

THE COMMONWEALTH OF MASSACHUSETTS  
STATE RECLAMATION & MOSQUITO CONTROL BOARD

# CENTRAL MASSACHUSETTS MOSQUITO CONTROL PROJECT

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## ANNUAL REPORT 2009



## PREFACE

The 2009 Annual Report of the Central Massachusetts Mosquito Control Project (the Project) has been prepared to provide the citizens and officials of the member cities and towns with information pertaining to the Project's control procedures and related activities.

As you read through this report you will notice that the Project is committed to an Integrated Pest Management (IPM) program. IPM utilizes a variety of control techniques and evaluation procedures. All control efforts are undertaken only after surveillance data has been collected and analyzed. This allows control decisions to be made based on the exact need that exists at each specific site. Environmental considerations are paramount when prescribing various control techniques.

The CMMCP Board of Commission is appointed by the State Reclamation and Mosquito Control Board to represent your community's interest. The Commissioners meet with the Executive Director and Director of Operations on a regular basis to discuss and formulate policies, and to provide their expertise in the operation of the Project. The Commissioners welcome your input, and we encourage you to schedule an appointment to visit our Project headquarters.

Copies of this report are distributed to key officials and departments in our member communities, as well as to the public libraries. We would encourage officials to take time from their busy schedule to read this report. Project personnel are available to answer questions you may have, and to meet with you to discuss out procedures and techniques. The Project's website at [www.cmmcp.org](http://www.cmmcp.org) has extensive information on mosquito control in Central Massachusetts.

The Project's goal is to provide effective and environmentally sound mosquito control, reducing mosquito annoyance and the potential for the transmission of mosquito-borne diseases. Our staff of competent, well-trained employees are known throughout the member communities as individuals who take great pride in their work.

Thank you,

Richard J. Day, Chair  
Board of Commissioners  
Central Massachusetts Mosquito Control Project



Member,  
Northeastern  
Mosquito Control  
Association



Sustaining Member,  
American  
Mosquito Control  
Association



Partner,  
EPA Pesticide  
Environmental  
Stewardship Program



Member,  
New Jersey  
Mosquito Control  
Association

**THE COMMONWEALTH OF MASSACHUSETTS**

State Reclamation & Mosquito Control Board  
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LIST OF MEMBER COMMUNITIES - 2009

TOWN

SQUARE MILES

DISTRICT ONE

BILLERICA	25.96
CHELMSFORD	22.70
DRACUT	20.90
LITTLETON	16.60
TEWKSBURY	20.70
WESTFORD	30.60
WILMINGTON	17.12

DISTRICT TWO

ACTON	20.00
AYER	9.00
BOXBOROUGH	10.40
FITCHBURG	27.80
LANCASTER	27.70
LEOMINSTER	28.90
LUNENBURG	26.40
STOW	17.60

DISTRICT THREE

BERLIN	12.90
CLINTON	5.70
HUDSON	11.50
MARLBOROUGH	21.10
NORTHBOROUGH	18.50
SHREWSBURY	20.70
SOUTHBOROUGH	14.10

DISTRICT FOUR

ASHLAND	12.40
HOLLISTON	18.70
HOPEDALE	5.27
HOPKINTON	26.60
MILFORD	14.60
NATICK	15.10
SHERBORN	16.00
WESTBOROUGH	20.50

DISTRICT FIVE

AUBURN	15.40
BLACKSTONE	10.90
MILLBURY	15.70
MILLVILLE	4.92
NORTHBRIDGE	17.20
STURBRIDGE	37.40
UXBRIDGE	29.50
WEBSTER	12.50

Total Square Miles

699.57



## MOSQUITO CONTROL ACTIVITIES

One basic fact of the mosquito's biology is the dependence on still, stagnant water to complete its life cycle from egg to adult. Currently, there are two basic control methods practiced by the Project to disrupt this process. The first and most permanent method is called "water management, source reduction or wetlands restoration". This method reduces or eliminates the source of a potential mosquito problem, and consists of cleaning road-side ditches and culverts, removal of brush and accumulated debris from streams, and removal of containers which contain water. All of the above mentioned methods serve to accomplish the same goal - they permit water to flow freely, and reduce the likelihood for stagnant areas, areas in which the mosquito needs to reproduce. Source reduction is practiced year-round, and is done only after extensive examinations, and permission is received by the property owner(s).

There are places where water management is neither practical nor feasible for one reason or another. In these situations, we practice a method called *larviciding*. After a field technician has determined that larval mosquitoes are present, a small amount of environmentally sensitive product is applied to the area according to label directions. This is often a very effective control method, reducing the emergence of the adult mosquito from that area. Larviciding is practiced from late-March to September. Bti is the product of choice for larviciding in wetlands.

A third method is to attempt to control the adult mosquito. The control of adult mosquitoes is done on a request-only basis, and the presence of adult mosquitoes is confirmed before any application is done. Adulticiding can be an effective method of temporary control, which can be beneficial prior to public gatherings, outdoor events and festivals, or when mosquito populations have been determined to be intolerable. Since this part of the program is done **only upon request**, this allows the individual resident to have the ultimate discretion on mosquito spraying in their area - how much or how little. Exemptions for spraying are handled through the City/Town Clerk and the Project office, and are updated each year. Adulticiding is done from approximately Memorial Day to Labor Day, depending on prevalent mosquito populations and the mosquito-borne disease situation.

All products used by the Project have been extensively tested by manufacturers, the US government and mosquito control agencies for many years. They are registered by the EPA and the Mass. Pesticide Bureau. Labels and fact sheets are available upon request to the public from the Project's office, or from our website.

We operate a full surveillance program in our service area. The landing rates performed by our field staff are brought back to the Project lab to be keyed out to species, allowing us to tailor our larviciding program and reduce future dependence on adulticides. We have a mobile team of specialized mosquito traps, called *gravid traps*, designed to capture virus-bearing mosquitoes. These mosquito collections, called *pools*, are sent into the Mass. Dept. of Public Health (MDPH) laboratory in Jamaica Plain for testing of West Nile Virus, Eastern Equine Encephalitis, and other arboviruses of concern by MDPH. These traps are used in a rotation throughout our service area, and are then concentrated in areas showing arboviral activity to supplement MDPH's collection protocols. Additional trap types are utilized in suspect areas to monitor and evaluate the risk of viral transmission to the local populace.

A comprehensive educational program is offered to area schools and civic groups. The program is aimed towards mosquito biology, mosquito habitat, and efforts citizens can undertake to reduce the potential for mosquito populations in their own neighborhood. This program is tailored to suit the requirements of the individual group, from elementary school children, to high school, to adult groups.

## PROGRAM EVALUATION

This is a part of the program which many people involved directly never see. It must begin with a carefully planned program, one designed so that the data obtained during surveys before treatment and the surveys taken after treatment can be analyzed by statistically sound methods. Only by doing this can the value of a mosquito control program be determined. We will then know what type (species) of mosquito we are dealing with; what the population density is; what method(s) of control provide the most economical and efficient results. Then and only then can we say that we have or have not affected mosquito control on a level that is acceptable to the community.

SEASONAL OUTLINE OF MOSQUITO CONTROL PROGRAM

1. Vehicle and equipment repair and storage - November through March
2. Wetlands Restoration - throughout the year
3. Program Preparation - December through March
4. Map compilation and training - throughout the year
5. Larviciding - May through September
6. Adulticiding - June through September
7. Catch Basin Treatment - May through September

Any mosquito control being done by individual member communities must, by law, be coordinated through the Central Massachusetts Mosquito Control Project.



## SERVICES AND ACTIVITIES

The following services and activities are available to those communities participating in the Central Massachusetts Mosquito Control Project:

### **ADMINISTRATIVE**

1. Assess the need for mosquito control within each of the member communities.
2. Plan and organize a mosquito control program for each member community based on the specific needs of that community.
3. Assist member communities to implement mosquito control programs so as to enable the residents of that community to receive maximum benefits from organized mosquito control.
4. Administer new and coordinate existing mosquito control programs.
5. Collect and maintain accurate records of mosquito populations, ascertain prevalent species, and collate pertinent data for each member community.
6. Cooperate with federal, state and local agencies concerned with vector control programs which may be implemented in the community.
7. Prepare annual reports of Project activities, mosquito population density profiles, recommendations, and any other data requested by the member communities.
8. Provide supervision to staff members and encourage policies which lend themselves to effective and efficient mosquito control.

### **PUBLIC EDUCATION**

1. Inform the general public, as well as professional groups, of the mosquito control activities intended for each member community through news releases, speakers for community and professional organizations, special educational and training programs (including seminars for environmental interest groups), integration of proposed vector control programs with other organizations, agencies and institutions with similar goals.
2. Offer educational programs to the public school system within the member cities and towns. Programs will be aimed toward mosquito biology, mosquito habitat, and efforts which citizens can undertake to reduce mosquito populations in their neighborhoods.
3. Keep the member communities informed of changes and advancements in mosquito control technology and legislation.

## MEDICAL ENTOMOLOGY LABORATORY REPORT, 2009

The mission of the Medical Entomology Laboratory is to refine and maximize the CMMCP's ongoing effort to control mosquitoes. During 2009 Medical Entomology Laboratory personnel carried this mission forward in the following ways.

Medical Entomology Laboratory personnel made 63 educational presentations before 1,986 elementary school students in 15 Elementary schools. The students learned about the life cycle and biology of mosquitoes. They also learned what they could do to control the mosquito population around their own home and how to protect themselves from nuisance mosquitoes.

The laboratory also acquired five additional Modified Reiter Gravid Traps. Modified Reiter Gravid Traps are used to monitor the adult mosquito population for West Nile virus. Modified Reiter Gravid Traps are attractive to the mosquito species thought most likely to have a role in the maintenance and spread of West Nile virus in the United States of America.

CMMCP personnel constructed Resting Boxes to add to the Laboratory's array of mosquito traps. Resting boxes are attractive to *Culiseta melanura* the mosquito species known to play a part in the transmission cycle of Eastern Equine encephalitis. A Resting Box is made from plywood and measures one cubic foot in size. One side of the box is open. The box is painted black on the outside and red on the inside. The black color is attractive to mosquitoes that come to rest inside the box. The red colored interior of the box makes it easier for the collector to see the mosquitoes resting inside the box. One or more boxes are set out in a habitat favored by *Cs. melanura* mosquitoes. When the time comes to check the trap the collector first closes the open end of the box with a Plexiglas cover. Then the collector injects a chemical spray into the box which anesthetizes any adult mosquitoes which have come to rest in the box. The collector vacuums up the adult mosquitoes with a battery operated aspirator and places them in a cooler with cold packs. The mosquitoes are brought back to the laboratory for processing.

During 2009, four interns were employed for the season to operate the mosquito surveillance traps and assist in the identification of mosquitoes. CMMCP staff also participated in the operation of surveillance traps. Using their knowledge of mosquito behavior and the local terrain, these skilled and experienced personnel monitored the adult mosquito population.

CMMCP personnel made and processed 1,565 collections this season. The collections contained 37,230 adult mosquitoes which were identified to species. Twenty-six mosquito species were represented in the collections. Adult mosquitoes of species known to play a role in the transmission of disease were tested for the presence of West Nile virus and Eastern Equine Encephalitis virus.

Thirteen thousand, seven hundred and ninety-one mosquitoes (13,791) were determined to be suitable for virus testing. They were divided into 606 groups or pools. These pools of mosquitoes were tested for West Nile and Eastern Equine virus infection. Three of these pools tested positive for West Nile virus. Three of these pools tested positive for Eastern Equine Encephalitis. The findings are listed below.

The CMMCP increased surveillance of mosquitoes in these areas in response to the positive test results. Mosquito control measures were augmented as well. The data from these collections was shared with the Massachusetts Department of Public Health. The surveillance indicates that these pathogens were circulating in the local environment during 2009.

Modern, scientifically based mosquito control has many facets. These include public education, surveillance, water management and control of immature and adult mosquitoes. Medical Entomology Laboratory personnel are committed to advancing all facets of mosquito control. Such a commitment will further enable the Central Massachusetts Mosquito Control Project to provide its member communities with quality mosquito control.

