

Metropolitan Mosquito Control District

MMCD 1995 Operational Review and Plans for 1996

RA 640 .M574 1995/96

EDITORIAL STAFF

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ACKNOWLEDGEMENTS

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February 1996

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METROPOLITAN MOSQUITO CONTROL DISTRICT

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JOSEPH F. SANZONE Director

W.J. CAESAR Business Admin.

April 30, 1996

Dear Reader:

The following is the Metropolitan Mosquito Control District's (MMCD's) 1995 Operational Review and Plans for 1996. This report outlines program operations, based on the goals set forth by MMCD's board of county commissioners.

This report has been reviewed by the Metropolitan Mosquito Control Commission's Technical Advisory Board (TAB). The charge of the TAB is to comment on and make recommendations for improvements in the District's operation, on an annual basis. The minutes and recommendations from their February 26, 1996 meeting are included in the report.

The TAB recommendations and report were accepted by the MMCD board of commissioners at the April 24, 1996 Commission meeting. The MMCD board has instructed staff to consider the recommendation of the TAB, and report the results of those considerations to the Executive Committee of the Commission.

If we can provide further information on the District please contact us.

Sincerely.

Kseph F. Sanzone Director

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EXECUTIVE SUMMARY

In 1994 the Metropolitan Mosquito Control District (MMCD) began a process of structural and operational reorganization to provide services more efficiently. This process will be completed by the start of the 1996 mosquito season. All staff will then be working in interrelated teams. MMCD recognizes that it can function more effectively if staff is trained and empowered to perform all operations.

One effect of the reorganization is that "focus programs" will not be used after 1995. However, this report will show 1995 activities in the focus program format. Plans for 1996 will be discussed in terms of how focus program activities will fit into the new structure.

MMCD continued to achieve excellent control of spring floodwater mosquito larvae in 1995. This resulted in low numbers of adult spring mosquitoes for the year. Larval control efforts for cattail mosquitoes were extended to townships along the District's periphery. This resulted in more cattail mosquito breeding acres being treated in 1995 than 1994. The District continued to reduce the number of Altosid[®] briquets it uses for floodwater and cattail mosquito control, relying more on Altosid[®] pellets and *Bti* granules.

There were no reported cases of LaCrosse (LAC) encephalitis within the District during 1995. Surveillance for *Aedes triseriatus*, the LAC vector mosquito, identified several neighborhoods for control and prevention efforts. These efforts included public education, removing more than 42,000 tires (the primary breeding source) and limited adult control measures. Monitoring for western equine encephalitis by sentinel chicken flocks was expanded in 1995. However, numbers of the vector mosquito (*Culex tarsalis*) were generally low and no virus activity was discovered. In 1995 monitoring continued for the black-legged tick (*Ixodes scapularis*). This tick is the known vector of Lyme disease and ehrlichiosis. Numbers of ticks collected were down by at least 50% and no changes in tick distribution were detected.

The District's black fly control program on small streams and rivers continues to be highly effective. Improved control strategies and below average larval numbers at some sites kept control material usage to a four-year low. A supplementary study on the effects of the black fly larvicide, *Bti*, on stone flies in the Rum River was completed in the fall of 1995. Results indicate that no significant effects could be detected on stone fly species composition or biomass throughout the study years of 1993 -'94. The first draft of this work is under review at the MN Dept. of Natural Resources.

The public affairs program was active in 1995 in getting MMCD's message to citizen groups, government agencies, news media, and the public. Information booths and panels were set up at county fairs, conventions, public buildings, nature centers, and special events. An interesting CD-ROM concerning mosquitoes was produced by MMCD. This CD-ROM was distributed to public schools and libraries throughout Minnesota.

MMCD maintains one of the most comprehensive wetland map inventories in the metropolitan area. During 1995 we provided over fifteen hundred square miles of wetland maps to local government units in the metropolitan area.

In 1996 service levels will be reduced because of a 26% budget reduction. Staff will maintain control services in heavily populated areas of the District at or near 1995 levels. Services will be decreased in less densely populated areas of the District. However, some service will be provided to each area.

There will be a significant decrease in annoyance mosquito control in 1996. In particular, the use of Altosid briquets for floodwater mosquito control will be drastically reduced. The monitoring and control of vector species will continue at 1995 levels. Black fly control is an effective, popular and low cost service. It also will be maintained at 1995 levels. Public affairs activities will be increased, especially to improve communications with our customers.

MMCD faces many challenges in 1996. However, it is ready and able to meet its core responsibility: to protect the public from mosquito and tick-borne diseases.

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Metropolitan Mosquito Control District 1995 Operational Review and Plans for 1996

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY NATIONAL HEALTH AND ENVIRONMENTAL EFFECTS RESEARCH LABORATORY MID-CONTINENT ECOLOGY DIVISION 6201 CONGDON BOULEVARD • DULUTH, MN 55804- 2595

April 18, 1996

Commissioner Richard Wedell, Chair Metropolitan Mosquito Control Commission 2099 University Avenue West St. Paul, MN 55104 OFFICE OF RESEARCH AND DEVELOPMENT

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EGEUW

Dear Commissioner Wedell,

The Technical Advisory Board (TAB) met on February 26, 1996 with two issues on the agenda. The first was to discuss the Scientific Review Panel (SPRP) report and the second was to review the 1996 MMCD program. The SPRP report review was summarized in an earlier memorandum to the MMCD dated February 28, 1996. A copy is attached.

The MMCD program review did not raise many questions from the TAB. Because of the funding reduction, we found that the District has restructured its administration and operational plans and those ideas were presented and discussed. The MMCD staff also reviewed their public information program and the activity of the Interagency Panel on MMCD Effectiveness. The public information program seems to be greater than in other years. The Interagency Panel report was received with little comment.

The District has responded to the funding loss by changing its operation, both in administration and in operations. The operation restructuring will emphasize applications in areas of high population with a reduction in control applications to lower population areas, although all areas will receive some control. In this transition year, the success of the new approach may well be measured in the public arena. The TAB found no technical objections to the proposed changes.

Sincerely yours,

Richard L. Anderson Acting TAB Chair 1996 TAB Chair 1997

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Minutes of the 1996 Spring Technical Advisory Board Meeting Feb. 26, 1996

Members Present:

Dave Noetzel, Chair Richard Anderson, Vice-Chair Dave Belluck Ron Chatfield Jim Cooper Howard Krosch Art Mason Robert Sherman Alan Singer

Members Absent

Larry Gillette Craig Hedberg Bob Wryk

MMCD Staff

Joseph Sanzone, Director Sandy Brogren, Technical Support Janet Jarnefeld, Technical Support David Neitzel, Control Program Susan Palchick, Technical Support

Member Agency

University of Minnesota, Entomology United States Environmental Protection Agency Minnesota Pollution Control Agency Industry Representative (Solvay Animal Health Inc.) University of Minnesota, Fisheries and Wildlife Minnesota Department of Natural Resources Minnesota Department of Agriculture Hennepin County, Planning/Development Environmental Interest Groups (Minneapolis Parks)

Member Agency

Hennepin County Parks Minnesota Department of Health Minnesota Department of Transportation

> Nancy Read, Technical Support Mark Smith, Technical Support James Stark, Public Information John Walz, Technical Support

Visitors

Gary Montz, Minnesota Department of Natural Resources Stan Smith, United States Fish and Wildlife SErvice

I. The Feb. 26, 1996 meeting of the Technical Advisory Board (TAB) was called to order at 12:30 pm at the Metropolitan Mosquito Control Headquarters in St. Paul by the chair, Dave Noetzel.

II. Scientific Peer Review Panel Report and Discussion

Dick Anderson presented the Scientific Peer Review Panel (SPRP) report of impacts of methoprene and *Bacillus thuringiensis israelensis (Bti)* as used by the MMCD. A brief summary of the study and results follow, more detailed information is available in the final report.

The study included laboratory toxicity tests on wetland invertebrates and amphibians. Field tests were conducted to test direct and indirect effects on naturally occurring animals through long-term studies with repeated treatments.

Researchers were contracted through Request for Proposals with renewal on a year to year basis, related to progress. The SPRP recommended several years of preapplication baseline studies followed by 2-3 years of applications to measure effects. The laboratory studies were conducted

concurrently with the set-up and first years of the field studies. Research began in 1987 and concluded in 1995.

Laboratory studies showed no significant effects on crayfish, amphibians, cladocerans, copepods, or amphipods. Studies with *Bti* showed that *Paratanytarsus* chironomids were affected at concentrations near or below those that kill mosquitoes, although a longer exposure time was required.

Field studies showed no effects on wetland bird populations and variable findings on mallard duckling growth and behavior. The Wright County Long Term Experiment (WCLTE) was the most comprehensive study conducted by the SPRP on wetland invertebrates. This study found no significant effects on aquatic insect populations in 1991, but found significant reductions in chironomid populations in 1992 and 1993.

Discussion by TAB members followed Dick Anderson's presentation. Bob Sherman inquired about the storage and availability of the data from the studies. MMCD owns the data and it is stored in electronic form.

Bob Sherman also questioned whether researchers will continue to check the sites in the WCLTE study. Dick responded that they would if they were under contract. Joe Sanzone said that MMCD will continue to treat the sites in 1996 but does not have the funds to do the sampling. It may be possible to get outside funding, such as an LCMR grant, to do sampling in 1997 and 1998. No treatments would be made in 1998 in order to check for population rebounds.

Joe Sanzone stated that MMCD is taking measures this year to mitigate the effects found in the study. He would like the TAB to help us find experts to give input on these measures. A suggested waterfowl expert is Mike Zicus of the Minnesota DNR.

Dave Noetzel suggested that the TAB recommend to the MMCD Board of Commissioners that they continue to fund the Wright County Long Term Experiment and public survey studies. Dave Noetzel will draft the recommendation and circulate it to TAB members. (February 28, 1996 memo attached).

Bob Sherman, on behalf of the TAB, expressed thanks to Dick Anderson for his role on the SPRP. Bob made a **motion** to send letters of appreciation to all SPRP members for their time and effort. Jim Cooper seconded the motion and the motion passed.

III. Program Update

Joe Sanzone gave a MMCD program update. With a 26% reduction in the budget for 1996, the District is restructuring. There will be more awareness of demographics, concentrating our control in areas with high human population. Control in less populated areas will drop off, but everyone will get some service. To reduce the cost of control materials, briquet treatments will be decreased.

IV. Public Information Update

Jim Stark, MMCD Public Affairs Coordinator, gave an update of MMCD's public information program. He is using several methods to inform the public of our program, including informational panels, presentations to community groups and information booths at special events.

Jim is making personal contact with the media and developing a weekly "mosquito forecast" spot on local television.

V. Interagency Panel on MMCD Effectiveness

Nancy Read reported on the conclusions of the Interagency Panel on MMCD effectiveness, which was set up at the request of the Environmental Quality Board in 1994. The panel developed a list describing existing and needed information on effectiveness and encouraged some focus group and GIS work (see Program Development section of the 1995 Operational Review). Given funding constraints, the panel turned over implementation of further studies to MMCD and plans to check on progress periodically.

The meeting was adjourned at 2:22 pm.

Twin Cities Campus

Department of Entomology College of Agricultural, Food, and Environmental Sciences 219 Hodson Hall 1980 Folwell Avenue St. Paul, MN 55108-6125

612-624-3636 Fax: 612-625-5299

TO: MMCD Board

FR: Technical Advisory Board (TAB) /David M. Noetzel, Chairperson, U of M

RE: Need for continuing research related to impact of mosquito control on non-taragets, and man

DT: February 28, 1996

The initial motion for support of the non-target research under the leadership of the Scientific Peer Review Panel (SPRP) was made by the Technical Advisory Board in 1984. Information generated from those studies, when it became available, has been considered by the TAB in its deliberations as to recommendations made to the MMCD Board. We commend the members of the SPRP for their exceptional commitment of time to this endeavor and for their studied preparation of their report to the Board.

The TAB expresses their support of the SPRP recommendations that the Wright County Long Term Experiment (WCLTE) be continued in a manner that would permit possible sampling of particularly insect populations in 1996 and 1997. The experiments have demonstrated that midge populations appear to be the major non-target insect being affected by both Bti and Altosid. Why this is so, and whether these changes affect waterfowl populations remains open.

Although TAB understands the MMCD funding is for operational mosquito control there continues to be a need for budgeted research support in view of continuing questions from the public about both control efficacy and possible non-target effects. Continued research, most especially with the highly valuable WCLTE, seems to us the course of wisdom.

Background and Overview

- Technical Advisory Board Members
- Metropolitan Mosquito Control Commissioners
- MMCD Mission Statement and Staff Qualifications
- Program Overview
- Administration
- Scientific Peer Review Panel
- Control Materials



Metropolitan Mosquito Contro TECHNICAL ADVISORY BOARD 1996	I District					
REPRESENTATIVE	MEMBER AGENCY					
Dave Noetzel, Chair	University of Minnesota, Entomology 226 Hodson Hall St. Paul, MN 55108					
Richard Anderson, Vice Chair	United States Environmental Protection Agency Environmental Research Laboratory 6201 Congdon Boulevard Duluth, MN 55804					
Dave Belluck	Minnesota Pollution Control Agency 520 Lafayette Road St. Paul, MN 55155					
Ron Chatfield	Solvay Animal Health Inc. (Industry Representative) 1201 Northland Drive Mendota Heights, MN 55120					
Jim Cooper	University of Minnesota, Fisheries and Wildlife 200 Hodson Hall St. Paul, MN 55108					
Laurence Gillette	Hennepin Parks 3800 County Road 24 Maple Plain, MN 55359					
Craig Hedberg	Minnesota Department of Health 717 SE Delaware Street Minneapolis, MN 55440					
Howard Krosch	Minnesota Department of Natural Resources Box 25 DNR Building 500 Lafayette Road St. Paul, MN 55155					
Art Mason	Minnesota Department of Agriculture 90 W. Plato Boulevard St. Paul, MN 55107					
Robert Sherman	Hennepin County, Planning/Development A-2308 Government Center Minneapolis, MN 55487					

Alan Singer

Minneapolis Parks (Environmental Group Representative) 200 Grain Exchange Building 400 South 4th Street Minneapolis, MN 55415

Robert Wryk

Minnesota Department of Transportation Water's Edge 1500 West County Rd. B2 Roseville, MN 55113

Metropolitan Mosquito Control District **Board of County Commissioners**

The Metropolitan Mosquito Control District, established in 1958, controls mosquitoes and gnats (black flies) and monitors ticks in the metropolitan counties of Anoka, eastern Carver, Dakota, Hennepin, Ramsey, Scott and Washington. The District operates under the seventeen member Metropolitan Mosquito Control Commission, composed of county Commissioners from the participating counties. A Director is responsible for the operation of the program and reports to the Commission.

