types of similar vegetation that are irregularly flooded by rains, spring or storm tides. It will not be employed on marshes that are regularly inundated or affected by daily tides such as tall saltmarsh cordgrass (Spartina alterniflora), wildrice (Zizania aquatica), cattail (Typha spp.), arrow arum (Peltandra virginica), threesquare (Scirpus olneyi) and other types of similar vegetation.
 - B. All alterations must directly affect mosquito breeding depressions.
 - C. The direction and type of alteration used will depend on the distribution of the mosquito breeding depressions and their proximity to natural ponds and tidal ditches.
 - D. An experienced wildlife biologist, mosquito control worker, or both, shall stake out all breeding depressions ahead of the equipment. Depression marking shall be utilized to determine the least amount of alteration needed to eliminate mosquito breeding.
 - E. All mosquito or other ditches encountered that are not contributing to breeding mosquitoes will not be cleaned.
 - F. When possible, ponds previously altered by mosquito ditches will be restored.
- II. ALTERATIONS. Three types of alterations (tidal ditches, ponds and pond radials) will be used.
 - A. Tidal Ditches
 1. All tidal ditches will be dug with suitable equipment, preferably with a rotary ditcher.
 2. When mosquito breeding depressions are located adjacent to a tidal, mosquito or other ditch, a tidal ditch alteration will be utilized.
 3. When a tidal ditch is dug near a pond, the spoil should be deposited on the pond side.
 4. Attempts should be made to dig tidal ditches to a depth of approximately three feet. Meandering or straight ditches are acceptable.
 5. Main tidal ditches are used to provide tidal circulation through large areas. They should be connected to a tidal source on both ends where possible. Their location is determined by the distribution of breeding depressions.
 6. Lateral tidal ditches connect breeding depressions to mains, natural tidal ditches or other laterals. Such laterals often dead-end in a breeding depression.

7. All mosquito or other ditches that are breeding will be cleaned.
8. Spoil shall be used whenever possible to fill adjacent mosquito breeding depressions or spread evenly over the marsh to encourage growth of existing vegetation.

B. Pond Radials

1. All mosquito breeding depressions located near a natural or other permanent pond shall be connected to this pond by pond radials. These radials will provide access for fish to devour mosquito larvae in the depressions.
2. All pond radials shall be constructed with suitable equipment, preferably with a rotary ditcher.
3. To prevent drainage of a pond by muskrats or snow geese, all pond radials shall terminate at a sufficient distance from a tidal ditch.

C. Ponds

1. Where large numbers of mosquito breeding depressions are concentrated in a limited area, a pond alteration will be utilized.
2. Pond construction is accomplished by the use of the rotary ditcher, amphibious crane or other suitable equipment.
3. Ponds should be shallow, less than one foot in depth, to promote the best waterfowl, wading and shore bird use.
4. To prevent mosquito breeding during droughts, a reservoir three feet in depth shall be installed within the pond.
5. These reservoirs should provide proper pond access by humans. When large numbers of radials are used, reservoirs are unnecessary.
6. Reservoirs for fish can be ensured in natural ponds that dry out during droughts by construction of three foot ditches with a rotary ditcher or other suitable equipment. These reservoirs will connect all the lowest areas within the pond.
7. Pond spoil should be squashed and leveled without causing depressions. It should be reduced to the lowest possible level to ensure reestablishment of existing vegetation. Spoil shall approximate the level of the existing marsh.
8. Ponds may take the shape of the breeding area or may be squared off to facilitate construction. The shape of a pond or ditch does not appreciably affect wildlife use. Depth, food potential and availability are the main factors that determine wildlife utilization.

III. OBJECTIVES

- A. To adequately serve the three major objectives (control mosquitoes, eliminate insecticides and enhance the tidal food web) all three alteration types (tidal ditches, ponds and pond radials) shall be utilized on each section of marsh whenever possible. Diversity provides a better marsh environment, prevents marsh surface breeding by all genera of mosquitoes and enhances both major branches of the tidal food web.
- B. Insecticide use is gradually phased out as OMWM progresses to eliminate breeding acreage. When the project is completed, all insecticide use should terminate.

IV. OTHER TECHNIQUES

Impoundments, stop ditches and other types of management techniques are not OMWM.

V. EVALUATION

Mosquito larval dippings, vegetational plots, invertebrate sampling and wildlife censuses are to be conducted on the area treated with OMWM and compared with a control of similar composition.