Respectfully submitted,  
 Curtis R. Best, Staff Entomologist

Collection Date	Species	Town	Test Type	Result
8/4/2009	<i>Culex species</i>	Westborough	WNV	Positive
8/6/2009	<i>Culex species</i>	Westford	WNV	Positive
9/2/2009	<i>Culex species</i>	Shrewsbury	WNV	Positive
9/22/2009	<i>Culiseta melanura</i>	Webster	EEE	Positive
9/22/2009	<i>Culiseta melanura</i>	Leominster	EEE	Positive
10/9/2009	<i>Culiseta melanura</i>	Webster	EEE	Positive

WNV Surveillance Summary - <b>Statewide</b>	2009
Mosquito Pools Positive	26
Animals Positive	1
Humans Positive	0
EEE Surveillance Summary - <b>Statewide</b>	2009
Mosquito Pools Positive	54
Animals Positive	3
Humans Positive	0
CMMCP Surveillance Summary	2009
Mosquitoes Collected and Identified	37,230
Mosquito Pools Submitted for testing	606 (13,791 specimens)
Mosquito Pools Positive WNV	3
Animals Positive	0
Humans Positive	0
Mosquito Pools Positive EEE	3
Animals Positive	0
Humans Positive	0

**Central Mass. Mosquito Control Project  
2009 SEASON SUMMARY**

Cumulative Surveillance Summary

Target Species	Ae. vex	Cq. per	Cs. mel	Oc. can	Culex	All Species
No. Pools	136	269	355	180	888	3786
Total Specimens	836	10578	2114	852	13980	37274
No. Pools WNV +	0	0	0	0	3*	3*
No. Pools EEE +	0	0	3*	0	0	3*

- \*Pool of WNV+ Culex Species collected in Westborough on 8/4/09
- \*Pool of WNV+ Culex Species collected in Westford on 8/6/09
- \*Pool of WNV+ Culex Species collected in Shrewsbury on 9/2/09
- \*Pool of EEE+ Culiseta melanura collected in Webster on 9/22/09
- \*Pool of EEE+ Culiseta melanura collected in Leominster on 9/22/09
- \*Pool of EEE+ Culiseta melanura collected in Webster on 10/9/09

Weather Summary (Northborough, MA): This mosquito season was extremely wet. Statewide monthly rainfall averages were as follows: May-4.04" (CMMCP/Northborough 2.71"); June-5.84" (CMMCP/Northborough 4.2"); July-7.80" (CMMCP/Northborough 12.1"); August-4.15" (CMMCP/Northborough 3.75"); September-2.21" (CMMCP/Northborough 2.41").

**CMMCP 2009 Mosquito Summary-**

Target Species	Δ From Last Year's Final Totals	Predominant Trap Sites
Aedes vexans	-69.86%	Westborough, Dracut
Coquillettidia perturbans	-32.32%	Leominster, Tewksbury, Westborough
Culiseta melanura	+31.06%	Holliston, Boxborough
Ochlerotatus canadensis	-46.82%	Westborough, Hopkinton, Westford
Culex Species	+13.95%	Auburn, Northborough, Leominster
All Species	-7.240%	Leominster, Westford, Westborough

The predominant mosquito species for the 2009 surveillance season was Culex Species (~37.51% of total specimens collected) followed by Coquillettidia perturbans (~28.38% of total specimens collected). 606 pools of mosquitoes comprising 13,791 mosquitoes were sent into Jamaica Plain for testing.

Requests for service, especially adulticiding, showed a 28.5% increase over 2008 with a total of 12,800 calls. All requests for service this year totaled 13,614.

Frank Cornine, Field Biologist  
Tim Deschamps, Executive Director

## FIELD BIOLOGIST REPORT 2009

The Research and Efficacy Department continued many projects during 2009, including the observation for resistance in field collected mosquitoes to ANVIL® 10+10 using bottle assays, and the study of host-seeking activity for several mosquito species in the CMMCP service area. This year the Norfolk County Mosquito Control Project contributed data to the host-seeking activity study. Results from this study were presented during December at the 55<sup>th</sup> Annual Northeastern Mosquito Control Association Meeting, held in Sturbridge, MA. The presentation was well received by those in attendance.

This was the third full, consecutive season of conducting bottle assays for level of resistance in local mosquito populations to ANVIL® 10+10. By introducing mosquitoes into test bottles coated with a baseline concentration of diluted ANVIL® 10+10 we are able to observe to what degree if any, the collected CMMCP service area mosquitoes are developing resistance. Simultaneously conducting bottles without the presence of test product served as a control measure. Again, the observations from these bottle assays did not indicate a need for change in adulticide product at this time.

The host-seeking activity study was continued this season with the addition of collections from the Norfolk County Mosquito Control Project. Using programmable collection devices that segregate collections according to specific time periods, we are able to observe when targeted species are most active. Knowledge of when these species are most active has direct control implications because mosquitoes in flight have the highest probability to contact product, and so are most susceptible to adulticide control measures. Because species have different host-seeking activity behaviors, control methods may have to become more fluid depending on the local population dynamics and virus levels in order to maximize efficacy. Species of interest in this study included *Culex pipiens/restuans* complex, *Culiseta melanura*, *Ochlerotatus canadensis*, *Psorophora ferox*, *Coquillettidia perturbans*, *Aedes vexans*, *Anopheles quadrimaculatus* and *Anopheles punctipennis*.

As in past seasons, weekly mosquito surveillance reports were produced for the CMMCP service area, which included regional species population graphs, virus findings, yearly comparisons, and weather data. These reports were posted on the CMMCP website for residents, state and local officials. These weekly surveillance reports were also distributed to the State Reclamation Board, the Mass. Department of Public Health, and to the CMMCP Board of Commission. The mosquito surveillance program itself was assisted in several ways this past year. Seasonal staff were trained, while equipment and trap sites were maintained. Select mosquito surveillance traps were also set and collected. A seasonal intern assisted in many aspects of the department, including bottle assays and trap deployment, freeing up valuable time for mosquito identification.

Updates and advancements were made to the CMMCP geographic information system (GIS). A GIS layer updates included streets surveyed/treated in the catch basin larvicide program, wetlands treated in the aerial larvicide program, trap site locations from the mosquito surveillance program, and also statewide virus activity. Updates were also made for the NHESP Memorandum layers, with maps created and distributed to the CMMCP Wetlands Coordinator. Several maps were produced for the field technicians including standard town maps for use in the adulticide program, culvert cleaning and reference for catch basin larviciding. Maps were also created for select wetlands restoration jobs to examine the level of mosquito activity through service requests, historic larvicide sites, and virus activity.

Public education was conducted in several different ways. Assistance with the Elementary School presentations occurred in the spring with great success. "Mosquito Control in Central Massachusetts- an Overview," was also presented to a local Rotary club informing them of all aspects of CMMCP. As more public education opportunities arise, efforts will be made to accommodate.

Several training opportunities were taken during this past year, including two webinars presented by the American Mosquito Control Association entitled "What is an integrated mosquito management program," and "Dispelling myths about mosquito control utilizing the media." Training in the packaging and shipping of Division 6.2 materials and dry ice by the National Laboratory Training Network was successfully taken. GIS course "Understanding Map Projections and Coordinate Systems" by ESRI was also completed this year. Retaining current licenses and advancing through educational opportunities will be continued in 2010, with the Research and Efficacy Department also assisting other CMMCP departments.

Respectfully submitted,  
Frank H. Cornine III, Field Biologist

## WETLANDS RESTORATION PROGRAM REPORT 2009

### INTENT AND PURPOSE OF PROGRAM:

Wetland restoration is an important part of the CMMCP's Integrated Pest Management (IPM) plan for mosquito control. The intent of the program is to improve the flow of water in degraded ditch systems through ditch maintenance and restoration projects. These projects will effectively reduce stagnant breeding sites, and can reduce or often eliminate the need for periodic applications of pesticides.

Wetland restoration/water management projects are conducted per the *Massachusetts Best Management Practices and Guidance for Mosquito Control* and the addendum entitled *Mechanical Wetlands Management Activity Post-Monitoring Guidelines*.

Projects are initiated with a phone call from a town resident or town official. Also, a member from the CMMCP staff may identify a site that could benefit from work. Once a site is brought to the attention of CMMCP, the Wetland Project Coordinator performs an assessment of the site. If the site is appropriate for work, a site survey, plan, and notifications are completed.

The site survey includes soil sampling, taking transects and cross sections of the ditch, and determining hydrological conditions. Wetlands are classified and sites are documented in the pre- and post-excavation states through a photographic record. Any historical information on the drainage system is obtained from local residents or town records. The data gathered in the field is used in combination with information acquired from maps and DEP wetland aerial photographs to develop a project site plan. The site plan includes the specifications that the field staff need in order to properly perform the project.

Once the site plan is completed, notification letters and permission slips are sent out to all property owners who would be affected by the project. In addition to the letters sent to property owners, notification letters are sent to DEP, the local conservation commission, and the US Army Corps of Engineers for all mechanized work using a low ground pressure excavator. The notification letter provides the agencies with a 30 day grace period prior to commencement of a project. During this time, the agencies have the opportunity to notify CMMCP of any concerns that they may have with a project. If there are legitimate concerns, a project may be modified, delayed or abandoned. If no issues are brought to the attention of CMMCP within the 30 day period, the project begins as planned.

### SUMMARY OF WORK FOR 2009:

In 2009, 111 sites were assessed by the Wetland Project Coordinator. Of these sites, 34 were visited multiple times to best survey, implement, and monitor water management work at each site. Of the sites, 28 were brought to the attention of the Project through resident requests (25%). Eighteen sites were requested by town officials (16%), and forty-seven were identified by CMMCP staff (42%). Eighteen sites were requested from a combination of residents, officials, and/or CMMCP staff (16%).

Eighty-eight water management jobs were set up and completed, with ongoing maintenance. Twenty-four of these jobs involved the use of the low ground pressure excavator.

In addition to assessing and setting up sites for water management work, the wetland project coordinator's focus included beaver management. Several member communities requested assistance with breaching beaver dams. After the appropriate permits were issued by the local Board of Health and Conservation Commission, work to breach the dams was conducted.

Additional information on our procedures or on specific restoration projects can be acquired by calling the CMMCP office at (508) 393-3055 from 7:00am to 3:30pm.

Respectfully submitted,  
Katrina Proctor, Wetland Project Coordinator

# SATISFACTION SURVEY OF SERVICE REQUESTS IN THE CENTRAL MASSACHUSETTS MOSQUITO CONTROL PROJECT SERVICE AREA – 2009

**TIMOTHY D. DESCHAMPS**, Executive Director  
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## ABSTRACT

Residents of our service area request service from the menu of services offered to them by CMMCP. Requests for adulticiding (spraying) and larval control are the most common forms of service requests we receive. We accept requests for service through a variety of means, primarily by telephone, but increasing more by the online service request form from the CMMCP website. Additional methods include personal visits to our office, phone calls on behalf of residents from town and/or state officials, and direct requests to our field staff. The CMMCP Commission requested a survey of residents who requested service in 2009 to determine if our staff was meeting acceptable levels of customer satisfaction. This is the same survey that was done in 2005, 2007 and 2008. After compiling these results, we find that a majority of residents in our service area were satisfied with our control efforts and methods, which mirrors our results from previous years. We also compared 2009 with the 3 year average to determine if satisfaction levels were comparable.

## SURVEY METHODOLOGY

In 2009 we received 13,614 requests for service, ranging from adulticiding to larval control, a 28% increase in service requests from 2008. 8,012 adulticiding calls were filtered (duplicates removed) and placed into a separate database. Service calls were sorted according to town, and each town was tabulated for total requests received in 2009. These towns were then graphed to show which towns had the most calls. Each town was assigned a percentage according to this data. This percentage would determine the number of postcards sent to each town from the overall total. The CMMCP Commission decided that 1,500 postcards would be a representative sample of the service calls received this year (this is an increase of 500 over the past 3 surveys). The survey was designed to be as easy as possible for residents to access and complete. An online survey was created, and the postcards would include unique identifiers that the residents would use. The postcards contained a blind weblink to the survey so that unauthorized users would not be able to participate in the survey. Information such as how they contacted us, were the office and field staff helpful and informative, how long did they wait for service, was the service provided effective, and their overall satisfaction was measured. This study uses the same methodology as the three previous resident surveys.