1996								
Dick Wedell, Chair*	Ramsey County							
Dick Underferth, Vice-Chair*	Scott County							
Randy Johnson, Secretary	Hennepin County							
Dick Lang	Anoka County							
Margaret Langfeld	Anoka County							
Dave McCauley*	Anoka County							
Ursula Dimler*	Carver County							
John Siegfried, alt	Carver County							
Patrice Bataglia	Dakota County							
Don Maher*	Dakota County							
James Mueller	Dakota County							
Mike Opat	Hennepin County							
Penny Steele	Hennepin County							
John Finley	Ramsey County							
Hal Norgard	Ramsey County							
Ed Mackie	Scott County							
Donnic Hogherg*	Washington County							
Dave Engstrom	Washington County							

Metropolitan Mosquito Control Commission

*Executive Committee

Metropolitan Mosquito Control District MISSION STATEMENT

The Metropolitan Mosquito Control District protects the public from mosquitoes, biting gnats, and ticks which threaten health and well-being, accomplishing this in an environmentally sensitive manner.

We provide advice and services to all levels of government for environmental service projects on wetlands and associated organisms.

We encourage open communication to achieve public understanding, acceptance, and approval.

We believe our mission cannot be accomplished without the commitment of excellent employees, therefore we must provide a safe and supportive working environment to aid employee development and overall program effectiveness.

Metropolitan Mosquito Control District STAFF & QUALIFICATIONS

Joseph Sanzone, Director,

William Caesar, Business Administrator,

Susan Palchick, Technical Services Manager

Sandy Brogren, Entomology Laboratory Dave Clark, Personnel Manager Diann Crane, Entomology Laboratory Rosemary Golias, Admin. Secretary Dave Neitzel, Group Leader

Scott Ranta, Group Leader Nancy Read, Program Development

Mark Smith, Quality Assurance James Stark, Public Affairs Coordinator John Thompson, Data Processing Manager M.S. Biology/Entomology,
B.S. Entomology
Masters Business Administration,
B.S. Business
Ph.D. Entomology,
Masters Public Health, Epidemiology
M.S. Entomology,
B.S. Agricultural Journalism
B.S. Entomology
J.D., B.B.A.
M.S. Entomology, B.A. Biology
M.A. Theology, B.Ed. Chemistry
M.S. Environmental Health,
B.S. Wildlife Management
Ph.D. Candidate, Entomology,

M.S. Entomology, B.S. Biology B.S. Biology B.S. Journalism B.S.-MIS-Metro State College, in progress

PROGRAM OVERVIEW

The Metropolitan Mosquito Control District(MMCD) is comprised of seven counties working together to provide mosquito and black fly control, and tick monitoring to the citizens of the metropolitan Minneapolis-St. Paul area. MMCD is governed by a board of 17 elected county Commissioners and is managed by a Director and a Business Administrator.

The mission of MMCD is to protect public health and well-being. This is accomplished by suppressing mosquito and tick transmitted diseases, and reducing annoyance levels of mosquitoes and black flies below levels that interfere with outdoor activities. This mission is accomplished with environmental sensitivity.

Through 1995 MMCD employed focus programs to conduct operations. In 1996 these operations will be performed by teams working together. We intend to leverage maximum benefit from resources, particularly from our most valuable asset - human resources.

During 1995 operations were performed by several programs, the largest being the Mosquito Control Program. Other District programs include Vector-borne Disease Management and Black Fly Control. These programs are supported by Quality Assurance, Program Development and the Entomology Laboratory.

Emphasis of the Mosquito Control Program is on larval control. Mosquitoes are most concentrated and susceptible to control in this aquatic stage. Sites are mapped, sampled and prioritized according to mosquito productivity. The most productive sites are treated using two types of biological control materials that affect immature mosquitoes in an environmentally sensitive approach. A natural soil bacteria (*Bacillus thuringiensis* var. *israelensis* or *Bti*) and an insect growth regulator (methoprene or brand name Altosid®) are used in dry, granulated, or briquet forms.

Localized adult mosquito control is done to reduce mosquito annoyance for public events on request. MMCD primarily treats in and around park and recreation areas and for civic events. Adult mosquito control materials are permethrin and resmethrin products. These materials are synthetic pyrethroids and are similar in chemical structure to pyrethrum, a natural botanical insecticide that is the extract of a chrysanthemum flower.

MMCD has chosen to use the most environmentally compatible control materials available. Staff remain current in advances in mosquito control technology. They continue to evaluate alternative control methods and solicit input from toxicologists and other sources about control materials. This effort is supported by information obtained in the recently completed Scientific Peer Review Panel (SPRP) report. This report assesses the nontarget effects of *Bti* and methoprene in metropolitan area wetlands. Technical Advisory Board members have received the SPRP report.

To accomplish the above work, MMCD's operations budget for 1995 was not increased from the 1994 budget level. The MMCD average levy on a home valued at \$100,000 was less than \$4.80 in 1995. In 1995, 93% of MMCD's budget went into the field for the

control of mosquitoes and black flies, tick and disease surveillance, program development, quality control and environmental studies. The total 1996 budget will be reduced by 26% due to decreased tax levying authority. MMCD's average levy on a home valued at \$100,000 is expected to be \$3.75 in 1996. Reduced services will occur in 1996 because of this budget cut. However, it is expected that increased efficiencies in MMCD's organizational structure will lessen the effects of the service reduction.

As a public service agency, MMCD is very sensitive to the questions and concerns of citizens of the metropolitan area. Our public information program provides speakers for schools and groups such as Kiwanis and Lions clubs. Several brochures and write-ups are sent to callers with questions and are available for distribution. In 1995, information booths were located at the State and county fairs. It is estimated that more than 29,000 people visited our displays at these fairs. MMCD has produced a CD ROM (available only for Macintosh computers) in 1995. The CD contains an entertaining, interactive program about mosquitoes and is aimed at those 8 years and older. It has been distributed, free, to ca.1800 public schools and libraries throughout Minnesota. In addition, a video overview of MMCD is available for presentations to citizen groups.

ADMINISTRATION

1. Background

The administration of the Metropolitan Mosquito Control District leads and enables operations staff to accomplish their tasks in an effective and efficient manner, while controlling and coordinating resource use. Staff seek to work with the public to identify and define citizen expectations. These service level expectations are communicated to the Commission. Staff design activities and systems to implement Commission policies and goals.

Administrative objectives include:

- Provide leadership and support in the District's reorganization. Particularly focusing on maintaining high morale and obtaining the best use of human resources, in meeting the District's mission and goals.
- Strengthen improvement in the quality of services provided and responsiveness to citizen expectations through the efforts of the Continuous Quality Improvement (CQI) initiative of the District.
- Implement an activity based costing system to better identify cost effectiveness of operations and areas needing improvement.
- Automate and simplify the processes used to collect, analyze, access and report operational data. Provide training for end users, including follow-up support.

2. 1995 Program

- Structural reorganization has been established, with a unified control operations and reduced administrative staff in place. Operations reorganization will continue into 1996, with the focus being on staff training and education.
- Continuous Quality Improvement (CQI) training is helping all staff during the reorganization process. It is enabling people to work in teams to identify problems and provide input. Problem solving teams are working on several issues, including customer satisfaction and efficiency.
- A vigorous program to improve management information systems at the District has been undertaken. The District is currently in the process of implementing Activity Based Costing.

3. 1996 Plans

Legislative action has reduced the MMCD budget for 1996 by 26%, from \$9,765,680 to \$7,245,160. Management and Administration have had to initiate reductions in resources which will accommodate the change while maintaining services as well as possible. Over 91% of the budget will be for Control Operations and 8.4% will be for Administration.

The ongoing reorganization of 1995 has provided a basis for the more extensive changes needed because of the budget reduction. The resulting staff reductions will require ongoing focus on decentralizing processes which can be effectively accomplished by operational staff.

Centralized procurement of major resources will continue. Facilitating resource sharing among the operating units should be enhanced as a result of a restructured control operations section. Continuous Quality Improvement which has been spearheaded by Administrative staff at all levels, will further the efforts to prevent and solve problems, and improve effectiveness.

Communication will receive major emphasis in 1996. The District has been very effective at responding to many types of calls and concerns of our constituents. Requests, comments and complaints are addressed quickly using a process that includes both central office and field staff. This process needs to be expanded to have a greater ability to provide all information more quickly and easily.

SCIENTIFIC PEER REVIEW PANEL

The work of the Scientific Peer Review Panel (SPRP) was completed and presented to the MMCD in January, 1996. The executive summary of the report "An Assessment of Non-target Effects of the Mosquito Larvicides, Bti and Methoprene, in Metropolitan Area Wetlands" as well as the cover letter from the scientific chair of the SPRP to MMCD are found in the appendix.

MMCD Response to SPRP Findings

MMCD appreciates the time and effort put in by all members of the SPRP in dealing with a complex area and comprehensive study. It is encouraging to see the number of organisms not affected by mosquito control treatments. However, MMCD acknowledges the effects shown on several aquatic insects and the concerns raised about food web effects. MMCD intends to address those effects that have been shown as well as the concerns raised.

As the Panel recommended, MMCD would like to develop an adaptive management approach, assessing ecological risks and social benefits in pursuing its mission. The report raises many questions and points out several areas of incomplete information. Using the best information available and addressing ways to obtain additional information, MMCD will take a responsible management approach. Three main areas of work are needed to address the concerns raised:

1. **Chironomids**: Increase understanding of chironomid midge biology to provide input for decisions on mosquito treatments.

Most of the effects seen in the insect fauna of sites treated 2 or more years were in the midges (Chironomidae). The biology of this group of insects is not well known, despite their abundance. Shorter term studies of the effects of methoprene and *Bti* on this group have shown few, if any, effects. We would like to assemble current knowledge in this area, through both literature searches and meetings with experts, to try to understand the mechanisms underlying the effects seen, and see if there are ways we can avoid or mitigate those effects. This also involves reviewing information from related unfinished studies (Karsten Liber, University of Wisconsin, Superior). Information on related insects, such as tipulids (crane flies), could also be assembled. This could be done in conjunction with control material manufacturers, who would also be interested in this information.

2. Wetland Birds: Promote knowledge of bird populations in the metro area, factors impacting those populations, and effective management strategies.

No effects on breeding bird species were seen in the SPRP studies, but the effects seen on insects raised concerns about food availability. Researchers on the long-term study suggested that other factors, such as nest loss due to predation, may affect population levels such that food abundance is not the main limiting factor. We would like to gather information from waterfowl specialists and assess ways we can promote healthy bird populations while still fulfilling our mission to the public. Techniques such as maintaining minimum food availability during drought stress could be considered.

3. **Continue Long-Term Study**: External funding will be sought to continue treatments at the long-term study sites and to sample the sites again after additional treatments in 1997. Questions raised by both the NRRI and SPRP include:

- a. Does longer-term treatment increase the effects on insects?
- b. How long does it take for affected insects to rebound to untreated levels?

Summary

The MMCD will use the information provided in #1 and #2 above to propose changes in treatment regime that might mitigate possible effects on aquatic insects and waterfowl. While that information is being gathered, MMCD is considering changes in:

- time of year that treatments are done;
- which sites are treated;
- where in the sites treatments are applied;
- formulations of control materials;
- alternative food sources for waterfowl.

CONTROL MATERIALS

The following is an explanation of the control materials currently in use by MMCD. The specific names of products used in 1995 are given. The generic products will not change in 1996, although the specific formulator may. Additional information of the products are located in the Appendix.

ALTOSID® (methoprene) 150-DAY BRIQUETS

(Sandoz Agro-Zoecon Corporation-Altosid® XR Extended Residual Briquet) Altosid® briquets are typically applied to mosquito breeding sites which are 3 acres or less. Briquets are applied to the lowest part of the site on a grid pattern of 14-16 ft. apart at 220 briquets per acre. Sites which may flood and then dry up (Types 1 & 2) are treated completely. Sites which are somewhat permanent (Types 3, 4, 5) are treated with briquets to the perimeter of the site in the grassy areas. Pockety ground sites (i.e. sites without a dish type bottom) may not be treated with briquets due to spotty control achieved in the uneven drawdown of the site.

Cattail mosquito (Cq. perturbans) breeding sites are treated at 330 briquets per acre in rooted sites or 440 briquets per acre in floating cattail stands. Applications are made in the winter and early spring.

Altosid[®] briquets are not applied to known fish breeding habitats as defined by the MN Department of Natural Resources (DNR).

ALTOSID® (methoprene) LIQUID

(Sandoz Agro-Zoecon Corporation - Altosid[®] Liquid Larvicide Concentrate - A.L.L. Liquid)

Altosid[®] liquid is mixed with water and applied in the spring to mosquito breeding sites which are breeding spring *Aedes* mosquito larvae. Typical applications are to woodland pools. Sites which are greater than 3 acres in size are treated by the helicopter at a rate of 1 ounce of concentrate per acre. The dilution is adjusted to achieve the best coverage of the site. Altosid[®] liquid treatments are ideally completed by June 1st of each season.

ALTOSID® (methoprene) **PELLETS**

(Sandoz Agro-Zoecon Corporation - Altosid[®] Pellets)

Altosid[®] pellets consist of methoprene formulated in a pellet shape. Altosid[®] pellets are designed to provide up to 30 days control but trials have indicated control up to 40 days. Applications will be made to ground sites (less than 3 acres in size) at a rate of 2.5 lbs. per acre for *Aedes* control and 4-5 lbs. per acre for *Cq. perturbans* control. Applications are also done by helicopter in sites which are greater than 3 acres in size at the same rate as ground sites, primarily for *Cq. perturbans* control.

Bacillus thuringiensis israelensis (Bti) CORN COB

(Abbott Laboratories Vectobac[®] G; Novo Nordisk Bioindustrial BactimosTM) Bti corn cob may be applied in all types of mosquito breeding sites which have targeted mosquito larvae in the water. Bti can be effectively applied during the first three instars of the mosquito breeding cycle. Typical applications are by helicopter in sites which are greater than 3 acres in size at a rate of 5-10 lbs. per acre. In sites less than 3 acres, *Bti* may be applied to pockety sites by ground crews with cyclone seeders or power back packs.

Bacillus thuringiensis israelensis (Bti) LIQUID

(Abbott Laboratories Vectobac® 12AS)

Bti liquid is applied directly to small streams and large rivers to control black fly larvae. Treatments are done when standard mylar sampling devices collect threshold levels of black fly larvae. Maximum dosage rates are not to exceed 25 ppm of product as stipulated by the Minnesota Department of Natural Resources. *Bti* is applied at predetermined sites, usually at bridge crossings (applied from the bridge) or river by boat.

MMCD will investigate use of *Bti* liquid for mosquito larval control.

PERMETHRIN

(Clarke Mosquito Control Products - Permethrin 57% OS; Vectec- Punt 57 OS) Permethrin is used by the District to treat adult mosquitoes in known daytime resting or harborage areas. Harborage areas are defined as wooded areas with good ground cover to provide a shaded, moist area for the mosquito to rest during the daylight hours.

Adult control is initiated when MMCD surveillance (harborage and light trap collections) indicates nuisance populations of mosquitoes, when employee conducted landing rate collections document high numbers of mosquitoes, or when a large number of citizen complaints of mosquito annoyance are received from an area. Harborage spraying can also be initiated prior to large outdoor civic events when requested by public officials.

The District mixes permethrin with soybean and food grade mineral oil and applies it to wooded areas with a power backpack mister at a rate of 17 oz. of mixed material per acre (0.1 lb active ingredient per acre).

We will also evaluate ULV formulations of permethrin (e.g. FLAK, Biomist) in 1996.

RESMETHRIN (Roussel Bio Corporation - Scourge[®] 4+12)

Resmethrin is used by the District to treat adult mosquitoes in known areas of concentration or nuisance. Resmethrin is applied from truck or ATV mounted Ultra Low Volume (ULV) machines which produce a fog which contacts mosquitoes when they are flying. Fogging may also be done with hand held cold fog machines which enable the applications to made in smaller areas than can be reached by truck. Cold fogging is done either in the early morning or at dusk when mosquitoes become more active. Resmethrin is mixed with other oils and is applied at a rate of 1.5 ounces of mixed material per acre. Resmethrin is applied by MDA licensed applicators.

Programs

- Public Affairs
- Vector-borne Disease Management
- Mosquito Control Program
- Mosquito Surveillance
- Quality Assurance
- Program Development
- Black Fly Control Program



PUBLIC AFFAIRS

1.1. Background

The District is committed to openly communicate its activities to citizens, media, and organizations who interact with our program. Communication with our public is designed to be clear, concise, and timely.

District staff conduct Public Information/Education programs for elected officials, citizen groups, civic organizations, and school districts within the MMCD. Press releases, along with television and radio spots also provide information about program activities. In addition, informational literature is developed and updated as MMCD programs and public expectation and needs change.

1.2. 1995 Program

Media Relations

In the spring of 1995 MMCD staff contacted metropolitan media outlets, both electronic and print, and offered them the opportunity to go out into the field and observe our operation. This effort was supported with a press release describing our early season control efforts. We made a number of good contacts, and continued to provide press releases, and information pertaining to the wide variety of District services throughout the season. This personal contact led to information about the District being published or broadcast by many of these outlets.

Informational Panels

Staff developed a number of information panels describing District operations. These panels are distributed to libraries, nature centers and other public buildings. Each operating division has their own inventory of panels to distribute. Key messages cover program effectiveness, safety and cost effectiveness.

MMCD Information Booths

MMCD operates information booths at a variety of locations. On display are samples of mosquito and biting gnat larvae, black-legged and wood ticks, information on Lyme disease and dog heartworm and printed information pertaining to District services. The following are sites MMCD had booths in 1995.

Minnesota Newspaper Assoc. Convention League of Minnesota Cities Convention Association of Minnesota Counties Convention Earth Day in the St. Paul Skyway Twin Cities Juneteenth Celebration The Science Museum of Minnesota (in conjunction with their backyard monsters picnic) Information booths are also operated at the State and seven metro county fairs. Following is a tabulation of the number of people who visited MMCD fair booths in 1995.

	state and county run ration	
Ramsey County Fair	July 19 - 23	1,331
Hennepin County Fair	July 27 - 30	1,950
Scott County Fair	July 27 - 30	1,485
Anoka County Fair	August 1 - 6	2,746
Washington County Fair	August 2 - 6	1,847
Dakota County Fair	August 7 - 13	3,172
Carver County Fair	August 9 - 13	2,159
Minnesota State Fair	August 24 - Sept. 3	14,713

Wetland Map Inventory

MMCD maintains one of the most complete and up-to-date wetland map inventories in the metropolitan area. Many local governing units (LGU) have asked for copies of our maps to help with their water resource management plans. In 1995 MMCD provided over 1500 square miles of wetland maps to LGUs in the metropolitan area.

CD-ROM

The District has developed a computer-based interactive CD-ROM entitled *The Minnesota Mosquito*. It contains information about mosquito biology, disease prevention, and ways to reduce annoyance in your own backyard. In our ongoing efforts to help Minnesota citizens protect their health and well-being, this CD-ROM has been provided to every public school and library in the state.

Telephone Response to Citizen Inquiry

As a public agency, MMCD is responsible to citizen questions and concerns. In 1995 the District received over 900 telephone calls inquiring about District operations (Table 1.1). Staff answer questions, provide information, and obtain information about the caller and their request. Citizens call with a variety of questions and concerns including mosquito annoyance complaints, inquiries about public property treatments, concern about control material, treatment notification, and report of a breeding site. The category of calls received and the path of service for each are found in the appendix.

Adult Mosquito Control Information Line - 643-8383.

To inform citizens concerned about the time and location of mosquito adulticiding operations, MMCD offers an adulticiding information line. The information line enables citizens to hear a daily recorded message on where adulticiding activities will be taking place. This provides a greater service to the citizens, since they do not have to be at home to receive our call. Staff will call citizens who still desire advanced notice of adult mosquito control treatments. Results from the number of calls received were tallied at the end of the season. Most inquires were in the South Hennepin region (Table 1.2).

TELEPHONE SUMMARY 1995								
Type of Call 1991 1992 1993 1994 1993								
Citizen Issues & Concerns	234	292	233	349	164			
Mosquito Breeding Site Location	347	273	359	293	202			
Mosquito/Black Fly (gnat) Annoyance Levels	112	161	173	137	164			
Public Treatment Requests	161	137	171	147	145			
General Information	194	210	387	111	84			
Waste Tire Removal					155			
Total Calls	1048	1073	1323	1037	914			

Table 1.1. Number of telephone calls by category received by MMCD.

Table 1.2. Number of phone can inquiries received by Division for 1773, 1774, and 177	Table	1.2.	Number	of phone of	all inc	uiries	received by	y Division	1 for 199	3, 1994	, and 199
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ADULT MOSQUITO CONTROL INFORMATION LINE 1995									
	Phone Call Inquiries 1993	Phone Call Inquiries 1994	Phone Call Inquiries 1995	1995 Percent by County					
Anoka	151	106	96	10.8%					
Carver	52	43	68	7.6%					
Dakota	35	51	92	10.3%					
North Hennepin	87	85	116	13.0%					
South Hennepin	286	186	230	25.8%					
Ramsey	98	95	119	13.4%					
Scott	63	44	96	10.8%					
Washington	54	30	· 74	8.3%					
TOTAL	826	640	891	100%					

1.3. 1996 Plans

MMCD is in the process of developing a public affairs workgroup. This group will consist of the Director, Public Affairs Coordinator and two or three members of the public relations community. This group will assist in developing strategic plans, identifying potential problems and responding to concerns.

MMCD strives to include every employee in the communications function of the District. To support this, staff will be involved in training to enhance their communication skills, and the District is developing ways to improve and keep these skills current. The Public Communications/Citizen Response Team and a Government Agency Relations Team will provide support for public affairs.

The Public Affairs Coordinator is responsible for developing informational material, and identifying target audiences. The District will continue working towards identifying the best means of letting citizens know who we are and what services we provide.

VECTOR-BORNE DISEASE MANAGEMENT

2.1. Background

In 1995, the Vector-borne Disease Management Program provided a variety of disease surveillance and control services to help prevent the following diseases: LaCrosse encephalitis, western equine encephalitis, Jamestown Canyon virus, Lyme disease and ehrlichiosis.

LaCrosse encephalitis prevention services were initiated in 1987 to identify areas where there is significant risk of LaCrosse encephalitis cases occurring within the District. Areas with high populations of the primary vector *Aedes triseriatus* (tree hole mosquito), and a history of LaCrosse encephalitis cases, are defined as high risk areas. These high risk areas are targeted for intensive control efforts including public education and mosquito breeding site removal. In addition, monitoring and control procedures are conducted at confirmed LaCrosse encephalitis case sites. An *Ae. albopictus* (Asian tiger mosquito) surveillance program has also been initiated to detect this potential LaCrosse encephalitis vector before it becomes established within the District.

In 1990, the MMCD initiated Lyme disease tick surveillance to determine the range and abundance of the black-legged tick (*Ixodes scapularis*) and the Lyme disease spirochete (*Borrelia burgdorferi*) within the District. To date, we have mapped the current distribution of black-legged ticks, and have initiated cooperative spirochete studies with the University of Minnesota. All of the data collected are summarized and given to the Minnesota Department of Health (MDH) for their risk analysis. This has been a surveillance and public education effort only, as no large-scale black-legged tick treatment options are available.

2.2. 1995 Program

Aedes triseriatus Surveillance.

This year, intensive surveillance was conducted in 78 wooded neighborhoods of the Lake Minnetonka region (Hennepin and Carver counties). The majority of past LaCrosse encephalitis cases have occurred in this area, including the two cases reported within the District in 1994. Monitoring began in this area in 1987, and was increased in 1988-1989. High risk neighborhoods within the region were identified during that effort, thus monitoring of *Ae. triseriatus* population levels was continued to evaluate treatment success and to identify further problem areas. Adult mosquitoes were collected from each site using a large aspirator. Several locations yielded an average of 2 or more *Ae. triseriatus*/5 minute sample, and were targeted for additional control efforts. Similar surveillance was conducted at all past confirmed LaCrosse encephalitis case locations to prevent further cases in those areas.

Aedes triseriatus Control.

As in past years, staff continued to distribute the LaCrosse encephalitis prevention brochure. We supplied brochures to county and state fairs, and other public functions. We also conducted a mass mailing of over 53,000 brochures, as local newspaper inserts, in identified risk areas within Hennepin and Dakota counties. In addition, interpretive posters and other information were presented at each county fair and the state fair. The brochures and presentations outlined LaCrosse encephalitis, and stressed water-holding container removal to prevent the disease.

In 1995, our staff removed 43,614 waste tires from high risk areas of the District. A waste tire agreement with the Minnesota Pollution Control Agency (MPCA) allowed MMCD to be reimbursed for some of the tire disposal costs. In addition, cooperative tire dump cleanup efforts with the several county environmental management departments resulted in the elimination of many waste tire sites (especially Dakota, Washington, Carver and Scott counties).

Program staff removed artificial containers and modified wet tree holes in several areas including the Lake Minnetonka area. Adult mosquito treatments were conducted in some high risk areas to prevent the dispersal of *Ae. triseriatus* mosquitoes into heavily populated neighborhoods after the mosquito breeding habitat was removed.

There were no confirmed cases of LaCrosse encephalitis reported in the District in 1995 (Fig. 2.1). The two case areas reported in 1994 received additional surveillance and control efforts this year, and no evidence of further cases was found.



Fig. 2.1. Number of LaCrosse encephalitis cases between 1970 and 1994 in the seven county metropolitan area. LaCrosse Encephalitis Prenvention Program began in 1987.

Aedes albopictus (Asian Tiger mosquito) Surveillance.

We found no evidence of *Ae. albopictus* within the District in 1995. The only site that required regular monitoring in 1995 was the tire recycling facility in Scott County, where an infestation had been discovered and eradicated in 1991.

Western equine encephalitis (WEE) and Jamestown Canyon virus (JCV) surveillance.

During 1995, the District expanded WEE surveillance to three sentinel chicken flocks (20 birds/flock) established along the western metropolitan area in Wright and Scott counties. Blood samples were taken from the birds weekly to determine if they had been exposed to the virus. Staff at the Minnesota Department of Health laboratory tested the samples, and no evidence of the virus was found in 1995. Populations of the WEE vector mosquito (*Culex tarsalis*) were also
monitored by staff during evening sweep net counts. Numbers were low all season except for small peaks in June and August.

Over 15,000 mosquitoes were collected and tested for Jamestown Canyon virus. A previous MMCD study documented the presence of this potentially serious virus in local white-tailed deer populations, but we were unsure of the local vector species. Several spring *Aedes* species have been identified as important vectors in other states, so our collecting efforts focused on them. The Centers for Disease Control (CDC) is testing the mosquitoes, but results are currently unavailable.

Lyme disease tick and spirochete studies.

We continued sampling the network of 100 sites set up in 1991-1992 to look for changes in blacklegged tick distribution over several years. As in previous years, our main sampling method involved capturing small mammals from each site, and removing all attached ticks from them. Over 1400 mammals were inspected this year, and black-legged ticks were found at 35 of the sampling locations. *I. scapularis* numbers were much lower than in 1994 (by at least 1/2). Most ticks were found in the northeastern area of the District, although one adult female *I. scapularis* was found by an employee in southern Scott County (Fig. 2.2). Further monitoring failed to detect other black-legged ticks in this part of the District where both the tick and Lyme disease are rare.

We also continued cooperative studies with Dr. Russell Johnson of the University of Minnesota to determine the distribution and prevalence of *B. burgdorferi*. Small mammals from six study sites in North Oaks (Ramsey County) were brought to Dr. Johnson to be tested for the spirochetes. North Oaks was chosen for study, as it represents a Lyme disease endemic suburb within the metropolitan area. Lyme disease spirochetes still appear to be quite localized in the eastern woodlots of North Oaks, however the full 1995 results are not yet available.