## SURVEY FINDINGS

From 1,500 postcards mailed, 306 responses were received (21%). The results are as follows:

### 1). In your most recent experience, how did you contact the Central Mass. Mosquito Control Project?

	Number	Percent
Telephone	146	48.5%
Website	148	49.2%
In person	1	0.3%
Other	6	1.9%
Total	301	

**2). If by telephone or in person at the CMMCP office, were your questions or concerns answered to your satisfaction?**

	Number	Percent
Yes	156	98.7%
No	2	1.2%
Total	158	

**3). If by telephone, did you experience difficulty reaching our staff?**

	Number	Percent
Yes	19	12.1%
No	137	87.8%
Total	156	

**4). If through the website or e-mail, did you find the information you needed in a satisfactory manner?**

	Number	Percent
Yes	169	98.2%
No	3	1.7%
Total	172	

**5). Please give the approximate time you waited for service from your initial request:**

NOTE: 88.5% within a week or less

	Number	Percent
1-3 days	116	38.2%
3-5 days	76	25%
1 week	77	25.3%
2 weeks+	35	11.5%
Total	304	

**6). Did you find our response from your initial request to when you received service within a reasonable amount of time?**

	Number	Percent
Yes	283	94%
No	18	5.9%
Total	301	

**7). When you received service, did our field representative appear knowledgeable and competent about his/her profession?**

	Number	Percent
Yes	255	89.2%
No	31	10.8%
Total	286	

**8). Were your questions and concerns answered by the Technician to your satisfaction?**

	Number	Percent
Yes	252	91.3%
No	24	8.6%
Total	276	

**9). Did you receive any written information (pamphlets, etc.) from our representative?**

	Number	Percent
Yes	205	68.7%
No	93	31.2%
Total	298	

**10). Did you find this information useful?**

	Number	Percent
Yes	189	71.10%
No	14	5.20%
Did not receive	63	23.60%
Total	266	

**11). Did you request service more than once in 2009?**

	Number	Percent
Yes	138	45.5%
No	165	54.4%
Total	303	

**12). If you requested additional service in 2009, was it because the original application was insufficient to meet your needs, or for a later re-treatment or follow up?**

	Number	Percent
Retreatment	119	79.8%
Insufficient	30	20.1%
Total	149	

**13). Would you/did you recommend our service to others in the future?**

	Number	Percent
Yes	296	97.6%
No	7	2.4%
Total	303	

**14). In your opinion, did our application made your area better, worse, or had no effect?**

	Number	Percent
Better	245	81.6%
Worse	0	0%
No Effect	55	18.3%
Total	300	

**15). If you think your area improved, can you give an approximate length of time you experienced relief from mosquito annoyance?**

	Number	Percent
1-2 days	42	17.5%
3-5 days	41	17.1%
1 week	63	26.3%
2 weeks+	93	38.9%
Total	239	

NOTE: 2/3 experienced at least a week of relief, nearly 39% report more than 2 weeks of relief

**16). On average, our services cost \$2.00 – \$4.00 per person each year (withheld from local aid rec'd from the State). In your opinion, is this amount too high, too low, or sufficient?**

	Number	Percent
Sufficient	241	82.5%
Too Low	48	16.4%
Too High	3	1%
Total	292	

**17). In which month or months do you recall receiving service?**

	Number	Percent
June	69	23.2%
July	92	30.9%
August	52	17.5%
More than 1	84	28.2%
Total	297	

**18). Overall, are you happy with the service provided this year by CMMCP?**

	Number	Percent
Yes	276	92%
No	24	8%
Total	300	

**19). Do you plan on using our service again in the future?**

	Number	Percent
Yes	293	98%
No	6	2%
Total	299	

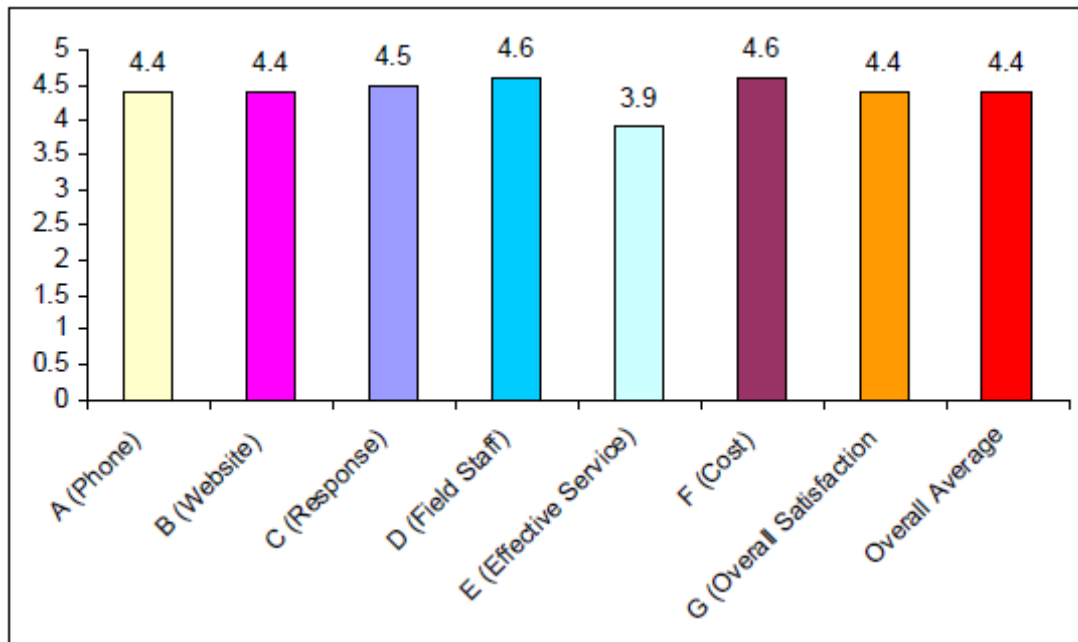
Please rate our performance for 2009 from 0 to 5, where 5 is the best rating, 0 is the worst rating:

QUESTION	POINTS	AVERAGE
The information you received over the phone was informative & helpful	935 points from 1,050 (210 respondents)	4.44 average from 5
The information on our website is easily available and helpful	1,137 points from 1,285 (257 respondents)	4.4 average from 5
The response time for service is reasonable	1,339 points out of 1,485 (297 respondents)	4.5 average from 5
Our field staff that responded is knowledgeable and competent	1,258 points out of 1,370 (274 respondents)	4.6 average from 5
The service provided was effective	1,175 points out of 1,475 (295 respondents)	3.98 average from 5
This service is reasonable compared to the cost	1,342 points out of 1,470 (294 respondents)	4.6 average from 5
Please rate your overall satisfaction with the service received in 2009	1,301 points out of 1,475 (295 respondents)	4.4 average from 5
<b>Total satisfaction rating: 8,487 points out of 9,610 possible – 4.41 average</b>		

## CONCLUSION

Overall satisfaction was 92%, and 98% would use our services again in the future. Answers to question #9 shows a marked increase over past years in regards to residents receiving public relations materials. This survey also documents the increase in website usage to register requests.

Overall this survey shows high satisfaction amongst the respondents, but some ratings were lower slightly than in past surveys. This was due in part to a higher volume of service requests, cooler than average nighttime temperatures in the early part of the spray season, and most notably significant rain events throughout most of the summer that negatively impacted spray operations and contributed to a constant hatch of new mosquito broods.



# **Bottle Assays of Field Collected Mosquitoes for Level of Resistance to ANVIL® 10+10 in Central Massachusetts (Update 2009)**

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## **ABSTRACT**

In 2009, the Central Mass. Mosquito Control Project continued conducting bottle assays, which test the potency of a substance on live specimens, to determine if pesticide resistance has been developing in local mosquito populations. Using procedures recommended by the Center for Disease Control and Prevention, the results of unexposed mosquitoes were compared to those collected from areas serviced by the CMMCP adulticide program. It was determined that the level of resistance in local mosquito populations does not warrant any procedural or insecticide changes at this time. Despite these findings, CMMCP will continue bottle assays of local mosquito populations to monitor the levels of resistance so that if indications of resistance are observed, proper actions could be implemented to ensure control effectiveness.

## **INTRODUCTION**

With environmental changes, mosquito species have the potential to change their current distribution and bring disease with them to new areas (Brogdon 1998; Simsek 2003). These possible diseases include malaria, dengue, yellow fever and Rift Valley Fever among others (McAbee 2003; Simsek 2003). Faced with these new threats, vector control personnel must be aware of the dynamics of local mosquito species in order to lessen the threat of human infections.

Resistance to pesticides can have a major impact on the abilities of public health officials against vector-borne disease (Brogdon 1998). It has been

shown that some past agricultural and pest control use of insecticides has led to the development of resistance of these chemicals in select populations of mosquitoes (Rodriguez 2005). This resistance is predicted to be the basis for future reemergence of vector-borne diseases, and also impair the control efforts in these situations (Brogdon 1998).

There are several factors that may have contributed to this development, including the narrowing scope of insecticides available for public health use, along with increasing restrictions from regulatory agencies (Brogdon 1998). Resistance to pyrethroids in

particular could be due in part to past use of DDT in some areas, with the resistance mechanism being similar for both (Brogdon 1998; McAbee 2003). This cross-resistance, as observed between pyrethroids and DDT, is becoming more prevalent as the existing resistance mechanisms are being enhanced in the target insects (Brogdon 1998).

Despite research that has shown resistance in specific mosquito species, the actual impact of this on vector control is not known due to several issues. One is the lack of information about the current resistance levels, due in part to the wide variety of surveillance programs and data collection efforts. Another factor, and potentially more important, is that resistance seems to be localized. In one study, certain mosquito populations that were only a few kilometers apart varied greatly on the presence and levels of resistance, including the actual mechanism for the resistance (Brogdon 1998).

These unknowns about the level of resistance in vector species have reinforced the need to study pesticide resistance by CMMCP. The goals of this research will be to create baseline data for control efforts, detect early resistance, and to observe the current effects of control strategies (Brogdon 1998). If resistance is observed, then a change in application rates or a change to a different class of insecticides may need to be considered.

To control adult mosquitoes, CMMCP uses ANVIL® 10+10 (Clarke Mosquito Control Products, Inc., Roselle, IL) (EPA Reg. No. 1021-1688-8329), a synthetic pyrethroid composed of 10% SUMITHRIN® (Sumitomo Chemical Company, Ltd., Osaka, Japan)(d-phenothrin) and 10% piperonyl butoxide (PBO)(Center for Disease Control and Prevention 2002; PHEREC 2001), which is used as a synergist<sup>1</sup>. In this ongoing study to monitor resistance levels in its service area, CMMCP continued conducting bottle assays in the summer of 2009 for ANVIL® 10+10.

## METHODS

The bottle assay procedure used by CMMCP was modeled after the CDC method (Center for Disease Control and Prevention 2002), where a baseline for resistance was established using specimens collected from an area without any historical adulticide exposure. This data could then be plotted against data from mosquito populations in areas where CMMCP records show past insecticide usage has occurred. This will determine if any degree of resistance has developed to the current CMMCP adulticide product.

To start, clean 250ml Wheaton bottles (Wheaton Science Products, Millville, NJ) were lined with 1ml of various concentrations of ANVIL® 10+10 (8.868µg/ml, 22.17µg/ml, 44.34µg/ml, and 88.68µg/ml), which

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<sup>1</sup>Synergist- Additional substance that will assist in the elimination of certain resistance mechanisms; PBO synergist eliminates oxidase activity (Center for Disease Control and Prevention 2002).

were diluted with pesticide grade acetone (Thermo Fisher Scientific, Inc., Fair Lawn, NJ). Approximately 10-15 field collected mosquitoes were introduced into each bottle by mechanical aspiration and % knockdown was recorded at 5 minute intervals, up to 100% knockdown. For control bottles lined with only acetone (zero ANVIL® 10+10), % knockdown was observed at 5 minute intervals up to an hour. Each pesticide concentration assay had several trials until a concentration was found that created a timely mortality curve that reached total knockdown around 30 minutes. Once the ANVIL® 10+10 baseline concentration was determined, it could be used against the exposed mosquito populations, with control bottles running simultaneously.

The collection of mosquitoes for the bottle assays were facilitated by the use of several CDC light traps (John W. Hock Co., Gainesville, FL), baited with CO<sub>2</sub> at a flow rate of 500ml/min. ABC standard collection nets (Clarke Mosquito Control Products, Inc., Roselle, IL) were used to contain the mosquitoes, along with a simple food source, until resistance testing took place, which was usually within a couple of hours. The mechanical aspiration from the collection cages to the assay bottles was enabled by the use of a flashlight aspirator (BioQuip Products, Inc., Rancho Dominguez, CA).

The baseline mosquitoes were collected from an area located near an organic farm. This site has been an official exclusion property since 2006, but even prior to that CMMCP

has no record of using adulticide products there. Once the baseline concentration had been determined using these unexposed mosquitoes, collections were made at several other sites that had varying number of adulticide events (~2-15) over the previous couple of years. In 2007 six different locations were used, with two sites having multiple collections and trial sets. An additional site was added in 2008, while bottle assays were concentrated on four different sites in 2009, sites which had been monitored previously. These potentially resistant mosquitoes were then run against the baseline concentration from the unexposed population, as well as control bottles coated with only acetone.

After conducting bottle assays on the collected mosquitoes against the baseline concentration, the knockdown percentage was plotted against the time interval to determine if any degree of resistance was forming in these populations compared to those unexposed. If any specimens survived longer than those of the baseline group, this could represent some degree of resistance has developed.

## RESULTS

The baseline component of the bottle assays that resulted in the optimal concentration of the ANVIL® 10+10 was 22.17µg/ml, which corresponded with data from previous studies (PHEREC 2001). Using this concentration, it was found that in 2007 only one assay of eight trial sets had specimens that did not reach 100% knockdown

before the 25 minute mark. This particular site, Haskell Street, had an average of 98.9% knockdown at the 25 minute mark, and by the next time interval did reach 100% knockdown. Both Otis Street locations had a slower curve than the rest of the

sites, although they still reached 100% knockdown at 25 minutes like the baseline population. As one would expect, the control bottles coated with only acetone had zero knockdown effect (Figures 1, 2).

Figure 1: 2007 Time-% Knockdown Curves of Bottle Assays for ANVIL® 10+10 (22.17µg/ml)



Figure 2: 2007 Time-% Knockdown Curves of Bottle Assays (2) for ANVIL® 10+10 (22.17µg/ml)



The bottle assays performed in 2008 resulted in similar findings to 2007. Of the 13 trial sets, 6 had specimens that did not reach 100% knockdown by the 25

minute mark. However, these findings were not significant and all had knockdown rates at the 25 minute mark of over 97.22%. Again, the acetone only coated bottles had zero knockdown effect (Figure 3).