Lyme disease public education activities continued in 1995. Personal protection measures, tick identification, and black-legged tick distribution were stressed during presentations at each county fair and the state fair. The MMCD continued involvement with two MDH Lyme disease education work groups, designed to educate the public and the medical profession on important aspects of Lyme disease and other tick-borne diseases.

Ehrlichiosis Surveillance

In 1995, we began a cooperative study with Dr. Barb Greig (University of Minnesota) to determine if ehrlichiosis is present within the District. This bacterial disease, transmitted by *I. scapularis* ticks, has been associated with human illness and several deaths near Duluth, Minnesota and in northwestern Wisconsin. Sera samples were taken from small mammals that were collected as part of our Lyme disease studies, and tested by Dr. Greig. Results of this work are not yet available.



2.3. 1996 Plans

As part of staff and program reorganization, the former Vector-Borne Disease Management Program will now be integrated into the rest of the control operations. We are planning to maintain the same level of disease surveillance and control. Cross-functional training of staff will raise District wide awareness of vector-borne disease management. By joining programs, trained staff are available for disease control and surveillance activities.

LaCrosse encephalitis prevention services will continue to emphasize *Ae. triseriatus* surveillance and control within the Lake Minnetonka region of Hennepin County, due to the recent viral activity in the area. Waste tire removal will also continue to be a priority across the entire District. We will clean up small tire piles that produce *Ae. triseriatus*, and continue to work with the MPCA and county environmental management departments to clean up larger tire piles.

We will also continue the *I. scapularis* distribution study and cooperative spirochete studies with the University of Minnesota. The Lyme Disease Tick Advisory Board (LDTAB), made up of local scientists and agency representatives with Lyme disease expertise, will be updated on the progress of our Lyme studies during the spring of 1996. In addition, we will maintain the current WEE monitoring, however JCV vector studies will probably not be continued. Ehrlichiosis studies will not be continued unless sample testing is available.

MOSQUITO CONTROL PROGRAM

3.1. Background

The mosquito control program targets the principal summer pest mosquito, *Aedes vexans*, several species of spring *Aedes*, and the cattail mosquito *Coquillettidia perturbans*. Larval control is the main focus of the program but is augmented by adult mosquito control when necessary. *Aedes* larvae hatch in response to rain with adults emerging at various times during the summer, 10 days to 2 weeks after the rain. Cattail mosquito larvae develop in cattail marshes over twelve months and emerge as adult mosquitoes in June and July.

The floodwater mosquitoes are adept at utilizing the natural resources of the metropolitan area. These same natural resources contribute to the recreation and enjoyment for the citizens of the area. The rolling topography provides an unusually high number of highly productive breeding sites for the mosquito larvae. Summer rains which replenish the aquifers also provide the necessary moisture for mosquito development. Lush wooded areas serve as protection from daily heat and low humidity for the resting adult mosquitoes.

3.2. Control Strategy Overview

Due to the large size of the metropolitan region, larval control was considered the most cost effective control strategy in 1958 and remains so to date. The Mosquito Program targets the most prolific mosquito breeding locations for all human biting mosquitoes. An insect growth regulator (Altosid[®] or methoprene) and a soil bacteria (*Bti*) are the larval control materials. Summaries of material usage are found in the appendix.

Adult mosquito control is a minor part of the MMCD program. Control is done upon request primarily in high use park and recreation areas and for public events. Two synthetic pyrethroids (resmethrin and permethrin) are used for adult mosquito control. As specified in the adult mosquito control policy, adult mosquitoes are only treated when a threshold number is exceeded. A description of control materials is found in the previous section.

3.3. 1995 Mosquito Control

Cattail Mosquito Control

Crews inspected approximately 2000 *Cq. perturbans* breeding sites from late-August through November, 1994. Larviciding began in February 1995 using Altosid[®] XR 150-day briquets applied on the ice and snow. Deep sites were treated first and applications continued through April when the small, shallow sites were treated after the spring thaw. A total of 520 acres were treated with Altosid[®] briquets through April and then 4334 acres with Altosid[®] 30-day pellets applied by helicopter in late May.

Floodwater Mosquito Larval Control

As in the past, ground sites (less than 3 acres) were treated primarily with Altosid® briquets. This formulation provides season long mosquito control. Fewer acres (6783) were treated with briquets in 1995 compared to 1994 (7895 acres) as sites were identified as being more effectively

treated with pellets or *Bti*. Approximately 3885 acres were treated with pellets for floodwater mosquitoes in 1995, this is comparable to 1994 (4047 acres).

Air sites (3 acres or more) were treated with *Bti* corn cob granules by helicopter. Approximately 132,773 acres were treated in 1995, which is more than the 102,860 treated in 1994, due to the above average rainfall. Acreage treated in 1995 was above the 5 year average, but below the previous high in 1991 (134,011 acres). The threshold was set at 2 larvae per dip in the inner or primary treatment zone of the District. The threshold in the outer zone was variable depending on the total number of acres breeding mosquitoes and the amount of time and material remaining.

ACRES TREATED	1994 Altosid®XR Briquets	1995 Altosid®XR Briquets	1994 Altosid® Pellets	1995 Altosid® Pellets
Cattail Mosquito	662	520	1,782	4,334
Floodwater Mosquito	7,895	6,783	4,047	3,885
TOTAL -	8,557	7,303	5,829	8,219

Adult Mosquito Control

Permethrin usage (6,305 acres) was less than usage in 1994 (10,499 acres). Resmethrin usage (62,199 acres) was greater than in 1994 (40,687). More adult mosquito control operations were targeted at high populations of *Cq. perturbans* than in previous years because we were better able to identify areas of high concentration. Resmethrin use increased due to the availability of ATV mounted ULV sprayers that provided access to trails in high mosquito density areas. These trails could not be treated with a truck mounted sprayer.

3.4. Supporting Research

The following studies were conducted to evaluate present and possible future control methods. More detailed reports are available in the MMCD library.

Efficacy Studies

For cattail mosquito control, staff conducted studies on the efficacy of Altosid ® XR 150-day briquets applied on the ice and Altosid ® 30-day pellets applied by helicopter. Six emergence cages were placed in each of 8 sites treated with the 150-day briquets, 30-day pellets, and reference sites that have never been treated. Each cage covered approximately one square meter of breeding area within the site. Adult mosquitoes were vacuumed from cages twice weekly from June 1 through August 11. Overall, briqueted sites had a 92% reduction in mosquito emergence, pellets a 99% reduction compared to the untreated reference sites. Both Altosid® briquets and pellets markedly reduced the number of Cq. perturbans emerging from treated sites compared to untreated sites throughout the study period (Fig 3.1).



Figure 3.1 Average number of *Cq. perturbans* collected per week in emergence cages from briquet or pellet treated and reference sites, 1995.

Altosid[®] Liquid Larvicide Testing for Use as Spring Aedes Control

A larval control material that has a residual capability can play an effective role in the control of spring species of *Aedes* mosquitoes. MMCD currently uses Altosid[®] briquets and pellets for residual control of the spring *Aedes* mosquitoes but Altosid[®] Liquid Larvicide (A.L.L.) may be an effective and less expensive alternative. Preliminary testing showed that A.L.L. was found to have a residual effect up to 30 days.

To provide a field evaluation of A.L.L. applications by air, 600 acres were treated in August. Unfortunately sites dried up before adequate bioassays could be performed.

Briquet Site Breeding History

A large portion of the control material budget has been spent on Altosid[®] XR briquets placed in sites less than 3 acres in size. The goal of this study was to update our information on the productivity of these sites so as to make more efficient use of the material.

Two approaches were used:

- 1) *Aedes* field staff chose the sites for which they wished to know larval production. From these data we can make site specific determinations of which sites warrant treatment with briquets.
- 2) Quality Assurance staff used the randomized list of sites treated with methoprene briquets that was generated for checkbacks as their list of sites to check. From these data, we can generalize about sites throughout the District.

Both approaches, as well as 1994 data, showed less than expected number of sites with larvae above a treatment threshold of 2 per dip (Table 3.1). This information was part of the rationale for decreasing briquet treatments in 1996.

Division	Percent of Sites Breeding	Percent of Sites Breeding > 2 per dip	Percent of Sites Not Breeding	Percent of Dry Sites
Anoka	81.1	34.0	15.1	3.8
Dakota	46.5	11.6	39.5	11.6
North Hennepin	66.7	15.7	29.4	3.9
South Hennepin	90.4	46.2	7.7	1.9
Scott/Carver	59.3	11.1	40.7	0.0
Ramsey/Wash.	75.5	53.1	22.4	2.0

 Table 3.1 1995 Briquet Study Summary of Treated Sites

Park Study

Larval sampling of agency refused entry lands (MDNR, USFWS, Minneapolis Parks, etc) was conducted by field personnel to determine larval productivity in large-scale untreated areas. Data are communicated to the various agencies.

Resistance Testing

Permethrin resistance trials using *Ae. vexans* (5 trials) and *Ae. trivitattus* (1 trial) were run using various concentrations of permethrin to determine EC_{50} , EC_{95} , and EC_{99} , etc. These data will be added to previous years' data and will serve as a working baseline from which to evaluate future years' resistance monitoring.

3.5. 1996 Plans for Mosquito Control

Cattail Mosquito

Because Cq. perturbans has a limited flight range of 5 miles, the program will focus control activities on the most productive marshes near human population centers. There will be a slight reduction in the total number of acres treated in 1996. This year we plan to use significantly less 150-day briquets and use more 30-day pellets. Briquet treatments will begin in February, and pellet treatments will be applied by helicopter to large cattail marshes late in May at a rate of 4 lb/ac. During the summer months we will monitor the efficacy of the treatments. We will also monitor the adult populations with the District's evening collections.

Larval Control

There will be a significant change in larval treatment strategy for 1996. Due to budget decreases we have chosen to drastically reduce the number of acres treated with 150-day briquets. We will increase the number of ground acres treated with 30-day pellets and *Bti*. This will require more

inspection of ground sites before treatment than in previous years.

In 1996, we plan to use 4 helicopters for the majority of the operational program with a fifth helicopter available during district wide broods and for widespread mosquito production. This will be a reduction of one helicopter from 1995. Breeding sites in highly populated areas will receive treatments first after a wide scale mosquito brood, based on dip counts of mosquito larvae. Treatments will then expanded into less populated areas where treatments will be based on a higher dip count of mosquito larvae.

The primary control material will again be *Bti* corn cob granules, the amount of material budgeted will be slightly less than that budgeted in 1995. Thresholds are set to maximize the limited time available to fly each brood. To become more efficient in our *Bti* allocations, we will continue with a rolling threshold this year. Based on historical use, a certain amount of *Bti* will be allocated for each month. If that allotment is not used for a particular month, the difference will roll over into the remaining months. In this way we should not end up with either a surplus or deficit of material at the end of the season.

We do not plan to treat floodwater mosquitoes with 30-day pellets by helicopter, due to the unresolved difficulties in applying the low dose (2.5 lb./ac.) in a uniform manner. However, we continue to attain fairly uniform applications at the 4 lb./ac. rate used for cattail mosquito control. We will continue working on the calibration of the application system to uniformly apply pellets from helicopters for floodwater mosquito treatments.

Adult Mosquito Control

Both permethrin and resmethrin applications may increase in 1996 from 1995 usage. We will use information from focus groups to direct our adult mosquito control treatments where they provide the greatest customer benefit. In the past these areas were high use park and recreation areas, areas with high cattail mosquito numbers, public functions, citizen annoyance reports, and high risk areas for mosquito-borne disease.

The adult mosquito control information line (643-8383) will be in use again this year. The use of the information line enables citizens to hear a daily recorded message on where adult mosquito control operations are taking place. This provides a greater service to the citizens since they do not have to be at home to receive our call. However, staff will continue to call citizens who wish to be notified in advance of adult mosquito control treatments.

Vector Mosquito Control

Field staff have traditionally been responsible for control of *Ae. triseriatus* (LaCrosse encephalitis vector) and *Cx. tarsalis* (western encephalitis vector), but with the MMCD structural changes they will also be responsible for monitoring vector populations. For a more detailed discussion of vector monitoring techniques, see the Vector-Borne Disease Program section.

MOSQUITO SURVEILLANCE

4.1. Background

Entomology staff coordinate a variety of activities that help monitor the District's progress toward reducing mosquito levels. Along with coordinating and gathering rainfall information, staff coordinate and process larval and adult mosquito collections. Larval samples taken from breeding sites before treatment are identified to detect the presence and amount of human-biting mosquito species. We use New Jersey light traps to monitor disease vectors and provide historical data of mosquito populations. Additionally, employees and volunteers take sweep net and CO_2 trap collections in the evening to monitor mosquito levels experienced by most citizens.

4.2. 1995 Summaries

Rainfall

The Entomology Lab maintains a network of 91 rain gauges located throughout the District to monitor rainfall amounts. A one inch rainfall can produce a brood of floodwater mosquitoes. Staff read the gauges immediately after a rainfall and areas that receive high rainfall are sampled for mosquitoes first. We also provide rainfall information to the Minnesota Department of Natural Resources State Climatology Office to supplement their network.

Average rainfall per gauge in the District in 1995 was 21.00 inches. This is 8% higher than the 37year average (Appendix 2). Northern counties of the district (Washington, Anoka, Ramsey, and North Hennepin) received more rain than other counties (Fig. 4.1).



Fig. 4.1. Rainfall received in each Division compared to the District average.

Larval Collections

During a brood, we quickly process larval samples and communicate the results to field personnel so they can perform treatments. Samples from sites to be treated by helicopter are given priority over sites that can be treated by an inspector in the field. As a trial this year, we trained a person in the Scott/Carver division to identify the high priority larval samples. This was successful because it eliminated the need to immediately bring the samples to the Entomology Lab for identification and expedited the use of the helicopter to treat the sites.

In 1995 staff identified approximately 19,000 larval collections. Slightly above average rainfall produced 13 broods of mosquitoes, five of which were medium- to large-sized and the remaining were small, localized broods. The two largest broods occurred in August as a result of storm events one week apart.

Adult Collections—New Jersey Light Traps

New Jersey light traps operate at night with a 25-watt light bulb used as an attractant. Traps are turned on and off by a timer and are emptied daily for 20 weeks from May to September. MMCD has used New Jersey light traps since 1960 and they are the standard collection devices for many mosquito control districts. In 1995, we operated 20 traps in various areas of inside and outside the District (Fig. 4.2). The processing of these samples is still in progress.