Figure 3: 2008 Time-% Knockdown Curves of Bottle Assays for ANVIL® 10+10 (22.17µg/ml)



Figure 4: 2008 Time-% Knockdown Curves of Bottle Assays (2) for ANVIL® 10+10 (22.17µg/ml)



Bottle assays performed in 2009 had trials where the specimens did not reach complete knockdown until the 35 minute mark (Figures 5, 6). Of all specimens tested in the 2009 trials, 99.72% of specimens were knocked down at the 30 minute mark or earlier. As with previous seasons, the acetone only coated bottles had zero knockdown effect (Figure 5).

Figure 5: 2009 Time-% Knockdown Curves of Bottle Assays for ANVIL® 10+10 (22.17µg/ml)

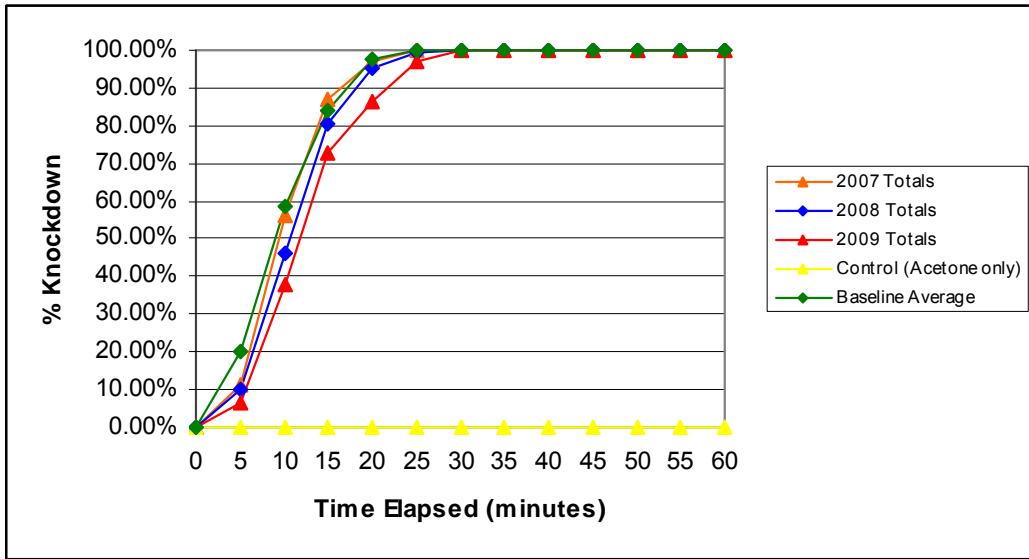


Figure 6: 2009 Time-% Knockdown Curves of Bottle Assays (2) for ANVIL® 10+10 (22.17µg/ml)



Looking at the yearly totals from the three seasons of bottle assays one can observe that the knockdown rate has slowed slightly (Figure 7). The yearly comparisons of bottle assay results show that the 2009 trials have been slower to reach 100% knockdown as opposed to earlier years.

Figure 7: Yearly Comparison of Time-% Knockdown Curves of Bottle Assays for ANVIL® 10+10 (22.17µg/ml)



#### DISCUSSION

The results of the bottle assays indicate that the level of resistance in the populations of the local mosquitoes tested in the CMMCP service area is not significant enough where a change of pesticide or application protocol is needed at this time. This is not necessarily surprising considering the nature of the CMMCP adulticide program, which is primarily request-only in localized, targeted areas. Another reason would be the vast size of the CMMCP service area, encompassing 38 municipalities, with non-member cities and towns with no mosquito control program scattered in and around them. These factors contribute to local mosquito populations not being consistently exposed to a single class of insecticides, lessening the potential development of resistance. The rapid degradation and low residual nature of the insecticide also could

contribute to low resistance development.

CMMCP had used resmethrin (Scourge® Bayer Environmental Science, Montvale, NJ) (EPA Reg. No. 432-667), for their ULV applications since 1988 before switching to ANVIL® 10+10 in 2007. Both products are synthetic pyrethroids. Both insecticides also use piperonyl butoxide (PBO) as a synergist, in different concentrations, with ANVIL® 10+10 using 10% PBO compared to 18% for Scourge® (Center for Disease Control and Prevention 2002; PHEREC 2001). Before using either of those synthetic pyrethroids, CMMCP had been using Malathion, an organophosphate, which is of a different chemical class (Nauen 2006).

Drought conditions in the latter part of 2007 impacted collection numbers, which hindered collections for additional bottle assay trials that

season. The 2008 season collections were not impacted by lack of rain, allowing more trials to be conducted. During 2009, heavy rains dominated the season, and in many instances hampered collection of specimens at previously monitored locations. Additional bottle assays in subsequent seasons will provide more baseline data for resistance management in the CMMCP service area.

Looking at the yearly trends from bottle assays it can be seen that the knockdown rate has become progressively slower, although blood meal stage on the field collected mosquitoes may have influence on this, as well as slight discrepancies between seasonal lab technicians. Despite this, the results of this bottle assays research conducted since 2007 show that the level of resistance in the local mosquito populations tested does not warrant a change in protocol or product, but monitoring for resistance should continue because it is a vital tool in resistance management.

#### ACKNOWLEDGEMENTS

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## HOST-SEEKING ACTIVITY OF MOSQUITOES IN CENTRAL MASSACHUSETTS - 2009

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### ABSTRACT

For a second year, the Central Massachusetts Mosquito Control Project evaluated various time periods for ultra-low volume adulticiding potential by conducting mosquito surveillance using programmable collection devices to observe the host-seeking activity periods for local mosquito species. Collections were made in several habitats for three hour intervals around sunset, with two collections being made before sunset, with another four afterwards. The specimens collected were later identified into several target groups including *Aedes vexans*, *Coquillettidia perturbans*, *Culex pipiens/restuans* complex, *Culiseta melanura*, *Ochlerotatus canadensis*, *Psorophora ferox*, and an *Anopheles* group which included *Anopheles punctipennis* and *Anopheles quadrimaculatus*. Besides *Oc. canadensis* and *Ps. ferox*, all species showed relatively little activity until the period right before sunset. Sunset was then followed by the largest activity period for all targeted mosquito groups except *Oc. canadensis* and *Ps. ferox*. Most species began to taper off for the rest of the collection period, except for *Oc. canadensis*, *Ps. ferox* and the *Anopheles* group which had a slight resurgence in the early morning hours. This season the Norfolk County Mosquito Control Project also collected data for this project. These findings reinforce the adulticiding protocol for CMMCP, which is to commence applications following sunset. Collections may be continued in the upcoming season with or without NCMCP, and will possibly include canopy traps, to further investigate this topic of host-seeking activity.

**NOTE: Full publication pending**

TOWN OF SHREWSBURY

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
01-06-09	Stream Survey	Dalphen Road
01-09-09	Culvert Cleaning (8)	Colonial Drive, Gulf Street, Bannister Street, Slocum Meadow Lane, Stone Meadow Farm Drive
02-05-09	Administrative	GPS Coordinates - No Spray
02-23-09	Stream Cleaning 40'	Walnut Street
	Stream Cleaning 50'	Brook Street
	Stream Cleaning 20'	South Street
	Stream Cleaning 40'	Green Street
	Stream Cleaning 10'	Green Street
	Culvert Cleaning (24)	Walnut Street, Hillando Drive, Bayberry Circle, Floral Street, Arbor Drive, Nursery Drive, Tennis Drive, South Street, Brook Street, Green Street
03-05-09	Stream Cleaning 20'	Main Street
	Stream Cleaning 40'	O'Donnell Avenue
	Stream Cleaning 70'	Roberts Street
	Stream Cleaning 100'	Lake Street
	Stream Cleaning 50'	Grove Street
	Stream Cleaning 40'	Farmington Drive
	Culvert Cleaning (28)	Main Street, O'Donnell Avenue, Old Mill Road, Audubon Drive, South Quinsigamond Avenue, Roberts Street, Oak Street, Lake Street, Beths Road, Grove Street, Grafton Street, Hemingway Street, Gold Street, Memorial Drive, Farmington Drive
03-25-09	Trap Site Survey	Dalphen Road
03-26-09	Larviciding	South Street, Boston Turnpike, Green Street
	Larval Survey	Sadja Drive, Afra Drive, Waterville Lane, Brook Street, Boston Hill Circle, Amherst Road, Claremont Circle, Arch Street, South Street, Berkshire Road, Hartford Turnpike, Boston Turnpike, Walnut Street, Green Street, Centech Boulevard, Cherry Street
03-31-09	Larviciding	Cherry Street, Hartford Turnpike, Memorial Drive, Hyde Farms Road
	Larval Survey	Cherry Street, Hartford Turnpike, Memorial Drive, Clews Street, Hyde Farms Road, George Street, Lake Street
04-07-09	Larviciding	Arrowwood Road, Myriah Road, Grove Street
	Larval Survey	Elderberry Circle, Hobblebush Road, Arrowwood Drive, Tanager Drive, Shannon Drive, Cedar Road, Heronwood Drive, Myriah Road, Sheridan Drive, Jordan Road, Lakewood Drive, Hancock Road, Lake Street, Eliot Circle, Grove Street
	Public Relations	Hobblebush Road
	Stream Cleaning 30'	Meadowsweet Road
	Stream Cleaning 80'	Hillside Lane
	Stream Cleaning 40'	Oak Street
	Culvert Cleaning (17)	Meadowsweet Road, Arrowwood Drive, Carrie Circle, Lake Street, Cedar Road, South Quinsigamond Avenue, Redland Road, Oak Street, Hillside Lane, Beverly Hill Drive, Roberts Street
04-14-09	Public Relations	Sheryl Drive, Heywood Street, Gulf Street
	Larviciding	Thoreau Circle, Sheryl Drive, Adams Road, Jane Street, Heywood Street
	Larval Survey	Faulkner Street, Thoreau Circle, Sinclair Road, Sheryl Drive, Adams Road, Hickory Drive, Grafton Street, Gold Street, Farmington Drive, Gulf Street
04-30-09	Public Relations	Francis Avenue, Bayberry Circle, Fisher Street, Arch Street, South Street, Brook Street, Rockwell Drive, Heath Road, Prospect Street, Camelot Drive, Heywood Street
	Larviciding	Bayberry Circle, Arch Street, Prospect Street, Camelot Drive
	Larval Survey	Francis Avenue, Fisher Street, South Street, Brook Street, Rockwell Drive, Heywood Street, Balsam Circle
05-05-09	Stream Cleaning 20'	Sewall Street
	Stream Cleaning 50'	Gulf Street
	Stream Cleaning 10'	Gulf Street
	Stream Cleaning 40'	Prospect Street
	Stream Cleaning 100'	Prospect Street
	Stream Cleaning 100'	Prospect Street
	Stream Cleaning 30'	Blackthorn Road

TOWN OF SHREWSBURY

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
05-05-09	Culvert Cleaning (32)	Sewall Street, Gulf Street, Slocum Meadow Lane, Deerfield Road, Rawson Hill Drive, Barnard Street, Prospect Street, Reservoir Street, Bowdoin Street, Keyes House Road, Joseph Road, Woodside Drive, Blackthorn Road, North Street, Morningside Drive, Partridge Hill Road, North Street
05-07-09	Public Relations Stream Cleaning 30' Stream Cleaning 40' Stream Cleaning 20' Stream Cleaning 100' Stream Cleaning 50' Culvert Cleaning (28)	Dalphen Road, Eaton Place, Brook Street, Berkshire Road Walnut Street Hillando Drive Lamplighter Drive Stoneybrook Lane Municipal Drive Walnut Street, Nursery Drive, Toblin Hill Drive, Hillando Drive, Main Boulevard, Floral Street, Arbor Drive, Flanagan Drive, Old Brook Road, Woodchuck Hill Road, Melody Lane, Grafton Street, Old Mill Road, Main Street
05-13-09	Larval Survey Larviciding Larval Survey	Dalphen Road, Eaton Place, Brook Street, Berkshire Road Cherry Street Cherry Street, Joyce Circle, Thomas Farm Road, Yorkshire Terrace, Old Laxfield Road, South Street, Tennis Drive, Nursery Drive, Toblin Hill Drive, Bummet Brook Circle, Hillando Drive, Gulf Street, Bannister Street, Health Road, Dalphen Road
05-18-09	Public Relations Larval Survey	Bumblebee Circle, Boylston Circle Walnut Street, Arbor Drive, Ryan Circle, Floral Street, Bumblebee Circle, Whippoorwill Drive, Main Boulevard, Greenwood Avenue, Norwood Avenue, Trowbridge Lane, Trowbridge Circle, Colonial Drive, Colonial Way, Boylston Street, Camelot Drive, North Street, Blackthorn Road, Niblick Road, Settlers Road, Old Colony Road, Carter Road, Keyes House Road, Travis Road, Kemble Drive, Reservoir Street
05-21-09	Larval Survey	Reservoir Street, Prospect Street, Lupine Circle, Hill Street, Fox Hill Road, Aspen Road, Barnard Street, Whippoorwill Drive
05-27-09	Administrative Contact Public Relations	Police Department Claremont Circle, Berkshire Road, Cherry Hill Drive, Stoney Hill Road, Grafton Street, Grove Street, Heath Road, Tanager Drive, Gleason Road, Meadow Lane, Francis Avenue, Whippoorwill Drive, Bayberry Circle, Main Circle, Jamie Lane, Boylston Circle, Gulf Street, Bannister Street, Greenbriar Drive, Thestland Drive, Westview Avenue
05-28-09	Landing Count Larviciding Administrative Contact Public Relations Stream Cleaning 30' Stream Cleaning 30' Culvert Cleaning (13)	Maple Avenue, Prospect Street Grafton Street Board of Health Gulf Street, Francis Avenue Stoneybrook Lane Hillando Drive Flanagan Drive, Old Brook Road, Lamplighter Drive, Floral Street, Arbor Drive, Nursery Drive, Walnut Street, Hillando Drive
06-02-09	Trap Site Survey Administrative Contact Public Relations  Adulticiding	Dalphen Road, North Quinsigamond Avenue Police Department Claremont Circle, Berkshire Road, Green Street, Cherry Hill Drive, Stoney Hill Road, Grove Street, Heath Road, Tanager Drive, Old Barn Road, Oak Street, Gleason Road, Mendon Lane, Francis Avenue, Whippoorwill Drive, Toblin Hill Drive, Bayberry Circle, Walnut Street, Main Circle, Jamie Lane, Boylston Circle, Gulf Street, Bannister Street, Greenbriar Drive, Thestland Drive, Westview Avenue Westview Avenue, Thestland Drive, Greenbriar Drive, Gulf Street, Bannister Street, Boylston Circle, Jamie Lane, Main Circle, Bayberry Circle, Toblin Hill Drive, Francis Avenue, Whippoorwill Drive, Honeysuckle Lane, Grafton Street, Meadow Lane, Gleason Road, Oak Street, Old Barn Road, Tanager Drive, Heath Road, Heronwood Drive, Grove Street, Stoney Hill Road, Nightingale Drive, Cherry Hill