Adult Collections—Daytime sweep net collections

The daytime mosquito sweep net collections in wooded areas were discontinued this year. Results of the 1994 evaluation of collection methods study encouraged us to replace the daytime collections with the evening collections. Black fly daytime collection continued in 1995 (Fig. 4.2), with a reduction in sampling sites from 100 to 50.

Evening sweep net and CO_2 trap collections-evaluation of collection methods

Adult mosquito sampling is needed to measure program effectiveness, measure annoyance, direct control measures, monitor disease vectors and collect historical data. Our methods using New Jersey light traps and daytime sweep net collections do not adequately measure all these parameters.

In 1994, we conducted a study to identify the adult mosquito collection method or combination of methods to meet these needs. CO_2 -baited trap and 2-minute sweep net collections were taken in the evening in employees' yards once per week for 20 weeks. The evening collections were taken at 5 minutes after the end of twilight, which is about 35-40 minutes after sunset. We continued this study in 1995, with the addition of a sweep net collection at sunset. This collection was added to address the concern of collectors who felt mosquitoes were more active earlier than the twilight collection.

We operated 29 CO_2 traps and the number of sweep net collections varied from 93-137 per night. The average number of *Ae. vexans* collected in the sweep nets was greater in 1995 than in 1994, while the average number of *Cq. perturbans* collected in the sweep collections was lower in 1995 than in 1994 (Table 4.1).



Fig. 4.2 New Jersey Light Trap and Daytime Black Fly Collection Locations, 1995

	CO ₂ Trap		Sunset Sweep	Sunset + 40 min Sweep	
	1994	1995	1995	1994	1995
Ae. vexans	54.44	139.54	2.80	1.84	5.44
Cq. perturbans	25.68	15.47	0.37	4.95	1.67
Spring Aedes	0.12	0.24	0.08	0.04	0.09
Cx. tarsalis	0.05	0.97	0.01	0.00	0.04

 Table 4.1. Average number of mosquitoes collected in night CO2 trap and sweep collections.

Aedes vexans was the predominant species collected in both the evening sweep net collections, with an average of 2.80 mosquitoes in the sunset sweep (first sweep) and 5.44 mosquitoes in the sunset+40 minutes (second sweep) (Table 4.1). Coquillettidia perturbans was the second most common species, averaging 0.37 in the first sweep and 1.67 in the second sweep.

More mosquitoes were collected in the second sweep than in the first sweep. The observation by some collectors that mosquitoes were more active earlier than the second sweep may have been true in certain circumstances, but district-wide the second sweep consistently collected more mosquitoes. The season average number of mosquitoes per sweep net collection varied throughout the District (Fig. 4.3).

 CO_2 traps ran for 2 hours, starting at 1 hour and 10 minutes before the first sweep net collection, and ending 10 minutes after the second sweep net collection. The 2-hour period was designed to include the evening black fly activity peak before sunset and the mosquito activity peak after sunset. The season average number of mosquitoes collected in CO_2 trap collections reflects the areas of treatment in the District (Fig. 4.4). Traps in the primary treatment zone are lower than traps outside the zone.

The CO₂ traps collected predominantly *Ae. vexans* with an average of 139.54 mosquitoes per collection (Table 4.1). *Cq. perturbans* averaged only 15.47 mosquitoes per collection, lower than in 1994. Spring *Aedes* are not collected in great quantities by any of the collection methods. The CO₂ trap collects *Cx. tarsalis* more efficiently than the sweep net because this species is not usually attracted to humans. Both the CO₂ trap and sweep net collections had more *Cx. tarsalis* in 1995 than 1994.

Seasonal Distribution

Rainfall received from June 5 to June 8 resulted in a medium brood of *Ae. vexans* (Fig. 4.5). Another medium brood of *Ae. vexans* emerged in mid-July as a result of heavy rains on July 5 and July 6. Most of the *Ae. vexans* were collected in August following two, 5-6 inch rain storms one week apart.

Fig. 4.3 Season average number of mosquitoes per 2-minute human-baited sweep net collection at end of twilight.



Fig. 4.4 Season average number of mosquitoes per 2-hour CO2 trap collection ending at end of twilight.





Fig. 4.5. Average number of Ae. vexans in sunset+40min sweep net collections, 1995

3. Plans for 1996

The evening collections have been a success the past two years. We have enlisted a large network of employee collectors and a few citizen volunteers. There are some gaps in our network that we would like to fill in with citizen volunteers

Ideally, we would like to develop methods that could collect both mosquitoes and black flies most efficiently and cost effectively. Both collection methods have given us valuable information about mosquito populations and annoyance. Since the second sweep consistently collects more mosquitoes than the first sweep, we can eliminate the first sweep. Operating more CO_2 traps would reduce the variability in the data. The value of the evening black fly collections is still undecided.

As a result of the success in training a field person in the Scott/Carver division in larval identification for priority samples, this process will be expanded to the other operating divisions. Travel time to bring larval samples to the main office from the field headquarters will be reduced and site treatment by helicopter will be more timely.

QUALITY ASSURANCE

5.1. Background

The Quality Assurance (QA) Program provides project management and technical support for quality related areas of MMCD operations. 1995 projects include:

- 1. Testing efficacy of methoprene pellets and briquets on mosquitoes in the field
- 2. Testing efficacy of *Bti* corncob on mosquitoes in the field
- 3. Comparing efficacy of two rates of *Bti* corncob on mosquitoes
- 4. Acceptance sampling of Altosid® (methoprene) briquets and pellets
- 5. Checking field placement of methoprene briquets

5.2. 1995 Program

During the May 1- September 30 mosquito season, rainfall was below normal until August when heavy rains brought the season total to 21.00 inches, or 8% above the 37 year average of 19.43 inches (MMCD records). The rains produced 13 broods of mosquitoes, 2 of which were large, widespread broods during August. Summer temperatures were above average. In this setting, 2 larval control materials showed increases in efficacy against *Aedes* mosquitoes compared to last year and 2 showed declines.

Efficacy of Altosid[®] Pellet and Briquet Applications.

Altosid[®] pellets were applied at 2.5 lbs/acre by helicopter, seeder or hand to 16,802 sites totaling 8,218 acres. Altosid[®] XR briquets were applied by hand at a rate of 220 briquets per acre to 21,190 breeding sites totaling 7,303 acres.

Methods: We use the pupal collection method to assess the performance of methoprene products in the field. This method is recommended by Zoecon Corporation.

Results and Discussion: Average control declined to 88% (n = 63) for methoprene pellets and increased to 82% (n=106) for methoprene briquets. The decline in control rates for pellets is

puzzling because chemical analysis conducted in the spring indicated high methoprene content of the pellets.

Performance of methoprene products must improve if MMCD is to achieve the target rate of at least 95% control in treated mosquito breeding sites.

Efficacy of Bti Corncob Applications.

Vectobac[®] brand *Bti* from Abbott Laboratories was the main *Bti* corncob product applied by helicopter in 1995. Average control of Aedes mosquitoes with Altosid pellets or briquets 94 95 96



In previous years, the 5 lb/acre rate was used early in the season when the vegetation in breeding sites is sparse. Later in the summer, the 8 lb/acre rate is used to offset the shielding effect of dense vegetative canopies in breeding sites. In contrast to previous years, both rates were used all season in 1995 in an effort to test the assumptions of past years rate selection criteria.All *Bti* corncob used in 1995 was of the larger (5/8) mesh size.

Efficacy was measured by foremen and seasonal staff in 22% of the 5,165 sites treated with *Bti* during the year (table below), using the pre-treatment and post-treatment dipping method. This method consists of taking a series of dips in breeding sites soon after a rainfall and estimating the average number of mosquito larvae per dip (pre-treatment count). The process is repeated in a randomly selected sample of sites 24-48 hours after treatment (post-treatment count). Counts are recorded on an airwork treatment form (FF-10) and control percentages calculated as a percent reduction based on the difference between the 2 counts.

Month	Average (mean) control at the 5 lbs/acre rate	Number of sites inspected	Average (mean) control at the 8 lbs/acre rate	Number of sites inspected
April			83%	31
May			85%	291
June	78%	23	84%	212
July	85%	98	92%	141
August	82%	352		

Results and Discussion: The pre/post dip counts show 83% average control (n=473) with 5 lbs/ac Vectobac and 86% (n=675) with 8 lbs/ac Vectobac. Comparing the rates is difficult because there is no side by side data available during early or late season. During June and July, control is about 6% better with the 8 pound rate. A cost benefit analysis can show if the higher control is worth the increased cost.



Acceptance Sampling of

Altosid (methoprene) Briquets and Pellets

In January, we collected a random sample of briquets and pellets from shipments received from Zoecon Corporation and had them analyzed for methoprene content by Interpoll laboratories. The

analysis method used was CAP No. 311, "Procedure for the Analysis of S-Methoprene in Briquets and Premix" furnished by Zoecon Corporation, Dallas, Texas. Of the 7 briquets analyzed, all were at or above the label claim of 1.8% methoprene (avg 2.13, sd 0.11). Of the 15 pellet samples analyzed, all were at or above the label claim of 4.0% methoprene (avg 5.34, sd 0.89).

BVA-13 mineral oil in Permethrin

Testing of oils used in Permethrin 5.7% mixtures were initiated by complaints of backpacks becoming plugged with materials falling out of solution. We tested BVA-13, a nationally used mineral oil, and the local equivalent, Worum's Tech-50. The premise was the BVA-13 might better preserve the homogeneous mixture than the local brand.

Laboratory tests showed no difference between the mineral oils. No separation occurred in either brand in the five month test period.

In 1994, clogging materials found in the backpacks were sent to the QA lab. It was evident that all samples contained some form of contamination (dirt, water, paint from storage can, etc.) and it was recommended that backpacks and storage containers be cleaned before using the new BVA-13 formulation.

Complaints dropped significantly with the new BVA-13 formulation. Plugged backpacks did not seem to be an issue during the 1995 season. The cleaning of the storage containers, backpack tanks and lines, more powerful Hudson backpacks and a greater awareness of contaminates had significant roles in this reduction of backpack related problems.

5.3. 1996 Program

Quality assurance will be done on various procedures in the field facilitated by foremen. All teams will have QA built into their processes.

PROGRAM DEVELOPMENT

6.1. Background

Program development (PD) staff have provided technical expertise and support for a variety of projects in the past year, including development of GIS capability and use, Customer Satisfaction Committee and focus groups, and the Interagency Panel on MMCD Effectiveness.

6.2. 1995 Program

Geographic Information System development

PD personnel learned how to use MapInfo® desktop GIS software. Using "Tiger" U.S. Census maps of counties, towns, streets, and water (purchased with MapInfo) and District data files we made maps to describe and analyze District activities, many of which are included elsewhere in this document. Some of these maps were used in presentations to county boards and at national meetings. Others have been useful in examining how MMCD's resources are used throughout the District, and what changes might be made with reduced resources. Initial contacts with county GIS offices, Met. Council, and other agencies interested in wetlands data were made and offer numerous opportunities for working together or sharing information.

<u>Poster on Effectiveness.</u> In September we prepared a poster for the state GIS/LIS conference which analyzed floodwater mosquito control effectiveness. For each township in the metro area, acres of potential floodwater mosquito breeding area and actual rainfall received in a given storm event were used to predict acres producing mosquitoes as a result of that rain. The acres treated at that time was subtracted from predicted production without treatment, and the resulting maps compared. In some areas where there was little potential breeding area or no rainfall, there was little difference between treated and untreated predictions. The greatest difference was in areas where there was a large amount of potential breeding area, lots of rain, and where many acres were treated. Questions remain about how this predicted mosquito production relates to recorded adult counts; some recorded counts were higher or lower than expected based on the predicted breeding.

<u>Night sampling project.</u> Weekly maps of night mosquito sample collections (described elsewhere) were made by geocoding the 170 collection sites. Data entry and management techniques to ensure GIS compatibility were explored. We also began work on automating production of these maps using the MapInfo programming language.

<u>NEXRAD rainfall maps.</u> A daily total rainfall map generated from NEXRAD radar is available on the Internet, and we were able to download it and combine it with a map of District township boundaries to make a useful product to guide fieldwork. Other rainfall map products available from commercial sources were explored, including the technology needed to reach them by modem. Testing of operational use of the NEXRAD daily rainfall maps will begin in 1996.

Customer Service.

Focus Group 1, March, 1995: Citizen Expectations for the Metropolitan Mosquito Control District.

This study involved 3 groups recruited by a random method from the metro area, with 7-9 participants each (24 total). Questions centered on what participants knew about MMCD when

they arrived, their opinions about MMCD services (after seeing MMCD video), and suggestions for what MMCD should do. Key findings were:

- Participants strongly emphasized the need for increased public education and awareness of MMCD and its services.
- Participants stated: "If the District is effective, it's well worth the money"; they asked about evidence of effectiveness, and gave some ideas about what looks like "getting their money's worth".
- Prevention of disease was important to all three groups.
- Environmental concerns were raised, although there did not seem to be uniform agreement on the level of concern.

Customer Satisfaction Committee

In April a small group of employees began discussing how MMCD can provide better customer satisfaction, and explored links between customer satisfaction and how we spend money. At the request of the Continuous Quality Improvement (CQI) committee we began working with Dale Mize, consultant from Advanced Quality Engineering, using the "House of Quality" (HOQ) technique for this analysis. We examined data available on citizen expectations from surveys and focus groups, as well as citizen phone calls and field contacts, developed a list of 22 expectations, and established importance ratings for each. We then evaluated MMCD and our "competitors" (e.g., other mosquito control districts, private companies, other environmental agencies) based on the list of expectations, chose "planned" levels of satisfaction, and used the HOQ calculations to establish importance ratings for improving each expectation.

The next step was to list technical parameters: things we measure such as mosquitoes, sites treated, brochures distributed, and presentations given. We developed a list of 67 parameters and rated how strongly they related to expectations. The ratings showed which technical parameters were most important for improving customer satisfaction. The committee presented its completed House to staff in January 1996, and is currently working on a written report of its findings (expected end of February, 1996).

Since some of the most important MMCD "customers" are the public officials who make decisions about what services will be "purchased", the committee also began looking for similar information on public officials' expectations. A survey was done of commissioners serving on the MMCD board, and showed some concerns differed from those of the general public, possibly reflecting more familiarity with services available, and also reflecting their position. More work is planned in this area.

Focus Group 2, August, 1995: Public Perceptions and Tolerance of Mosquitoes and Biting Gnats and Willingness to Pay for Reduced Populations.

This study was initiated by the Interagency Panel on MMCD Effectiveness (see below) to find out more about how people perceive mosquito problems, and what reductions in mosquitoes they feel are worthwhile. Two areas were chosen for recruiting participants: one centered around Anoka, where mosquito populations are usually high, and one around St. Paul, were there are generally fewer mosquitoes. Two groups were recruited in each of the two areas, resulting in a total of 25

participants. Questions were structured to find out people's perceptions of mosquitoes and gnats, mosquitoes' effect on their behavior, and their willingness to pay for change in mosquito numbers. Questions and study design were by Nancy Read, in consultation with Dr. Richard Krueger, Univ. of Minn., Panel members, and MMCD staff. Key findings were:

- When asked what mosquito levels they would describe as "Tolerable", participants gave counts of <10 bites or landings per evening or 2 or less per 5 minutes. At this level they did not have to go inside or use repellent. For "Bad" they gave counts ranging from 8 to 20 per evening or 2 to 8 per 5 minutes, and stated they would probably go in early or use repellent. For "Extremely Bad" they gave counts of >15 per evening or >5 per 5 minutes, and thought at that level "bug spray doesn't help", "bugs [are] on your face", you "can't be outside", and "they're in the house". These results are consistent with previous studies.
- Participants evaluated time periods by the number of "bad" days/nights when they were affected by mosquitoes. If going inside was an option, the number of mosquitoes beyond the "bad" threshold did not matter. If people had to be out, the number of mosquitoes was still important, and they would accept some "bad" days or times if it meant avoiding "extremely bad" exposures.
- Areas of primary concern by participants for mosquito reduction were: a) yards and neighborhoods, b) golf courses, ball parks, playgrounds, picnic areas and tennis courts, and c) events such as festivals or wedding receptions.
- Participants from areas that usually had more mosquitoes were more likely to report that mosquitoes affected their lives, through either direct cost for repellents and controls or indirect costs of limitations of activity.
- Most participants were willing to pay to reduce mosquito numbers, even if there were some mosquitoes left. Some participants were reluctant to pay for mosquito reductions unless they felt the methods used would not harm the environment.

Interagency Panel on MMCD Effectiveness

The Interagency Panel was organized in response to a 1994 request by the Environmental Quality Board (EQB). Its purpose was to assist the MMCD in developing a methodology to assess effectiveness, identify resources and measurement tools needed to implement an assessment of effectiveness, and maintain communication with MMCD staff and commissioners and with the EQB.

The panel met 8 times since the fall of 1994 and outlined information available or needed to assess District programs. They chose to focus on two mosquito species causing most human annoyance, the floodwater mosquito, *Ae. vexans*, and the cattail mosquito, *Cq. perturbans*. They developed a table of information which included physical measures such as mosquito breeding potential, weather, controls used and mosquito counts, as well perceptual measures such as people's behavior in response to mosquito numbers. In June 1995 they discussed ways to collect data needed. Since MMCD is already collecting much of the mosquito biology-related data, the Panel recommended the focus group (2, above) for addressing some perception issues. Panel members helped design and moderate the focus groups, and reviewed the results. At their February, 1996, meeting the Panel decided that it had completed most of its charge to the extent completion was possible. Like other agency programs, it was not possible to evaluate MMCD's effectiveness conclusively, but pieces of evidence existed. Given funding limitations that occurred after the Panel was formed, the Panel chose to turn over implementation of effectiveness studies to the MMCD. The Panel will be available to review progress annually.

The panel consisted of representative from MN-PCA, MN-DNR, Off. Envt. Assistance, MN-Dept. Ag., and MN-DOT. The panel recruited the following as advisors: John Nelson, City of Bloomington, Harriet Lykken, Sierra Club; Char Brooker, Isaak Walton League; Trudy Dunham, Metro. Parks Commission. MMCD staff support was provided by Nancy Read, Susan Palchick, and Dan Dobbert.

6.3. 1996 Plans

Geographic Information System development

One of the main goals for 1996 is expanding the use of GIS software and concepts to more MMCD staff. This had already begun at the end of 1995, and is progressing as computer systems are upgraded, as time for training is available, and as people encounter projects appropriate for GIS use.

One of the original concepts of GIS use for MMCD was to automate the production and use of field maps. The availability of digital orthophotos for the metro area, released inexpensively on CD-ROM by the USGS in 1995, makes this much more possible. We are now working on methods for combining information from the digital orthophotos, national wetlands inventory, and available street maps, and using this for on-screen digitizing of breeding sites.

In 1996 practical use of NEXRAD rain maps will be tested. We anticipate some technical aspects will need work, and hope to automate as much of the process as possible. We are also exploring ways to work with the data from the NEXRAD images, e.g., calculating average rainfall for a section or township for use in other analyses.

In late 1995 we successfully imported data from the MMCD GIS pilot project done by Minn. Planning's Land Management Information Center (LMIC) in ArcInfo format, and plan to examine that further. We are exploring the EPIC package for EPPL7 used by the DNR, for which many useful data layers for the metro area exist. We are also investigating ArcView-2 desktop GIS software to see if it offers any advantages.

Self-Assessment of Performance

The first MMCD Self-Assessment of Performance, similar to the performance reviews done by state agencies, was done in 1994. It was designed to clarify goals and assess progress towards those goals, and also provide background information for the general public. This report is expected to be updated in 1996.

Public opinion evaluation. We are considering updating the 1994 survey to assess public opinions and expectations in 1996.

BLACK FLY CONTROL PROGRAM

7.1. Background

The black fly program began in 1984 with only the small stream treatment program. Studies by MMCD during the early years of the program revealed that the three major black fly pests of human in the Twin Cities breed only in large rivers. Between 1987 and 1989, MMCD conducted efficacy and acute toxicity studies of the material used to control black flies, *Bacillus thuringiensis israelensis* or *Bti*, on the large rivers. Based on the positive outcome from those tests, MMCD began to phase in an operational control program on the large rivers in 1990. Currently, the black fly program monitors larval black fly populations that develop in the small streams and large rivers during spring and summer. Sites that reach larval population thresholds are then treated with liquid *Bti*.

7.2. 1995 Program

Simulium venustum Control Program

Simulium venustum is a human biting black fly with one, early spring generation in our region. Larvae breed in small streams throughout the District (Fig. 7.1). The MMCD began using *Bti* to control *S. venustum* in 1984.

More than 300 potential breeding sites were sampled in mid-April to determine the density of *S. venustum* larvae using the standard grab sampling technique developed by the MMCD in 1990. Treatment decisions were based on a threshold of 60 *S. venustum* per sample. Forty eight sites met the threshold and were treated once with *Bti* at a dosage rate of 10 ppm. A total of 8.95 gallons of *Bti* were used for the treatments in 1995 (Table 7.1).

Water body	Number of survey locations	Total number of treatments	Gallons of <i>Bti</i> used
Small streams	300+	48	8.95
Mississippi River	3	15	1225
Crow River	6	7	218.55
Minnesota River	7	22	2020
Rum River	5	15	120
Total	321	107	3592.5

Table 7.1 Summary of Bti treatments for black fly control by the MMCD in 1995.



Fig. 7.1 Treatments for black fly control at small stream treatment sites, 1995

Large River Program

There are 3 large river-breeding black fly species which MMCD targets for control. *Simulium luggeri* breeds mainly in the Rum and Mississippi rivers, although it also breeds in smaller numbers in the Minnesota and Crow rivers. *Simulium luggeri* is abundant from mid-May through August. *Simulium meridionale* and *S. johansenni* breed mainly in the Crow and Minnesota rivers. These species are most abundant in May and June, although *S. meridionale* populations will remain high throughout the summer if stream flow is also high.

In 1990, the District began operational treatments, at a restricted number of breeding sites, on the large rivers with *Bti* (Fig. 7.2). On the Mississippi River, operational treatments were linked to a 3-year nontarget insect production and community structure study. This study, requested by the DNR, examined indirect effects of black fly control such as alteration of the invertebrate community and food web.

The black fly population density at each treatment location was measured every 7 days using artificial substrates. Treatment thresholds used in 1995 were the same as those used since 1990.

A total of 3,583.55 gallons of *Bti* were used to treat the large rivers in 1995 (Table 7.1). This is compared to 5,070 gallons in 1993 and 4047.5 gallons in 1994. Less *Bti* was used in 1995 due to lower than average larval production on the Crow and Minnesota rivers. Control of black fly larvae on the large rivers improved in 1995 due additional material carry made possible by higher than average water levels.

Adult Population Sampling

The adult black fly population was monitored in 1995 at 50 locations using the over-head net-sweep technique. This same technique has been used since 1984. Samples were taken twice weekly from mid-May to September. These specimens have not yet been processed and no data is available at this time for comparison with previous years results.

Nontarget Studies

The supplementary report on Rum River stoneflies has been completed and is currently under review at the MNDNR. Preliminary results indicate that no significant effects on stonefly species composition or biomass could be detected throughout the study years (1993-1994).

A collaborative agreement between MMCD and the MNDNR to conduct an ongoing operational nontarget monitoring program was developed and implemented in June of 1995. This monitoring agreement consists of semiannual collections of Hester-Dendy multiplates from three locations on the Mississippi River. This minimal amount of sampling should provide insight regarding major changes in invertebrate community structure should they arise through long term operational black-fly control measures.



Fig. 7.2 Number of treatments per site for black fly control at large river treatment sites, 1995

7.3. 1996 Plans

Budget restrictions in 1996 and personnel reductions in the black fly program will make it necessary to focus on improving methods and processes to ensure the effectiveness of the black fly program. Our goal is to continue to effectively control black flies on large rivers and small streams where needed.

In 1996 the treatment threshold for the small stream inhabiting *S. venustum* will be 70 per grab sample, up from 60 in 1995.

The stonefly production study (Simmons and Crews 1996) has been completed and submitted to the MDNR. Data from this study clearly indicate that the use of *Bti* to control *S. luggeri* in the Rum River did not result in a large change in the composition of the stonefly community, population density, or standing crop. MMCD will now treat the uppermost monitoring site in the Rum River.

We will continue to process the multiplate samples of macroinvertebrates from rivers collected in 1995 to fulfill MDNR permit requirements. We will create a computerized database for black fly information —adult and larval counts. We will also conduct trials on the use of *Bti* liquid in mosquito sites.

Appendix

- SPRP Report Cover Letter and Executive Summary
- Category of Call Received and Path of Service
- Control Material Usage and Acres Treated (1988-1995)
- Amount of Materials Used in Each Division in 1995
- Rainfall Totals by County
- Meeting Notes, June 7 TAB Meeting
- Meeting Notes, November 30 TAB Meeting

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APPPENDIX 1. SPRP REPORT COVER LETTER AND EXECUTIVE SUMMARY

Scientific Peer Review Panel Of the Metropolitan Mosquito Control District

January 23, 1996

Richard Anderson, PhD Scientific Chair USEPA Research Laboratory 6201 Congdon Boulevard Duluth, Minnesota 55803

Judith Helgen, PhD Fresh Water Ecology

Stuart Hurlbert, PhD Department of Biology San Diego State University

Roger Moon, PhD Department of Entomology University of Minnesota

Robert Naiman, PhD Center for Streamside Studies University of Washington

William Schmid, PhD Department of Ecology, Evolution, and Behavior University of Minnesota

Kenneth Simmons, PhD Entomology

Keith Solomon, PhD Director Centre for Toxicology University of Guelph

Harrison Tordoff, PhD Professor Emeritus Department of Ecology, Evolution, and Behavior University of Minnesota

Michael Zicus, PhD Zoology

John Genereux 192 Charles Avenue St. Paul, Mn 55103 Administrative Chair

Joseph Sanzone, Director Metropolitan Mosquito Control District 2099 University Avenue West St. Paul, Minnesota 55104-3431

Dear Joe:

The SPRP was formed in 1986 as an independent research group, funded by the MMCD, with an aim to describe long-term consequences of the MMCD mosquito larvicide program. This letter accompanies a report that summarizes the research we promoted and the results of that research. It also marks the end of the SPRP.

During our operation we sponsored both laboratory and outdoor studies. The laboratory studies filled specific gaps in our information on the toxicity of Bti and methoprene. The field studies were designed to measure effects on nontarget invertebrate and bird populations when the larvicides were applied in their usual manner.

Our results and concerns are summarized in the Report's Executive Summary and detailed in the report. I would like to highlight some in this letter. The laboratory studies showed that chironomids may be as sensitive as mosquitoes and that some zooplankton may be affected at low concentrations (Daphnia) while others may not (Diaptomus). The chironomid results were supported in the field studies. Some chironomid species and other primitive flies were affected while no changes in the measured zooplankton populations Interpretation of the field results is never as were found. simple as those found in laboratory studies and we, as you can quess, struggled to produce the joint interpretation found in the report.

I would also like to highlight the SPRP concern about the potential for long-term effects and the need to study them more intently. The major study we sponsored included three application years and the wetlands have had an additional two years of applications. That means that the wetlands have been treated for five years. There is no experimental area that is as well studied or has the potential for assessing long-term larvicide effects.

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We ardently recommend that the invertebrate populations in those wetlands be sampled this spring (1996) and that applications be continued so that any environmental effects questions can be answered in more detail and with greater certainty.

However, the SPRP is aware that there is legislation that stops further research by the MMCD and your funding is reduced. It is truly sad that such an opportunity may pass and that answers will not be available for a questioning public.

In closing, the SPRP would like to thank the MMCD for both their "hands-off" approach during our operation as a research panel and the cooperation shown by all the staff when our requests were made. The high professional level made our jobs smoother. You and all your staff are applauded by us.

Sincerely yours,

Bichard I. Anderson

Richard L. Anderson Scientific Chair Scientific Peer Review Panel

Page 1

EXECUTIVE SUMMARY

The Scientific Peer Review Panel (SPRP) of the Metropolitan Mosquito Control District (MMCD) first met in 1986 to answer the question: What are the long term ecological consequences of the larvicide program? The SPRP began its work with a review of existing biological and toxicological information on the larvicides methoprene and *Bacillus thuringiensis israelensis* (Bti) used by the MMCD. This assisted the preparation of the Supplemental Environmental Impact Statement of the MMCD in 1987.