TOWN OF SHREWSBURY

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
06-02-09	Adulticiding	Drive, Cherry Street, Green Street, Berkshire Road Claremont Circle
06-03-09	Set Up Trap	North Quinsigamond Avenue
06-04-09	Pick Up Trap	North Quinsigamond Avenue
	Trap Pick Up	North Quinsigamond Avenue
06-09-09	Administrative Contact	Police Department
	Public Relations	Arch Street, Stoney Hill Road, Hartford Turnpike, Heywood Street, Mangs Drive, Walnut Street, Rice Street, Spring Street, Vista Drive, Camelot Drive, Boylston Circle, Boylston Street, Bunker Hill Road, Ptarmigan Drive, Redland Street
	Landing Count	South Quinsigamond Avenue, Boylston Circle, Arch Street, Spring Street
	Adulticiding	Arch Street, Stoney Hill Road, Hartford Turnpike, Heywood Street, Mangs Drive, Walnut Street, Rice Street, Spring Street, Vista Drive, Camelot Drive, Boylston Circle, Boylston Street, Bunker Hill Road, Ptarmigan Drive, Redland Street, Eastern Pint Drive, Eagle Head Terrace, North Quinsigamond Avenue, Quinsigamond Shores, South Quinsigamond Avenue, South Street
	Larval Survey	Hartford Turnpike, North Quinsigamond Avenue
	Set Up Trap	Dalphen Road
06-10-09	Pick Up Trap	Dalphen Road
06-16-09	Administrative Contact	Police Department
	Public Relations	Old Barn Road, Stoney Hill Road, South Street
	Adulticiding	Old Barn Road, Stoney Hill Road, South Street
06-17-09	Set Up Trap	North Quinsigamond Avenue
06-18-09	Pick Up Trap	North Quinsigamond Avenue
06-23-09	Set Up Trap	Dalphen Road
	Administrative Contact	Police Department
	Public Relations	Liberty Drive, Winslow Street, Bumblebee Circle, Floral Street, Waterville Lane, Walnut Street, Heath Road, Tanager Drive, Swan Circle, Westview Avenue, Colton Lane, Knowlton Avenue, Gulf Street, Cypress Avenue, Neptune Drive, Olde Colony Drive, Hunter Circle, North Street, North Street, Olde Colony Drive, Hunter Circle, Neptune Drive, Gulf Street, Knowlton Avenue
	Catch Basin Larviciding [259]	Holden Street, Maplehurst Street, Crosby Street, Higgins Street, Kenmore Street, Zylonite Street, Becket Street, Cannon Street, Renfrew Street, Chamberlain Avenue, Rhinecliff Street, Clinton Street, Glendale Avenue, Bosworth Road, Marsh Drive, David Road, Hazel Avenue, Jacob Street, Pleasant View Street, Verona Avenue, Eaton Avenue, Rice Avenue, Pond Avenue, Ira Avenue, Bow Street, Bowditch Drive, Oakland Avenue, Lear Street, Temple Court, Tamarack Lane, Eastern Pont Drive, Audubon Drive, Oriole Circle, Flamingo Circle, Sandpiper Drive, Crane Circle, Egret Circle, Cardinal Circle, Willet Drive, O'Donnell Avenue, Swan Circle, Mallard Circle, Ptarmigan Drive, Eagle Drive, Tern Drive, Eaglehead Terrace, Fifth Avenue, Althea Path, Cottage Avenue, Lakeside Path, Grove Ridge Path, Spring Street, Green Leaf Farm, School Street, Rice Street, Sheehan Drive, Ronald Lane, Spring Terrace, Park Grove Lane, Field Stone Drive, Wilder Road, Spring Meadow Road, Dean Drive, Barrows Road
06-24-09	Pick Up Trap	Dalphen Road
06-30-09	Administrative Contact	Police Department
	Public Relations	Liberty Drive, Winslow Street, Bumblebee Circle, Floral Street, Waterville Lane, Walnut Street, South Street, Gold Street, Deer Run Drive, Huntington Road, Carrie Circle, Health Road, Tanager Drive, Worthington Avenue, Swan Circle, Westview Avenue, Colton Lane, Gates Road, Cypress Avenue
	Adulticiding	Liberty Drive, Winslow Street, Bumblebee Circle, Floral Street, Waterville Lane, Walnut Street, South Street, Gold Street, Deer Run Drive, Huntington Road, Carrie Circle, Health Road, Tanager Drive, Worthington Avenue, Swan Circle, Westview Avenue, Colton Lane, Gates Road, Cypress Avenue

TOWN OF SHREWSBURY

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
06-30-09	Catch Basin Larviciding [221]	Slocum Meadow Lane, Cypress Avenue, Ridge Road, Ivy Path, Greenbriar Drive, Sewall Street, Oval Drive, Candlewood Way, Gulf Street, Bannister Street, Browning Road, Longfellow Road, Wadsworth Road, Tory Lane, Rolling Mill Road, Bryant Avenue, Wachusett Avenue, Wachusett Circle, Gristmill Circle, Old Salem Circle, Hearthiside Circle, Sturbridge Circle, Wheelock Street, Boylston Circle, Stone Meadow Farm Drive, Harlow Road, Redwood Lane
07-01-09	Set Up Trap	North Quinsigamond Avenue
07-02-09	Pick Up Trap	North Quinsigamond Avenue
07-07-09	Administrative Contact Public Relations	Police Department Lahinch Lane, Brook Street, Amherst Road, Rockwell Drive, Overlook Avenue, Heath Road, Kinglet Drive, Oak Street, Van Ness Avenue, Francis Avenue, Harvard Avenue, Walnut Street, Fieldstone Drive, Prospect Street, Carter Road, Gulf Street
	Adulticiding	Lahinch Lane, Brook Street, Amherst Road, Rockwell Drive, Overlook Avenue, Heath Road, Kinglet Drive, Oak Street, Van Ness Avenue, Francis Avenue, Harvard Avenue, Walnut Street, Fieldstone Drive, Prospect Street, Carter Road, Gulf Street
	Set Up Trap	Dalphen Road
07-08-09	Pick Up Trap	Dalphen Road
07-10-09	Catch Basin Larviciding [250]	Arrowwood Drive, Elderberry Circle, Meadowsweet Road, Cottonwood Circle, Sycamore Road, Bittersweet Circle, Hobblebush Road, Edgemere Boulevard, Bay View Drive, Canna Drive, Robertson Drive, Stringer Dam Road, Elliot Circle, Dickinson Circle, Baldwin Circle, Faulkner Road, Hemingway Street, Thoreau Circle, Sinclair Road, Adams Road, Beths Road, Sheryl Drive, Jam Street, Cox Lane, Emerson Circle
07-14-09	Administrative Contact Public Relations	Police Department Main Circle, Harvard Avenue, Liberty Drive, Main Boulevard, Winslow Street, Bumblebee Circle, Lamplighter Drive, Meadow Lane, Old Mill Road, Worthington Avenue, Heath Road, Overlook Avenue, Elderberry Circle, Lake Street, Adams Street, Grafton Street, Stoney Hill Road, Cherry Hill Drive, Walnut Street, Claremont Circle
	Adulticiding	Main Circle, Harvard Avenue, Liberty Drive, Main Boulevard, Winslow Street, Bumblebee Circle, Lamplighter Drive, Meadow Lane, Old Mill Road, Worthington Avenue, Heath Road, Overlook Avenue, Elderberry Circle, Lake Street, Adams Street, Grafton Street, Stoney Hill Road, Cherry Hill Drive, Walnut Street, Claremont Circle, O'Donnell Street, Wendell Street, Jackson Street, Worthington Avenue, Heronwood Drive
	Larval Survey Larviciding	Worthington Avenue Main Boulevard
07-15-09	Set Up Trap	North Quinsigamond Avenue
07-16-09	Pick Up Trap	North Quinsigamond Avenue
07-21-09	Administrative Contact Public Relations	Police Department, Board of Health South Street, Stoney Hill Road, Deer Run Drive, Kinglet Drive, Dalphen Road, O'Donnell Avenue, Weagle Farm Road, Francis Avenue, Gulf Street, Bannister Street, Cypress Avenue, Boylston Circle, Deerfield Road, Hill Street
	Stream Cleaning 40'	Reservoir Street
	Stream Cleaning 50'	Prospect Street
	Stream Cleaning 20'	Prospect Street
	Culvert Cleaning (18)	Spring Street, Greenleaf Farms Circle, Woodside Drive, North Street, Keyes Howe Road, Reservoir Street, Bowdoin Street, Prospect Street, Reservoir Street
	Set Up Trap	Dalphen Road
07-22-09	Pick Up Trap	Dalphen Road

TOWN OF SHREWSBURY

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
07-24-09	Catch Basin Larviciding [250]	Olympia Avenue, Wheeler Avenue, Dewey Road, Parker Road, Oregon Avenue, Marietta Avenue, Avon Avenue, Lake View Avenue, Pinedale Road, Plainfield Avenue, Lakewood Drive, Edgewater Drive, Sterling Street, Power Avenue, Hancock Street, Worthington Avenue, Vancroft Avenue, Villa Road, Wingate Street, Roberts Street, Jordan Road, Vinnie Way, Oak Street, Robin Road, Bluegrass Lane, Myriah Road, Old Cart Road, Redland Street, Old Bern Road, Linda Circle, Worthington Avenue, Heronwood Drive, Health Road, Kenda Road, Kinglet Drive, Tanager Drive, Grace Avenue, Shannon Drive, Darren Drive, Maury Lane, Pal Drive, Elizabeth Street, Angela Avenue, Dalphen Road, Rucliff Road, Latura Street, Marie Street, Rivelly Street, Cedar Road, Phillips Road, Fairfax Street, Hillside Lane, Beverly Hill Drive
07-27-09	Larviciding	Heywood Street
07-29-09	Set Up Trap	North Quinsigamond Avenue
07-30-09	Pick Up Trap	North Quinsigamond Avenue
08-04-09	Administrative Contact Public Relations	Police Department Tralee Lane, Arch Street, Amherst Road, South Street, Pheasant Hill Drive, Stoney Hill Road, Deer Run Drive, Kinglet Drive, Dalphen Road, O'Donnell Avenue, Weagle Farm Road, Francis Avenue, Gulf Street, Bannister Street, Cypress Avenue, Grist Mill Circle, Boylston Circle, Neptune Drive, Hill Street, Deerfield Road, Prospect Street, Carter Road, Vista Drive, High Street, Grist Mill Circle
	Adulticiding	Tralee Lane, Arch Street, Amherst Road, South Street, Pheasant Hill Drive, Stoney Hill Road, Deer Run Drive, Kinglet Drive, Dalphen Road, O'Donnell Avenue, Weagle Farm Road, Francis Avenue, Gulf Street, Bannister Street, Cypress Avenue, Grist Mill Circle, Boylston Circle, Neptune Drive, Hill Street, Deerfield Road, Prospect Street, Carter Road, Vista Drive, High Street, Grist Mill Circle
	Larval Survey	Arch Street, Sheridan Lane
	Set Up Trap	Dalphen Road
08-05-09	Pick Up Trap	Dalphen Road
	Administrative Contact	Police Department
	Public Relations	Bumblebee Circle
	Adulticiding	Bumblebee Circle
	Catch Basin Larviciding [250]	Westview Avenue, Monadnock Avenue, Knox Drive, Westbrook Crossing, Cabot Drive, Stratton Drive, Oxford Drive, Dalton Drive, Ashley Drive, Thestland Drive, Deergrass Road, Dana Road, Ireta Road, Beaver Drive, Westwood Road, Churchill Road, Surrey Lane, Colton Lane, Tuscan Place, Shrewsbury Crossings, Silver Gate Circle, Boxford Drive, Essex Drive, Minuteman Way, Bunker Hill Road, Concord Road, Lexington Road, Gage Lane, Westmont Road, Westmont Circle, Van Ness Avenue, View Street, Beach Road, Bailey Road, Edgemont Road, Leblanc Road, Mountain View Avenue, Willard Avenue, Caroline Avenue, Whitney Street, Howard Street, Selina Street, Beverly Road, Taft Road, Wesleyan Street
	Set Up Trap	Dalphen Road
08-06-09	Pick Up Trap	Dalphen Road
08-11-09	Administrative Contact	Police Department
	Public Relations	Thomas Farm Circle, Heywood Street, Cherry Street, Heath Road, Oak Street, Bumblebee Circle, Main Boulevard, Main Circle, Harvard Avenue, Liberty Drive, North Street, Niblick Road, Woodside Drive, Blackthorne Road, Merlin Circle, Round Table Road, Camelot Drive, Mercury Drive, Candlewood Way, David Road, Walnut Street
	Adulticiding	David Road, Candlewood Way, Mercury Drive, North Street, Round Table Road, Camelot Drive, Merlin Circle, Niblick Road, Woodside Drive, Liberty Drive, Harvard Avenue, Bumblebee Circle

TOWN OF SHREWSBURY

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
08-12-09	Set Up Trap	North Quinsigamond Avenue
08-13-09	Pick Up Trap	North Quinsigamond Avenue
	Public Relations	Walnut Street
	Adulticiding	Walnut Street
08-18-09	Administrative Contact	Police Department
	Public Relations	Walnut Street, Boston Hill Circle, Thomas Farm Circle, Heywood Street, Cherry Street, Stoney Hill Road, Deer Run Drive, Thistle Hill Drive, Heath Road, Oak Street, Main Boulevard, Bumblebee Circle, Walnut Street, Main Circle, Westwood Road, Gulf Street, Deerfield Road, Prospect Street, Camelot Drive
	Adulticiding	Walnut Street, Boston Hill Circle, Thomas Farm Circle, Heywood Street, Cherry Street, Stoney Hill Road, Deer Run Drive, Thistle Hill Drive, Heath Road, Oak Street, Main Boulevard, Bumblebee Circle, Walnut Street, Main Circle, Westwood Road, Gulf Street, Deerfield Road, Prospect Street, Camelot Drive, Boston Hill Circle
08-19-09	Set Up Trap	Dalphen Road
	Pick Up Trap	Dalphen Road
08-25-09	Administrative Contact	Police Department
	Public Relations	Hillando Drive, Liberty Drive, Park Street, Neptune Drive, Boylston Circle, Tanager Drive
	Adulticiding	Hillando Drive, Liberty Drive, Park Street, Neptune Drive, Boylston Circle, Tanager Drive
08-26-09	Set Up Trap	North Quinsigamond Avenue
08-27-09	Pick Up Trap	North Quinsigamond Avenue
09-01-09	Set Up Trap	Dalphen Street
	Administrative Contact	Police Department
	Public Relations	Arch Street, Liberty Drive, Harvard Avenue, Deerfield Drive
	Adulticiding	Arch Street, Liberty Drive, Harvard Avenue, Deerfield Drive
09-02-09	Pick Up Trap	Dalphen Road
09-09-09	Set Up Trap	North Quinsigamond Avenue
09-10-09	Pick Up Trap	North Quinsigamond Avenue
	Administrative Contact	Police Department
	Public Relations	Howe Avenue, Hillside Drive, Pal Drive
	Adulticiding	Howe Avenue, Lake Street, Overlook Avenue, Highland Street, South Quinsigamond Avenue, Pleasant Street, South Brook Street, Fairview Street, Grace Avenue, Kinglet Drive, Tanager Drive, Kenda Road, Dorianna Avenue, Dorianna Circle, Kendra Circle, Shannon Drive, Cedar Road, Darren Drive, Fairfax Street, Oak Street, Heronwood Drive, Heath Road, Dalphen Road, Latura Street, Rively Street, Redland Street, Old Barn Road, Old Cart Road, Myriah Road, Worthington Avenue, Linda Circle, Bluegrass Lane, Robin Road, Rucliff Street, Judick Street, Maury Lane
	Set Up Traps	Dalphen Road, Oak Street
	Pick Up Trap	North Quinsigamond Avenue
09-11-09	Pick Up Trap	Dalphen Road
	Set Up Trap	Dalphen Road, Oak Street
	Larval Survey	Dalphen Road
	Pick Up Trap	Oak Street
09-14-09	Pick Up Trap	Dalphen Road, Oak Street
	Set Up Trap	Dalphen Road, Oak Street
09-15-09	Pick Up Trap	Dalphen Road, Oak Street
	Set Up Trap	Dalphen Road
09-16-09	Pick Up Trap	Dalphen Road
09-23-09	Set Up Trap	North Quinsigamond Avenue
09-24-09	Pick Up Trap	North Quinsigamond Avenue
09-29-09	Set Up Trap	Dalphen Road
09-30-09	Pick Up Trap	Dalphen Road
10-07-09	Set Up Trap	North Quinsigamond Avenue
10-08-09	Pick Up Trap	North Quinsigamond Avenue

TOWN OF SHREWSBURY

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
10-16-09	Stream Cleaning 30'	South Street
	Stream Cleaning 50'	South Street
	Stream Cleaning 30'	Brook Street
	Stream Cleaning 20'	Green Street
	Stream Cleaning 70'	Green Street
	Stream Cleaning 40'	Farmington Drive
	Stream Cleaning 30'	Grafton Street
	Stream Cleaning 20'	Grove Street
	Stream Cleaning 60'	Grove Street
	Culvert Cleaning (38)	Amherst Road, South Street, Farm View Estates, Brook Street, Green Street, Joyce Circle, Thomas Farm Circle, Cherry Street, Adams Farm Road, Farmington Drive, Hyde Farms Road, Memorial Drive, Grafton Street, Grove Street
10-28-09	Stream Survey	Francis Avenue
10-30-09	Pick Up Trap Site	Dalphen Road
11-04-09	Stream Survey	Prospect Street
11-20-09	Administrative Contact	Board of Health
	Stream Cleaning 40'	Hillando Drive
	Stream Cleaning 50'	Walnut Street
	Stream Cleaning 100'	Floral Street
	Stream Cleaning 60'	Flanagan Drive
	Stream Cleaning 100'	Stoney Brook Lane
	Culvert Cleaning (19)	Walnut Street, Hillando Drive, Main Boulevard, Floral Street, Arbor Drive, Lamplighter Drive, Flanagan Drive, Old Brook Road, Stoney Brook Lane, Melody Lane, Grafton Street, Hunting Lane
12-08-09	Stream Cleaning 200'	Walnut Street
	Stream Cleaning 40'	South Street
	Stream Cleaning 20'	Cherry Street
	Stream Cleaning 30'	cherry Street
	Stream Cleaning 50'	Farmington Drive
	Stream Cleaning 20'	Grafton Street
	Stream Cleaning 50'	Grafton Street
	Culvert Cleaning (33)	Walnut Street, Hartford Turnpike, Amherst Road, Berkshire Road, South Street, Brook Street, Joyce Circle, Thomas Farm Circle, Cherry Street, Farmington Drive, Gold Street, Grafton Street
12-14-09	Stream Cleaning 100'	O'Donnell Avenue
	Stream Cleaning 20'	Sewall Street
	Stream Cleaning 50'	Gulf Street
	Stream Cleaning 40'	Deerfield Road
	Stream Cleaning 30'	Prospect Street
	Stream Cleaning 50'	Reservoir Street
	Culvert Cleaning (32)	Old Mill Road, O'Donnell Avenue, Audubon Drive, Ireta Road, Deergrass Road, Thestland Drive, Sewall Street, Bannister Street, Gulf Street, Slocum Meadow Lane, Stone Meadow Farm, Colonial Drive, Deerfield Road, Rawson Hill Drive, Barnard Street, Prospect Street

# Town of Shrewsbury: Catch Basin Larvicide Program 2009



BOYLSTON

NORTHBOROUGH



WORCESTER


9/4/2008  
9/2/2009  
WNV+

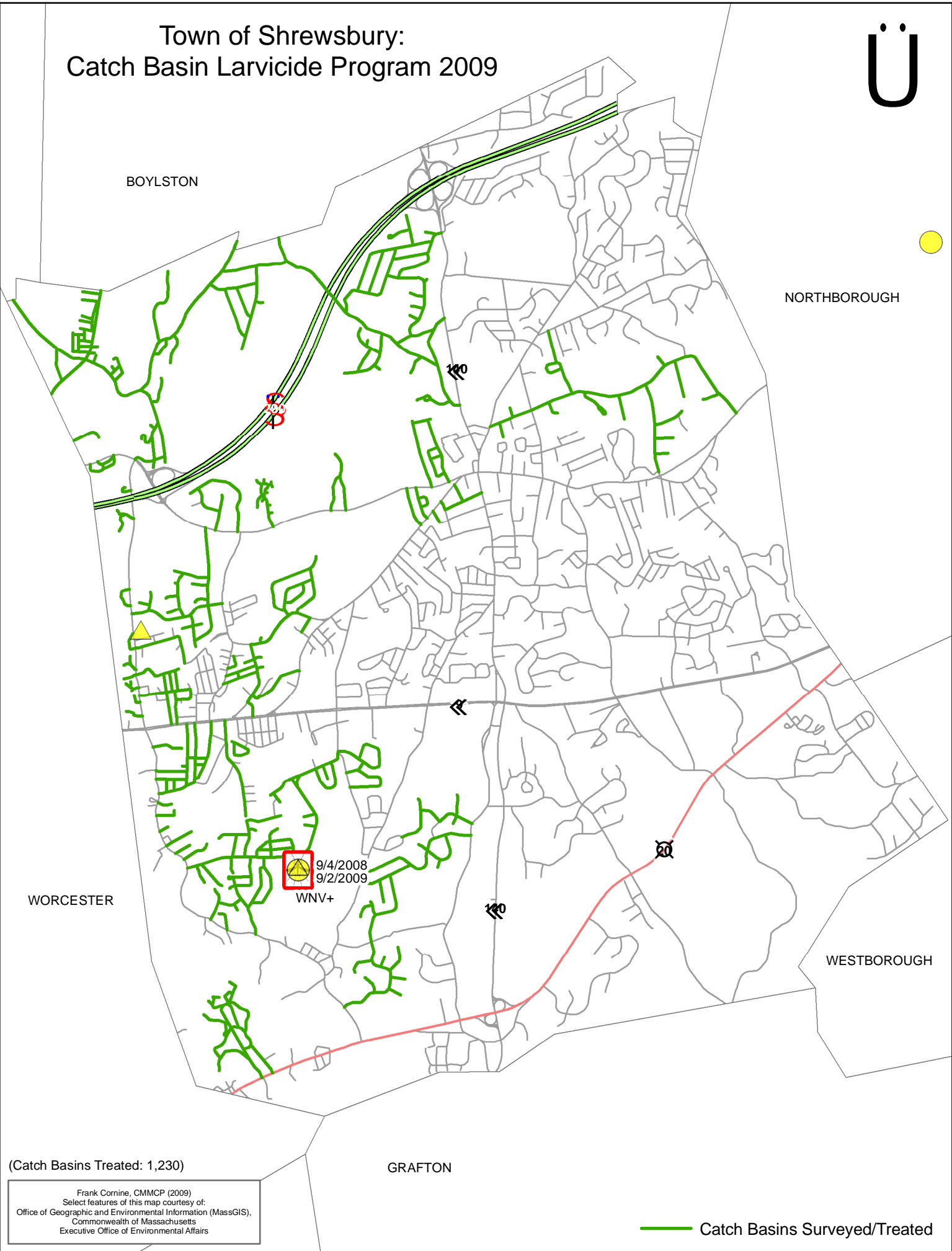
WESTBOROUGH

(Catch Basins Treated: 1,230)

GRAFTON

Frank Corrine, CMMCP (2009)  
Select features of this map courtesy of:  
Office of Geographic and Environmental Information (MassGIS),  
Commonwealth of Massachusetts  
Executive Office of Environmental Affairs

 Catch Basins Surveyed/Treated



# Town of Shrewsbury: Mosquito Surveillance Program 2009



BOYLSTON

NORTHBOROUGH







WORCESTER

WESTBOROUGH

GRAFTON

9/4/2008  
9/2/2009  
WNV+

-  Canopy CDC Trap
-  Combination Trap
-  Gravid Trap
-  Potential Mosquito Breeding Wetlands

Frank Cornine, CMMCP (2009)  
Select features of this map courtesy of:  
Office of Geographic and Environmental Information (MassGIS),  
Commonwealth of Massachusetts  
Executive Office of Environmental Affairs