Following this review, the SPRP developed a research plan to assess the biological effects of these larvicides. The panel recognized that wetland birds and amphibians were primary concerns of the public, but the SPRP also understood that any non-target effects of these larvicides would most likely be upon other invertebrates, especially aquatic insects, whose larval development occurs in wetlands. The SPRP further realized that studies relevant to non-target organisms would require assessment of both direct and indirect effects. Direct effects would be through acute or chronic toxicity; e.g., death or impaired reproduction. Indirect effects could result from changes in the food web; e.g., food supply, competition or predation. A significant reduction of aquatic invertebrates (as a direct effect of larvicide treatments) could be the basis for indirect effects on species that feed upon them; e.g., waterfowl, other wetland-associated birds, amphibians, and predatory invertebrates like dragonflies.

These considerations led to a research plan with both laboratory studies and multiple year field studies. The laboratory studies were needed to fill specific gaps in the toxicity information for wetland zooplankton, insects and amphibians. The field studies were commissioned to describe and define effects in natural wetland communities when methoprene and Bti were applied in their usual manner for mosquito control.

The laboratory studies with Bti showed that *Paratanytarsus* chironomids were affected at concentrations near or below those that kill mosquitoes, although a longer exposure time was required. Feeding studies on crayfish and amphibians using Bti-killed mosquitoes showed no effects. Laboratory tests sponsored by the SPRP using methoprene found the most sensitive animal species was the cladoceran *Daphnia* where reproduction decreased at concentrations of methoprene around 5 to 10 μ g/l, about 5 to 10 times higher than the methoprene concentration expected in water during operational use. The copepod *Diaptomus* and the amphipod *Hyalella* were much less sensitive than *Daphnia*. Methoprene did not affect amphibian growth or survival, even when the exposure concentration exceeded 1,300 μ g/l for 100 days.

The SPRP sponsored four outdoor studies and helped support, in part, a duckling study sponsored by the Legislative Commission on Minnesota Resources. The studies sponsored entirely by the SPRP included:

- The Wright County Long Term Experiment (WCLTE), where treatments were assigned and applied for three consecutive years in 27 wetlands in western Wright County;
- A divided wetland experiment where reference and treated sectors were established by dividing several wetlands; and
- Two historical studies which compared previously treated and untreated wetlands.

The SPRP is an Independent Research Group Funded by the Metropolitan Mosquito Control District

A five point summary of these studies is that:

- 1. Densities of some of the aquatic insects, particularly chironomids and other benthic flies, were reduced by applications of both methoprene and Bti in the WCLTE.
- 2. Zooplankton were not affected by applications of either larvicide in the WCLTE.
- 3. Reproduction by Red-winged Blackbirds nesting in the wetlands was not affected by applications of either larvicide in the WCLTE.
- 4. Densities of 18 other bird species were not affected by application of either larvicides in the WCLTE.
- 5. No effects of the larvicides on aquatic insects, on zooplankton, or on birds were seen in the two historical studies or in the divided pond study.

The SPRP remains concerned about possible effects of the applications of control materials on food resources. The significant effects associated with Bti and methoprene applications in the WCLTE were to reduce populations and biomass of chironomids and several other benthic fly taxa. No food web effects on foraging bird populations were found. However, many components of the wetland community food web were not examined, in particular predominant predators such as dragonflies, beetles, water bugs, damselflies, and the invertebrates associated with the wetland aquatic vegetation. In addition, bird species that are more strictly dependent on wetland foods (including ducks) were not examined closely. Measurements of some zooplankton parameters, as well as measurements of densities of breeding birds, were also relatively imprecise.

The WCLTE provided an optimal but imperfect model to begin study of the MMCD larvicide program in the environment. Despite the study's strengths, it is still unknown whether or not similar results would be seen if the larvicides, particularly Bti, were applied in other sites at the rates and frequencies similar to those used by the MMCD in most years. We believe there is overlap between the types of wetlands studied in the WCLTE and those treated by the MMCD. However, there is uncertainty as to exactly what types of wetlands are treated and how appropriate the WCLTE sample was for inference to the MMCD program. Further, the three-year WCLTE was too short to fully investigate all potential chronic effects. However, the WCLTE was designed to include continued treatment beyond three years to make follow-up sampling of benthic invertebrates and zooplankton possible. Continued treatment and sampling is extremely important.

The MMCD has supported the most comprehensive assessment of the effects of a mosquito larviciding program anywhere to date. This research has provided a partial basis for evaluating the non-target effects of the larvicides now being used. Questions concerning non-target effects remain unanswered and new ones likely will arise in the future, should mosquito treatment programs continue. Social responsibility dictates that a mosquito control district with a mandate to provide protection from arthropod and tick-transmitted diseases and relief from mosquito and black fly annoyance pursue control in ways that minimize ecological consequences.

The demand for mosquito control in the Metropolitan Area is likely to continue at least in the near future. Thus, the MMCD will need to pursue its mission in the face of ecological uncertainties. This task will be difficult, but not impossible. An adaptive management approach, whereby ecological risks and social benefits are continually reassessed by the Technical Advisory Board with inputs from affected citizens and continued research, will ensure the MMCD's mandate is achieved in a responsible way.

The SPRP is an Independent Research Group Funded by the Metropolitan Mosquito Control District

SECTION I. INTRODUCTION

The Metropolitan Mosquito Control District (MMCD) is a joint powers authority established to suppress mosquitoes that transmit diseases and to reduce mosquito and black fly populations so that outdoor activities of people are not disrupted. The District now emphasizes control of mosquito larvae with applications of several formulations of two larvicides: an insect growth regulator, methoprene, and a bacterial spore, *Bacillus thuringiensis israelensis* (Bti), with its associated toxin. General operation of the MMCD was described in an EIS (MMCD, 1977) and a supplement (MMCD, 1985), and in the agency's Self-Assessment of Performance (MMCD, 1994a).

In 1981, the MMCD established a Technical Advisory Board (TAB) which meets annually to discuss the MMCD operational decisions. In 1985, this board recommended that the MMCD investigate the effects of mosquito control practices on organisms other than mosquitoes; i.e., non-target effects. The MMCD formed a Scientific Peer Review Panel (SPRP) in 1985 in response to a recommendation of the TAB and a petition to the EQB by concerned citizens (Anonymous, 1985a, a petition from National Audubon Society, <u>et al.</u>, to EQB August 1, 1985; and Anonymous, 1985b, a response to petition by MMCD, October 18, 1985). This group of scientists was charged with developing and conducting, through contracts, a research program with the goal of gaining a better understanding of the ecological consequences of the District's larvicide program.

The SPRP first met in 1985 to consider what might occur when the larvicides methoprene or Bti are applied on a routine basis in Metropolitan Area wetlands. The problem had two levels: 1) to define potential impacts on non-target organisms of the two pesticides and 2) to define what measures were needed to research these effects on non-target species.

The panel recognized that wetland birds and amphibians were primary concerns of the public. The SPRP also understood that any non-target effects of these larvicides would most likely be upon other invertebrates, especially aquatic insects, whose larval development occurs in wetlands. The SPRP also realized that studies relevant to non-target organisms would require assessment of both direct and indirect effects. Direct effects would be through acute or chronic toxicity; e.g., death or impaired reproduction. Indirect effects could result from changes in the food web; e.g., food supply, competition or predation. A significant reduction of aquatic invertebrates (as a direct effect of chemical treatments) could be the basis for indirect effects on species that feed upon them; e.g., waterfowl, other wetland-associated birds, amphibians, and predatory invertebrates like dragonflies.

The literature review and special concerns over certain non-target species suggested that a number of studies would be required. The literature indicated that direct toxic effects of the larvicides were mostly limited to targeted insects and closely related species (Mian and Mulla, 1982, Mulla et al., 1979). The review also found specific gaps in toxicity information for wetland zooplankton, insects and amphibians. In addition, laboratory studies of toxicity were done on limited numbers of species, some of which were not native to Minnesota wetlands. And also, the laboratory tests were usually of a short-term (acute) nature.

The SPRP recognized the limitations of laboratory toxicity tests and decided that studies of the larvicides on natural Minnesota wetlands were necessary for several reasons. First, the literature lacked information about the chronic effects of repeated applications of mosquito larvicides. In addition, by studying these effects in natural wetlands, a broader spectrum of

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invertebrate and vertebrate non-target species could be examined, and indirect effects through food-web interactions could be evaluated.

The SPRP defined two critical areas that required more information:

- 1. Laboratory toxicity tests, acute and chronic, of direct effects of Bti and methoprene on specific wetland invertebrates and amphibians.
- 2. Direct and indirect effects of both larvicides on naturally-occurring animals through long-term field studies with repeated treatments.

In Sections II-IV, this report reviews pertinent literature and summarizes new laboratory and field studies that were commissioned by the SPRP. Section V interprets results and relates them to previous research and to the MMCD control programs. Some unresolved questions about the results are discussed and recommendations to the District for future studies complete the main body of our report.

Background information on the District's operations and wetlands biology and ecology is provided in separate appendixes. Appendix I describes the Bti and methoprene programs used by the MMCD in the seven-county metro area wetlands in recent years. Appendix II gives a general overview of the biology and trophic relations among the different kinds of animals that would be exposed to the larvicides in the treated wetlands. Appendix III reviews selected aspects of waterfowl feeding ecology. References used in the text and appendixes and a glossary are also included as Appendixes IV and V.

APPENDIX 2. CATEGORY OF CALLS RECEIVED AND PATH OF SERVICE

Citizen concerns. Citizens call with a variety of questions or concerns including control material information, notification before treatment, objection to treatment on private property, helicopter use, and chemical sensitivity, among others.

Callers are reassured that their concerns are being heard and that prompt action will be taken. A simple exchange of information is usually sufficient. However, many times callers are angry or upset and such calls are forwarded directly to the Public Affairs Coordinator. An investigation is initiated with follow-up that includes contact by letter, additional phone call(s), or personal visit. If the concern demands immediate attention, the Supervisor/Program Leader is located and apprised of the situation. Follow-up and response are completed within two working days. Follow-up for general questions or concerns is completed within five working days. District information is sent to the caller in addition to any specific follow-up to their request.

Report of a breeding site. Callers want to know if we are aware of a breeding site on their property or in their neighborhood, and if it has been treated.

The information taken from the caller is given to the appropriate Supervisor or Program Leader for follow-up. Maps and records are checked to make sure the site is listed. More than 95% of these calls refer to sites that are already mapped. If the field staff is unfamiliar with or unclear about the site, the citizen is contacted and the area is field-checked. A citizen response sheet is completed and returned to the main office within 5 working days.

The caller is sent information pertaining to breeding site identification and control materials. We include a District brochure that gives a brief overview of our operation. More specific information is available upon request. Our goal is to contact these callers and answer their questions as soon as possible.

Mosquito annoyance complaints. A caller registers a general complaint (e.g. "The mosquitoes are terrible! Please help!") with no reference to a breeding site nearby. Many times these calls come from areas in the District where larval control is minimal. Black fly annoyance is also recorded in this category. Caller information is recorded and sent to the appropriate Division. In addition, telephone staff explain our adult mosquito surveillance methods and control operations, and information is sent to the caller. The information obtained from the caller is valuable and helps direct control operations in that Division.

Public property treatments. Representatives from civic organizations or government agencies call to request adult mosquito control for park and recreational areas and, for civic events (i.e., graduations, sporting events, and local fairs and celebrations). Most public functions are held annually and treatment requests need to be submitted yearly. Information is recorded and sent to the appropriate Division. Treatments are done once priority work has been completed and weather conditions permit. Field staff document treatments and return information to the main office.

Waste tire removal. Citizens have been made aware that waste tires and artificial containers are the main production area for the LaCrosse encephalitis mosquito. In 1995, MMCD removed and

properly disposed of over 43,000 waste tires in the metro area. Approximately 30% of these were identified by citizen calls.

Adult Mosquito Control Information Line - 643-8383. To inform citizens concerned about the time and location of mosquito adulticiding operations, MMCD expanded its adulticiding information line. The information line enables citizens to hear a daily recorded message on where adulticiding activities will be taking place. This provides a greater service to the citizens, since they do not have to be at home to receive our call. Staff will call citizens who still desire advanced notice of adult mosquito control treatments.

MMCD uses its voice mail system to update daily information on this line. Field staff forward information to the main office at the end of work shift, which then allows main office staff to update the line by 4:00 P.M. weekdays.

Callers to the information line are first given a general greeting, followed by instructions for specific counties within the Metropolitan area. By pressing the corresponding number to the county requested, the caller receives specific adult mosquito treatment information for each community within the county involved.

Citizens who have expressed concern over adulticiding activities receive a letter with instructions on the use of the system at the beginning of the season. A person who chooses not to use this system can request the MMCD contact them if treatments were to happen in their area.

APPENDIX 3. CONTROL MATERIAL USAGE AND ACRES TREATED (1988-1995)

CONTROL MATERIALS USED BY THE MMCD FOR MOSQUITO & BLACK FLY CONTROL NUMBER OF ACRES TREATED BY MATERIAL TYPE FOR 1988-1995

CONTROL	ļ					i		
MATERIAL	1988	1989	1990	1991	1992	1993	1994	1995
ALTOSID								
XR BRIQUET	4,235	11,700	11,351	10,862	10,376	10,537	8,557	7,303
150 DAYS								
ALTOSID								
SAND	706	13,900	84,286	12,079	0	0	0	0
3-DAY		-						
ALTOSID			;					
SAND - GFM	0	0.	0	0	625	630	678	871
Research Only								
ALTOSID								
PELLETS	0	0	0	75	5,689	5,562	5,374	8,219
30-DAY			1					
ALTOSID SR-20							•	
LIQUID	0	0	0	1	3,279	15	13	668
	1	:	1					
BTI CORN COB							ł	
GRANULES	24,248	67,300	100,100	134,011	101,877	126,778	102,860	132,773
						•		
BTI LIQUID							i	
BLACKFLY	15	214	2,009	3,574	4,418	5,090	4,047	3,606
(GALLONS)								
PERMETHRIN			1					
ADULTICIDE	8,771	9,225	38,787	22,062	12,812	8,261	10,499	6,305
		:						
RESMETHRIN	:				1	`		
ADULTICIDE	15,787	58,880	225,900	155,922	48,716	53,345	40,687	62,199

NUMBER ACRES TREATED

acres95.wk3

	Altosid® XR Briquet (cases)	Altosid® Pellets (pounds)	Altosid® GFM Sand (cases)	Altosid® A.L.L. Liquid (ounces)	<i>Bti</i> granules (pounds)	<i>Bti</i> liquid (gallons)	Permethrin (gallons)	Resmethrin (gallons)
Anoka	720	1,834	0	350.0	210,488	-	142.7	164.5
Dakota	616	474	0	11.3	40,811	-	177.3	26.6
No. Henn.	1,143	1,704	0	0	143,681	-	213.3	220.5
So. Henn.	1,265	1,960	0	0	217,657		247.5	115.0
Ramsey/ Wash.	1,669	1,969	0	0	152,681	0.5	243.0	129.6
Scott/ Carver	1,366	1,855	0	306.0	132,974	-	206.2	77.3
Cattail	896	17,336	0	0	0	-	0.0	0.0
SPRP	0	0	4,363	0	6,456	-	0.0	0.0
Black Fly	-	-	-	-	-	3,605.5	-	-
District totals	7,675	27,132	4,363	667.3	904,748	3,606.0	1,230.0	733.5

APPENDIX 4. AMOUNT OF MATERIALS USED IN EACH DIVISION OR PROGRAM IN 1995

YEAR	Anoka	Carver	Dakota	N. Henn.	Hennepin	S. Henn.	Ramsey	Scott	Wash.	Wright	DISTRICT
1959	19.34		26.33		21.92		20.73	27.62	18.58		22.42
1960	23.02		17.60		23.00		21.06	18.90	21.10		20.11
1961	16.88		16.41		16.15		16.34	16.71	16.84		16.56
1962	24.45		21.17		25.24		26.42	23.86	26.78		24.65
1963	16.77		14.81		17.09		16.38	14.07	17.66		16.03
1964	17.43		22.41		23.25		20.99	22.47	19.88		21.07
1965	26.87		28.01		29.19		28.87	25.32	30.52		27.97
1966	14.11		15.61		14.41		14.13	13.13	15.95		14.41
1967	14.27		15.27		18.13		17.08	13.26	15.59		15.60
1968	19.97		22.65		24.11		22.77	22.30	23.58		22.62
1969	7.39		10.60		11.07		8.74	10.32	9.69		9.75
1970	16.05		18.39		17.28		16.41	18.28	17.68		17.55
1971	16.80		19.62		16.35		19.06	15.15	21.68		17.82
1972	19.38		17.85		18.34		17.73	15.63	19.85		18.06
1973	17.72		18.30		15.54		19.49	18.24	19.79		17.95
1974	16.23		13.84		15.80		13.09	10.84	14.46		14.32
1975	23.93		22.44		19.99		22.66	16.60	20.02		21.47
1976	8.16		9.27		9.52		9.43	10.74	9.06		9.48
1977	20.28		21.03		22.42		22.66	18.68	24.13		20.90
1978	24.58		26.67		24.41		26.49	21.98	27.98		24.93
1979	18.10		22.01		20.58		20.78	22.68	22.43		19.98
1980	22.79		20.94	18.51	19.13	19.51	20.55	16.00	24.34		19.92
1981	17.13		19.36	17.72	18.01	18.37	19.35	21.40	20.01		19.08
1982	16.84		16.21	15.88	15.46	14.87	14.32	16.71	14.62		15.59
1983	18.17	24.53	19.99	19.74	20.14	20.67	19.55	23.32	19.09		20.31
1984	20.18	27.31	17.35	20.52	21.63	23.10	22.58	22.09	20.75		21.45
1985	24.42	18.29	17.38	20.55	20.47	20.38	21.74	18.02	21.37	26.26	20.73
1986	22.81	21.90	24.87	20.94	21.55	22.31	24.56	24.85	25.59	24.28	23.39
1987	17.10	20.17	20.17	20.63	22.21	23.62	19.72	17.11	17.11	15.70	19.48
1988	13.50	10.50	12.46	11.07	11.69	12.07	14.33	11.90	14.42	9.35	12.31
1989	14.94	16.62	16.16	16.81	16.83	16.85	15.92	18.50	17.66	18.08	16.64
1990	25.23	23.38	22.73	23.04	23.54	24.08	24.61	24.89	22.97	22.49	23.95
1991	27.49	27.14	22.06	29.97	28.19	26.42	27.31	23.15	25.65	27.26	26.88
1992	15.40	18.29	21.67	20.63	19.33	18.13	20.72	25.13	19.37	17.02	19.10
1993	27.81	28.00	26.99	26.79	27.40	28.14	28.73	31.04	27.42	25.46	27.84
1994	15.90	20.99	23.37	16.21	17.50	18.76	15.05	22.67	17.85	17.62	17.72
1995	22.75	18.85	17.42	21.07	20.18	19.21	21.99	19.39	23.59	17.14	21.00
Thirty-seven year											
average	19.03		19.44		19.65		19.79	19.27	20.14		19.43
~						•					

Appendix 5. Rainfall totals in inches for May 1 - September 30, 1995.

APPENDIX 6. MEETING NOTES, SUMMER TAB MEETING

Metropolitan Mosquito Control District **TECHNICAL ADVISORY BOARD (TAB)** Meeting Notes—Special Meeting—June 7, 1995

Members Present:

Dave Noetzel, Chair Dave Belluck Ron Chatfield Larry Gillette Howard Krosch Art Mason Robert Sherman

Members Absent

Richard Anderson, Vice-Chair Jim Cooper Craig Hedberg Alan Singer Dave Warburton Bob Wryk

MMCD Staff

Joe Sanzone, Director Dan Dobbert, Legislative Liaison

Member Agency

University of Minnesota, Entomology Minnesota Pollution Control Agency Industry Representative (Solvay Animal Health Inc.) Hennepin County Parks Minnesota Department of Natural Resources Minnesota Department of Agriculture Hennepin County, Planning/Development

Member Agency

United States Environmental Protection Agency University of Minnesota, Fisheries and Wildlife Minnesota Department of Health Environmental Interest Groups (Minneapolis Parks) United States Fish and Wildlife Service Minnesota Department of Transportation

Susan Palchick, *Aedes* Program Manager Nancy Read, Program Development

- I. Joe Sanzone gave an update on the Metropolitan Livable communities act and its impacts to MMCD. Legislative action also prohibited expenditures on non-target research.
- **II**. TAB members discussed the importance and value of non-target research. The value of such long term studies should be emphasized to the legislature. (Legislators need to be involved in the problems they have created. Could a legislator be on the TAB?)

While the TAB feels it is still important to do non-target research, apparently the Commission and legislators feel that we know enough about potential impacts from control materials. Also research is important when evaluating new materials. Larry Gillette noted that the TAB recommends what is important to the program, and should not be a District advocate. However, the TAB can state what it sees as scientific consequences of legislative choices.

Ron Chatfield identified public understanding of control materials used as a hindrance to public acceptance. Perhaps MMCD could work with Sandoz to improve public relations. Art Mason recommended that the TAB should state scientific effects of the reductions in MMCD funds (e.g. concerns regarding increase home use of chemical insecticides).

The following **motion** was made by Larry Gillette:

TAB supports that MMCD have the option to continue non-target research and research on

unintended impacts of MMCD programs.

Dave Noetzel will write a letter and motion and circulate to members. Bob Sherman suggested that the letter (motion) mention that TAB was the original motivator of non-target research and its results have been important in TAB evaluation of MMCD program. Larry Gillette expressed concern that MMCD have the latitude to continue existing studies which they feel important.

Meeting Adjourned

APPENDIX 7. MEETING NOTES, FALL TAB MEETING

Metropolitan Mosquito Control District **TECHNICAL ADVISORY BOARD (TAB)** Meeting Notes—1995 Fall Technical Advisory Board Meeting November 30, 1995

Members Present:

Dave Noetzel, Chair Dave Belluck Larry Gillette Craig Hedberg Howard Krosch Art Mason Robert Sherman Alan Singer

Members Absent

Richard Anderson, Vice-Chair Ron Chatfield Jim Cooper Dave Warburton Bob Wryk

MMCD Staff

Joseph Sanzone, Director Sandy Brogren, Technical Support Diann Crane, Technical Support David French, Control Program David Neitzel, Control Program

Visitors

Gary Montz, Minnesota Department of Natural Resources

I. Chairman Noetzel called the meeting to order at 1:00 PM and TAB members and MMCD staff introduced themselves.

II. Joe Sanzone summarized MMCD's activities and results from this season's program. MMCD achieved excellent control of the Spring Aedes mosquitoes this year. The District experienced 13 broods of floodwater mosquitoes (primarily Aedes vexans) in 1995. MMCD achieved good control using methoprene and Bti until August when two major broods occurred. Emergence of these broods were due to three factors: 1) extensive breeding across the District, 2) weather interference in control activities, and 3) time of year—briquets and pellets were at the end of their life expectancy. Control of the cattail mosquito was excellent; 92% for methoprene briquets and 99% for methoprene pellets.

Member Agency

University of Minnesota, Entomology Minnesota Pollution Control Agency Hennepin County Parks Minnesota Department of Health Minnesota Department of Natural Resources Minnesota Department of Agriculture Hennepin County, Planning/Development Environmental Interest Groups (Minneapolis Parks)

Member Agency

United States Environmental Protection Agency Industry Representative (Solvay Animal Health Inc.) University of Minnesota, Fisheries and Wildlife United States Fish and Wildlife Service Minnesota Department of Transportation

> Scott Ranta, Control Program Nancy Read, Technical Support Susan Palchick, Technical Support James Stark, Public Information

No cases of LaCrosse encephalitis have been reported within the District in 1995. MMCD staff maintained three sentinel chicken flocks to monitor western equine encephalitis and results show no evidence of virus activity. Black legged tick surveillance continued this year. Tick populations were 50% lower than in 1994. (Craig Hedberg commented that the MMCD tick distribution map closely follows the Lyme disease case distribution in the metropolitan area.)

MMCD staff monitored black fly populations in 300 sites on small streams in the metropolitan area. Only 48 sites met threshold and were treated with liquid *Bti*. Fifty nine treatments were made on the large rivers. Non-target research continued on the Rum and Mississippi rivers and results will be reported at the spring TAB meeting.

Larry Gillette recommended that an executive summary like that presented by Joe Sanzone be a part of future reports.

III. Nancy Read reported on public opinion research conducted in 1995. Participants in a series of focus groups conducted in March, 1995 indicated that: a) more public information is needed, b) if effective, the program is worth the money, c) preventing disease is important, and d) some people have environmental concerns.

The Interagency Panel conducted a focus group to measure public perception of mosquito levels. Preliminary results indicate that ≤ 2 mosquitoes per 5 minutes is "tolerable", the number of "bad" mosquito nights is important, the primary concern is how are the mosquitoes in "my yard" (mosquito levels in golf courses and parks ranked second, and festivals and events ranked third), and there is a willingness to pay for mosquito reduction, even if some mosquitoes remain.

Discussion on the usefulness of focus groups followed. Focus group results were similar as other survey results. TAB members indicated that they are pleased with the public opinion research done so far. The TAB recommended that follow up surveys be done every 2 years to account for changing public attitude and to also provide current information to legislators.

The following **motion** was made by Bob Sherman:

That the MMCD construct an ongoing approach to appraisal of public opinion on the value of mosquito control services.

Howard Krosch seconded the motion and the motion was passed.

IV. Joe Sanzone presented the District's budget, District organization, and control strategies for 1996. Full-time nonunion staff was reduced by 31% and there will be a 36% reduction in control materials and helicopter use. The District will shift its focus from a geographically structured program to a demographically structured program. Larval control will continue to be the major focus, although methoprene briquet use will decrease. Some increase in adult control is anticipated to provide local service in areas not receiving larval control.

The Board discussed ways in which MMCD could obtain more money and materials, especially for those communities which will have less service. Dave Belluck suggested that MMCD establish partnerships with local governing units who could obtain materials and District employees could apply them. Bob Sherman recommended the District send a letter to communities to make them aware of the reduction in MMCD budget and offer our services to apply materials. Art Mason stressed that the District should let the public know what impacts are going to be felt from the reduction. MMCD is sending press releases, contacting public groups, and making presentations to keep people informed on this issue.

TAB members voiced concern about the District increasing adulticide use and the appearance of a shift from an environmentally sensitive program. Larry Gillette proposed not increasing adulticide use, allowing the public to see the difference in the District's program. Bob Sherman said it is important that the public know the increase in mosquito levels is due to a decrease in larval control materials.

The following **motion** was made by Al Singer:

The TAB recommends that the District continue to emphasize larval control and do adult control as pay-for-service or at the District's prerogative.

The motion was seconded and passed.

In addition the following motion was made by Larry Gillette:

The TAB recommends that MMCD not necessarily respond to increased mosquito annoyance with an increase in adulticide use.

The motion was seconded and passed.

Joe Sanzone reviewed other aspects of the District's 1996 program. MMCD will maintain public health efforts at the same levels. The black fly program will continue. The District is looking for ways to mitigate the reductions—staff are evaluating a new helicopter loading system and the use of NEXRAD in monitoring rainfall. Al Singer asked about attractant work. Joe Sanzone commented that attractant work is being done in other areas of the country, but MMCD is not currently active in this area.

The SPRP report (final draft) would be finished by the end of December or early January and will be made available to TAB members.

Larry Gillette asked if staff have entertained the idea of working in cooperation with other agencies to improve degraded wetlands (i.e. modify reed canary sites to type 3 or type 4 wetlands). District staff have contacted Ducks Unlimited offering our services on such projects in the metropolitan area and are working on wetland creation projects as well.

Bob Sherman made the following motion:

That the TAB expresses to the Commission its approval of the presented strategy outlines as an appropriate response to reduction in MMCD resources.

The motion was seconded and passed.

Art Mason expressed his regrets at seeing experienced personnel cut, and expressed thanks for the dedication of the remaining employees. He still considers MMCD one of the premier agencies in the nation, and reminded staff to call members of the TAB if they need help.

Meeting Adjourned 3:00 PM

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