SHREWSBURY SURVEILLANCE DATA  
2009

#	Town	Pool ID	Trap Set Date	Number of Traps	Trap Site	Pool Size	Species	Test Type	Result
1	Shrewsbury	CM09NS-0180	6/9/2009	1	Dalphen Rd.	3	<i>Culiseta melanura</i>	N/S	
2	Shrewsbury	CM09NS-0181	6/9/2009	1	Dalphen Rd.	4	<i>Culex species</i>	N/S	
3	Shrewsbury	CM09NS-0182	6/9/2009	1	Dalphen Rd.	3	<i>Coquillettidia perturbans</i>	N/S	
4	Shrewsbury	CM09NS-0217	6/9/2009	1	Dalphen Rd.	0	<i>No Collections Recorded</i>	N/S	
5	Shrewsbury	CM09-0015	6/17/2009	1	N. Quinsigamond Ave.	50	<i>Culex species</i>	WNV & EEE	Negative
6	Shrewsbury	CM09-0016	6/17/2009	1	N. Quinsigamond Ave.	36	<i>Culex species</i>	WNV & EEE	Negative
7	Shrewsbury	CM09NS-0442	6/22/2009	1	Dalphen Rd.	1	<i>Ochlerotatus japonicus</i>	N/S	
8	Shrewsbury	CM09-0023	6/23/2009	1	Dalphen Rd.	23	<i>Culex species</i>	WNV & EEE	Negative
9	Shrewsbury	CM09-0024	6/23/2009	1	Dalphen Rd.	10	<i>Culiseta melanura</i>	WNV & EEE	Negative
10	Shrewsbury	CM09NS-0443	6/23/2009	1	Dalphen Rd.	2	<i>Ochlerotatus canadensis</i>	N/S	
11	Shrewsbury	CM09NS-0444	6/23/2009	1	Dalphen Rd.	1	<i>Aedes cinereus</i>	N/S	
12	Shrewsbury	CM09NS-0445	6/23/2009	1	Dalphen Rd.	3	<i>Ochlerotatus excrucians</i>	N/S	
13	Shrewsbury	CM09NS-0446	6/23/2009	1	Dalphen Rd.	54	<i>Coquillettidia perturbans</i>	N/S	
14	Shrewsbury	CM09NS-0564	7/1/2009	1	N. Quinsigamond Ave.	4	<i>Culex species</i>	N/S	
15	Shrewsbury	CM09NS-0565	7/1/2009	1	N. Quinsigamond Ave.	1	<i>Ochlerotatus japonicus</i>	N/S	
16	Shrewsbury	CM09NS-0566	7/1/2009	1	N. Quinsigamond Ave.	1	<i>Coquillettidia perturbans</i>	N/S	
17	Shrewsbury	CM09NS-0696	7/7/2009	1	Dalphen Rd.	1	<i>Ochlerotatus japonicus</i>	N/S	
18	Shrewsbury	CM09NS-0708	7/7/2009	1	Dalphen Rd.	5	<i>Culex species</i>	N/S	
19	Shrewsbury	CM09NS-0709	7/7/2009	1	Dalphen Rd.	7	<i>Coquillettidia perturbans</i>	N/S	
20	Shrewsbury	CM09NS-0710	7/7/2009	1	Dalphen Rd.	1	<i>Anopheles punctipennis</i>	N/S	
21	Shrewsbury	CM09NS-0711	7/7/2009	1	Dalphen Rd.	1	<i>Aedes cinereus</i>	N/S	
22	Shrewsbury	CM09-0114	7/15/2009	1	N. Quinsigamond Ave.	50	<i>Culex species</i>	WNV & EEE	Negative
23	Shrewsbury	CM09NS-0896	7/15/2009	1	N. Quinsigamond Ave.	5	<i>Ochlerotatus japonicus</i>	N/S	
24	Shrewsbury	CM09NS-0897	7/15/2009	1	N. Quinsigamond Ave.	5	<i>Ochlerotatus triseriatus</i>	N/S	
25	Shrewsbury	CM09-0149	7/21/2009	1	Dalphen Rd.	15	<i>Culex species</i>	WNV & EEE	Negative
26	Shrewsbury	CM09-0150	7/21/2009	1	Dalphen Rd.	22	<i>Culiseta melanura</i>	WNV & EEE	Negative
27	Shrewsbury	CM09NS-1003	7/21/2009	1	Dalphen Rd.	2	<i>Ochlerotatus japonicus</i>	N/S	
28	Shrewsbury	CM09NS-1004	7/21/2009	1	Dalphen Rd.	1	<i>Culiseta melanura</i>	N/S	
29	Shrewsbury	CM09NS-1018	7/21/2009	1	Dalphen Rd.	1	<i>Culiseta morsitans</i>	N/S	
30	Shrewsbury	CM09NS-1019	7/21/2009	1	Dalphen Rd.	2	<i>Aedes cinereus</i>	N/S	
31	Shrewsbury	CM09NS-1020	7/21/2009	1	Dalphen Rd.	14	<i>Anopheles punctipennis</i>	N/S	
32	Shrewsbury	CM09NS-1021	7/21/2009	1	Dalphen Rd.	1	<i>Anopheles quadrimaculatus</i>	N/S	
33	Shrewsbury	CM09NS-1022	7/21/2009	1	Dalphen Rd.	3	<i>Aedes vexans</i>	N/S	
34	Shrewsbury	CM09NS-1023	7/21/2009	1	Dalphen Rd.	1	<i>Ochlerotatus canadensis</i>	N/S	
35	Shrewsbury	CM09NS-1024	7/21/2009	1	Dalphen Rd.	79	<i>Coquillettidia perturbans</i>	N/S	
36	Shrewsbury	CM09-0198	7/29/2009	2	N. Quinsigamond Ave.	37	<i>Culex species</i>	WNV & EEE	Negative

SHREWSBURY SURVEILLANCE DATA  
2009

#	Town	Pool ID	Trap Set Date	Number of Traps	Trap Site	Pool Size	Species	Test Type	Result
37	Shrewsbury	CM09NS-1294	7/29/2009	2	N. Quinsigamond Ave.	17	<i>Ochlerotatus japonicus</i>	N/S	
38	Shrewsbury	CM09NS-1295	7/29/2009	2	N. Quinsigamond Ave.	1	<i>Anopheles barberi</i>	N/S	
39	Shrewsbury	CM09NS-1296	7/29/2009	2	N. Quinsigamond Ave.	1	<i>Anopheles quadrimaculatus</i>	N/S	
40	Shrewsbury	CM09NS-1297	7/29/2009	2	N. Quinsigamond Ave.	1	<i>Ochlerotatus triseriatus</i>	N/S	
41	Shrewsbury	CM09-0236	8/4/2009	2	Dalphen Rd.	13	<i>Culex species</i>	WNV & EEE	Negative
42	Shrewsbury	CM09NS-1444	8/4/2009	2	Dalphen Rd.	6	<i>Ochlerotatus japonicus</i>	N/S	
43	Shrewsbury	CM09NS-1445	8/4/2009	2	Dalphen Rd.	3	<i>Ochlerotatus triseriatus</i>	N/S	
44	Shrewsbury	CM09NS-1446	8/4/2009	2	Dalphen Rd.	1	<i>Culiseta melanura</i>	N/S	
45	Shrewsbury	CM09-0294	8/12/2009	2	N. Quinsigamond Ave.	20	<i>Culex species</i>	WNV & EEE	Negative
46	Shrewsbury	CM09NS-1757	8/12/2009	2	N. Quinsigamond Ave.	5	<i>Ochlerotatus japonicus</i>	N/S	
47	Shrewsbury	CM09NS-1758	8/12/2009	2	N. Quinsigamond Ave.	2	<i>Ochlerotatus triseriatus</i>	N/S	
48	Shrewsbury	CM09-0344	8/18/2009	2	Dalphen Rd.	50	<i>Culex species</i>	WNV & EEE	Negative
49	Shrewsbury	CM09-0345	8/18/2009	2	Dalphen Rd.	18	<i>Culex species</i>	WNV & EEE	Negative
50	Shrewsbury	CM09NS-1937	8/18/2009	1	Dalphen Rd.	1	<i>Culex species</i>	N/S	
51	Shrewsbury	CM09NS-1938	8/18/2009	1	Dalphen Rd.	1	<i>Culiseta melanura</i>	N/S	
52	Shrewsbury	CM09NS-1939	8/18/2009	1	Dalphen Rd.	2	<i>Ochlerotatus trivittatus</i>	N/S	
53	Shrewsbury	CM09NS-1940	8/18/2009	1	Dalphen Rd.	16	<i>Coquillettidia perturbans</i>	N/S	
54	Shrewsbury	CM09NS-1947	8/18/2009	2	Dalphen Rd.	5	<i>Ochlerotatus triseriatus</i>	N/S	
55	Shrewsbury	CM09NS-1948	8/18/2009	2	Dalphen Rd.	2	<i>Ochlerotatus japonicus</i>	N/S	
56	Shrewsbury	CM09NS-1949	8/18/2009	2	Dalphen Rd.	5	<i>Anopheles punctipennis</i>	N/S	
57	Shrewsbury	CM09NS-1950	8/18/2009	2	Dalphen Rd.	1	<i>Culiseta melanura</i>	N/S	
58	Shrewsbury	CM09-0410	8/26/2009	2	N. Quinsigamond Ave.	14	<i>Culex species</i>	WNV & EEE	Negative
59	Shrewsbury	CM09NS-2205	8/26/2009	2	N. Quinsigamond Ave.	2	<i>Ochlerotatus japonicus</i>	N/S	
60	Shrewsbury	CM09NS-2206	8/26/2009	2	N. Quinsigamond Ave.	8	<i>Ochlerotatus triseriatus</i>	N/S	
61	Shrewsbury	CM09-0445	9/1/2009	2	Dalphen Rd.	40	<i>Culex species</i>	WNV & EEE	Negative
62	<b>Shrewsbury</b>	<b>CM09-0446</b>	<b>9/1/2009</b>	<b>2</b>	<b>Dalphen Rd.</b>	<b>35</b>	<b><i>Culex species</i></b>	<b>WNV</b>	<b>Positive</b>
63	Shrewsbury	CM09NS-2403	9/1/2009	2	Dalphen Rd.	5	<i>Ochlerotatus japonicus</i>	N/S	
64	Shrewsbury	CM09NS-2404	9/1/2009	2	Dalphen Rd.	3	<i>Ochlerotatus triseriatus</i>	N/S	
65	Shrewsbury	CM09NS-2405	9/1/2009	2	Dalphen Rd.	2	<i>Culiseta melanura</i>	N/S	
66	Shrewsbury	CM09NS-2410	9/1/2009	1	Dalphen Rd.	4	<i>Culex species</i>	N/S	
67	Shrewsbury	CM09NS-2411	9/1/2009	1	Dalphen Rd.	1	<i>Psorophora ferox</i>	N/S	
68	Shrewsbury	CM09NS-2412	9/1/2009	1	Dalphen Rd.	1	<i>Coquillettidia perturbans</i>	N/S	
69	Shrewsbury	CM09NS-2413	9/1/2009	1	Dalphen Rd.	1	<i>Ochlerotatus trivittatus</i>	N/S	
70	Shrewsbury	CM09-0487	9/9/2009	2	N. Quinsigamond Ave.	8	<i>Culex species</i>	WNV & EEE	Negative
71	Shrewsbury	CM09NS-2626	9/9/2009	2	N. Quinsigamond Ave.	8	<i>Ochlerotatus japonicus</i>	N/S	
72	Shrewsbury	CM09NS-2627	9/9/2009	2	N. Quinsigamond Ave.	1	<i>Anopheles quadrimaculatus</i>	N/S	

SHREWSBURY SURVEILLANCE DATA  
2009

#	Town	Pool ID	Trap Set Date	Number of Traps	Trap Site	Pool Size	Species	Test Type	Result
73	Shrewsbury	CM09-0489	9/10/2009	1	Oak St.	12	<i>Aedes vexans</i>	WNV & EEE	Negative
74	Shrewsbury	CM09-0490	9/10/2009	1	Dalphen Rd.	6	<i>Culex species</i>	WNV & EEE	Negative
75	Shrewsbury	CM09-0491	9/10/2009	1	Oak St.	3	<i>Culex species</i>	WNV & EEE	Negative
76	Shrewsbury	CM09NS-2635	9/10/2009	1	Oak St.	2	<i>Culex species</i>	N/S	
77	Shrewsbury	CM09NS-2636	9/10/2009	1	Oak St.	83	<i>Anopheles punctipennis</i>	N/S	
78	Shrewsbury	CM09NS-2637	9/10/2009	1	Oak St.	4	<i>Anopheles quadrimaculatus</i>	N/S	
79	Shrewsbury	CM09NS-2638	9/10/2009	1	Oak St.	1	<i>Aedes cinereus</i>	N/S	
80	Shrewsbury	CM09NS-2639	9/10/2009	1	Oak St.	2	<i>Coquillettia perturbans</i>	N/S	
81	Shrewsbury	CM09NS-2640	9/10/2009	1	Dalphen Rd.	45	<i>Anopheles punctipennis</i>	N/S	
82	Shrewsbury	CM09NS-2641	9/10/2009	1	Dalphen Rd.	5	<i>Anopheles quadrimaculatus</i>	N/S	
83	Shrewsbury	CM09NS-2642	9/10/2009	1	Dalphen Rd.	1	<i>Aedes vexans</i>	N/S	
84	Shrewsbury	CM09NS-2646	9/10/2009	1	Oak St.	1	<i>Ochlerotatus japonicus</i>	N/S	
85	Shrewsbury	CM09NS-2647	9/10/2009	1	Oak St.	1	<i>Anopheles punctipennis</i>	N/S	
86	Shrewsbury	CM09-0497	9/11/2009	1	Oak St.	8	<i>Ochlerotatus japonicus</i>	WNV & EEE	Negative
87	Shrewsbury	CM09-0498	9/11/2009	1	Oak St.	6	<i>Culex species</i>	WNV & EEE	Negative
88	Shrewsbury	CM09NS-2680	9/11/2009	1	Oak St.	1	<i>Anopheles punctipennis</i>	N/S	
89	Shrewsbury	CM09NS-2681	9/11/2009	1	Oak St.	1	<i>Culiseta melanura</i>	N/S	
90	Shrewsbury	CM09NS-2682	9/11/2009	1	Oak St.	1	<i>Anopheles punctipennis</i>	N/S	
91	Shrewsbury	CM09NS-2683	9/11/2009	1	Dalphen Rd.	8	<i>Anopheles punctipennis</i>	N/S	
92	Shrewsbury	CM09NS-2684	9/11/2009	1	Dalphen Rd.	1	<i>Culex species</i>	N/S	
93	Shrewsbury	CM09NS-2685	9/11/2009	1	Dalphen Rd.	1	<i>Ochlerotatus japonicus</i>	N/S	
94	Shrewsbury	CM09-0499	9/14/2009	1	Oak St.	4	<i>Aedes vexans</i>	WNV & EEE	Negative
95	Shrewsbury	CM09-0500	9/14/2009	1	Oak St.	6	<i>Ochlerotatus japonicus</i>	WNV & EEE	Negative
96	Shrewsbury	CM09NS-2686	9/14/2009	1	Oak St.	1	<i>Ochlerotatus canadensis</i>	N/S	
97	Shrewsbury	CM09NS-2687	9/14/2009	1	Oak St.	1	<i>Ochlerotatus hendersoni</i>	N/S	
98	Shrewsbury	CM09NS-2688	9/14/2009	1	Oak St.	35	<i>Anopheles punctipennis</i>	N/S	
99	Shrewsbury	CM09NS-2689	9/14/2009	1	Oak St.	3	<i>Anopheles quadrimaculatus</i>	N/S	
100	Shrewsbury	CM09NS-2690	9/14/2009	1	Oak St.	1	<i>Ochlerotatus hendersoni</i>	N/S	
101	Shrewsbury	CM09NS-2691	9/14/2009	1	Oak St.	3	<i>Culex species</i>	N/S	
102	Shrewsbury	CM09NS-2710	9/14/2009	1	Dalphen Rd.	1	<i>Culex species</i>	N/S	
103	Shrewsbury	CM09NS-2711	9/14/2009	1	Dalphen Rd.	3	<i>Psorophora ferox</i>	N/S	
104	Shrewsbury	CM09NS-2712	9/14/2009	1	Dalphen Rd.	4	<i>Aedes vexans</i>	N/S	
105	Shrewsbury	CM09NS-2713	9/14/2009	1	Dalphen Rd.	1	<i>Ochlerotatus triseriatus</i>	N/S	
106	Shrewsbury	CM09NS-2714	9/14/2009	1	Dalphen Rd.	4	<i>Aedes cinereus</i>	N/S	
107	Shrewsbury	CM09NS-2715	9/14/2009	1	Dalphen Rd.	1	<i>Anopheles quadrimaculatus</i>	N/S	
108	Shrewsbury	CM09NS-2716	9/14/2009	1	Dalphen Rd.	8	<i>Anopheles punctipennis</i>	N/S	

SHREWSBURY SURVEILLANCE DATA  
2009

#	Town	Pool ID	Trap Set Date	Number of Traps	Trap Site	Pool Size	Species	Test Type	Result
109	Shrewsbury	CM09NS-2717	9/14/2009	1	Dalphen Rd.	3	<i>Ochlerotatus japonicus</i>	N/S	
110	Shrewsbury	CM09NS-2718	9/14/2009	1	Dalphen Rd.	2	<i>Ochlerotatus triseriatus</i>	N/S	
111	Shrewsbury	CM09-0505	9/15/2009	2	Dalphen Rd.	27	<i>Culex species</i>	WNV & EEE	Negative
112	Shrewsbury	CM09NS-2719	9/15/2009	1	Dalphen Rd.	3	<i>Culiseta melanura</i>	N/S	
113	Shrewsbury	CM09NS-2720	9/15/2009	1	Dalphen Rd.	1	<i>Culex species</i>	N/S	
114	Shrewsbury	CM09NS-2721	9/15/2009	1	Dalphen Rd.	1	<i>Coquillettidia perturbans</i>	N/S	
115	Shrewsbury	CM09NS-2722	9/15/2009	1	Dalphen Rd.	3	<i>Anopheles punctipennis</i>	N/S	
116	Shrewsbury	CM09NS-2723	9/15/2009	2	Dalphen Rd.	7	<i>Ochlerotatus japonicus</i>	N/S	
117	Shrewsbury	CM09NS-2724	9/15/2009	2	Dalphen Rd.	2	<i>Anopheles quadrimaculatus</i>	N/S	
118	Shrewsbury	CM09NS-2725	9/15/2009	2	Dalphen Rd.	1	<i>Anopheles punctipennis</i>	N/S	
119	Shrewsbury	CM09NS-2726	9/15/2009	2	Dalphen Rd.	1	<i>Anopheles barberi</i>	N/S	
120	Shrewsbury	CM09-0549	9/23/2009	2	N. Quinsigamond Ave.	10	<i>Culex species</i>	WNV & EEE	Negative
121	Shrewsbury	CM09NS-2929	9/23/2009	2	N. Quinsigamond Ave.	14	<i>Ochlerotatus japonicus</i>	N/S	
122	Shrewsbury	CM09NS-2930	9/23/2009	2	N. Quinsigamond Ave.	10	<i>Ochlerotatus triseriatus</i>	N/S	
123	Shrewsbury	CM09-0577	9/29/2009	1	Dalphen Rd.	6	<i>Culiseta melanura</i>	WNV & EEE	Negative
124	Shrewsbury	CM09-0583	9/29/2009	2	Dalphen Rd.	6	<i>Ochlerotatus japonicus</i>	WNV & EEE	Negative
125	Shrewsbury	CM09NS-3069	9/29/2009	1	Dalphen Rd.	4	<i>Anopheles punctipennis</i>	N/S	
126	Shrewsbury	CM09NS-3101	9/29/2009	2	Dalphen Rd.	1	<i>Culiseta melanura</i>	N/S	
127	Shrewsbury	CM09NS-3201	10/7/2009	2	N. Quinsigamond Ave.	2	<i>Ochlerotatus japonicus</i>	N/S	
		<b>127 collections</b>				<b>1126</b>	<b>mosquitoes collected</b>		
		<b>27 collections submitted for testing</b>				<b>535</b>	<b>submitted for testing</b>		
		<b>ONE ISOLATION OF WNV IN 2009</b>					<b>N/S=not submitted for testing</b>		

## 2009 SUMMARY

The Central Massachusetts Mosquito Control Project (the Project) currently provides its services to 38 cities and towns throughout Middlesex and Worcester Counties. The Project's headquarters is located at 111 Otis Street, Northboro, MA. Tours of the headquarters or visits to field work sites may be arranged by calling the office in advance. Please call (508) 393-3055 during business hours for more information. The Project practices Integrated Pest Management (IPM), blending state of the art methods and techniques with expertise, experience, and scientific research to provide our member communities with environmentally sound and cost effective mosquito control.

During 2009 the Project received thirteen thousand, six hundred and fourteen (13,614) requests for service from town residents and officials. Ten thousand, nine hundred and ninety (10,990) pounds of Bti (*Bacillus thuringiensis israelensis*) was applied by helicopter over two thousand, one hundred and ninety eight (2,198) acres in 3 towns, Chelmsford, Billerica & Boxborough, and six thousand, three hundred and forty seven (6,347) pounds by hand over one thousand, two hundred and sixty nine (1,269) acres throughout our service area were applied to area wetlands to reduce the emergence of adult mosquitoes. This represents over three thousand, four hundred and sixty seven (3,467) acres of wetland that was treated with this mosquito-specific bacterium, significantly reducing adult mosquito populations in these areas. Twenty nine thousand, eight hundred and forty six (29,846) catch basins were treated with larvicidal product to control the mosquitoes that seek out these cool dark wet areas to breed, including the *Culex* mosquito, a major target for West Nile Virus transmission. Three thousand, two hundred and twenty six (3,226) culverts were cleaned in an attempt to eliminate unnecessary standing water and reduce mosquito breeding. This work was done in conjunction with cleaning, clearing, and digging of one hundred and thirty six thousand, eighteen (136,018) feet of streams, brooks and ditches. This represents over twenty five and a half (25.7) miles of waterways which were cleaned and improved by Project personnel in 2009.

The Mosquito Awareness Program which we offer to elementary schools and other civic organizations in our district has become very popular. Project staff meets with students, teachers or concerned residents to discuss mosquito biology, mosquito habitat, and control procedures. Much of the presentation is directed towards what children and their families can do to prevent mosquitoes from breeding around their homes. Slides, videos, coloring books and other handouts make this an interesting program. This program is tailored to meet the needs of the specific audience. In 2009, CMMCP laboratory personnel and other administrative staff made sixty three (63) educational presentations before one thousand, nine hundred and eighty six (1,986) students in fifteen (15) Elementary schools and ten (10) members of a rotary club. CMMCP gave a presentation on our program to 12 Clarke University students in the Clarke Vector Ecology program and exhibited at two (2) health fairs.

As part of our effort to reduce the need for pesticides we continue to expand our wetlands restoration program. By cleaning clogged and overgrown waterways, mosquito breeding can be reduced and drainage areas are restored to historic conditions.

Bti mosquito larvicide is used to treat areas where mosquito larvae are found. We routinely check known breeding sites kept in our database, but also encourage the public to notify us of any areas they suspect could breed mosquitoes. Our field crews will investigate all such requests and treat the area only if surveillance gathered at the time shows an imminent threat of mosquito emergence.

Our goal is to manage all mosquito problems with education, wetlands restoration or larviciding, but we recognize that there are times when adult mosquito spraying is the only viable solution. In such cases specific areas are treated with either hand-held or pickup truck mounted sprayers if surveillance gathered at the time exceeds a pre-determined threshold to warrant an application. This program is offered on a **request-only** basis, and the exclusion process allows residents and/or town officials to exclude areas under their control from this or any part of our program.

The Project's surveillance program monitors adult mosquito and larval population density, and is the backbone for prescribing various control techniques. Specialized mosquito traps are deployed throughout the Project's service area to sample for mosquitoes that may be transmitting mosquito-borne diseases. In conjunction with the Mass. Dept. of Public Health we sample in areas suspected of harboring WNV and other viruses. Six hundred and six (606) pools (collections) of mosquitoes totaling thirteen thousand seven hundred and ninety one (13,791) specimens were tested for mosquito-borne viruses this year. Six (6) collections were identified positive with mosquito-borne viruses, three (3) with West Nile Virus (WNV) and three (3) with Eastern Equine Encephalitis (EEE) - details are available in the Medical Entomology report in this document. No human cases of EEE or WNV were identified in our

service area. CMMCP lab personnel made one thousand, five hundred and sixty five (1,565) total collections of mosquitoes containing thirty seven thousand, two hundred and thirty (37,230) individual specimens, representing twenty six (26) mosquito species.

Some additional highlights from 2009:

- Resistance management study; no significant resistance to pyrethroids noted, no change recommended in adulticide material choice (see full report).
- Resident satisfaction survey: conclusion; overall satisfaction with the adulticide program was 92%, 98% plan to use our services again (see full report).
- Host seeking study to determine the prevalent time frame mammal-biting species are seeking bloodmeals; this information will determine the best time for adulticide applications (see abstract).
- Working with Tufts Veterinary Hospital to measure effects of adulticide program on non-target effects; no conclusion as of yet, multi year study begun in late 2007.
- Working with CT Agr. Experiment Station to determine host preference of *Culiseta melanura* by collecting and analyzing DNA of blood meals; results expected soon.
- We have been awarded PESP status by the US EPA again this year. The Pesticide Environmental Stewardship Program (PESP) is a voluntary program that forms partnerships between the EPA and pesticide users to reduce the potential health and environmental risks that may be associated with pesticide use.

Educational pamphlets are available to anyone interested in learning about mosquito control and the services provided by the Project, and these items are routinely stocked in member Town/City Halls and libraries. Display boards with information on our program are rotated through area Town Halls throughout the year. We also have a website, [www.cmmcp.org](http://www.cmmcp.org) that has extensive information on mosquito biology, our control procedures, etc. This website has become a model for other Mosquito Projects and has been widely used throughout our service area and beyond.

We would like to thank you for your support during 2009 and we look forward to helping you and your community with its mosquito problems in 2010 and beyond.

Respectfully submitted,  
Timothy D. Deschamps, Executive Director

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