

THE COMMONWEALTH OF MASSACHUSETTS
STATE RECLAMATION & MOSQUITO CONTROL BOARD

CENTRAL MASSACHUSETTS MOSQUITO CONTROL PROJECT

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www.cmmcp.org



ANNUAL REPORT 2014



printed on minimum 30% post-consumer content

PREFACE

The 2014 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 available 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 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



Member,
New Jersey
Mosquito Control
Association



Partner,
EPA Pesticide
Environmental
Stewardship Program



Partner,
EPA WasteWise
Program

THE COMMONWEALTH OF MASSACHUSETTS

State Reclamation & Mosquito Control Board
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<http://www.mass.gov/agr/mosquito/>

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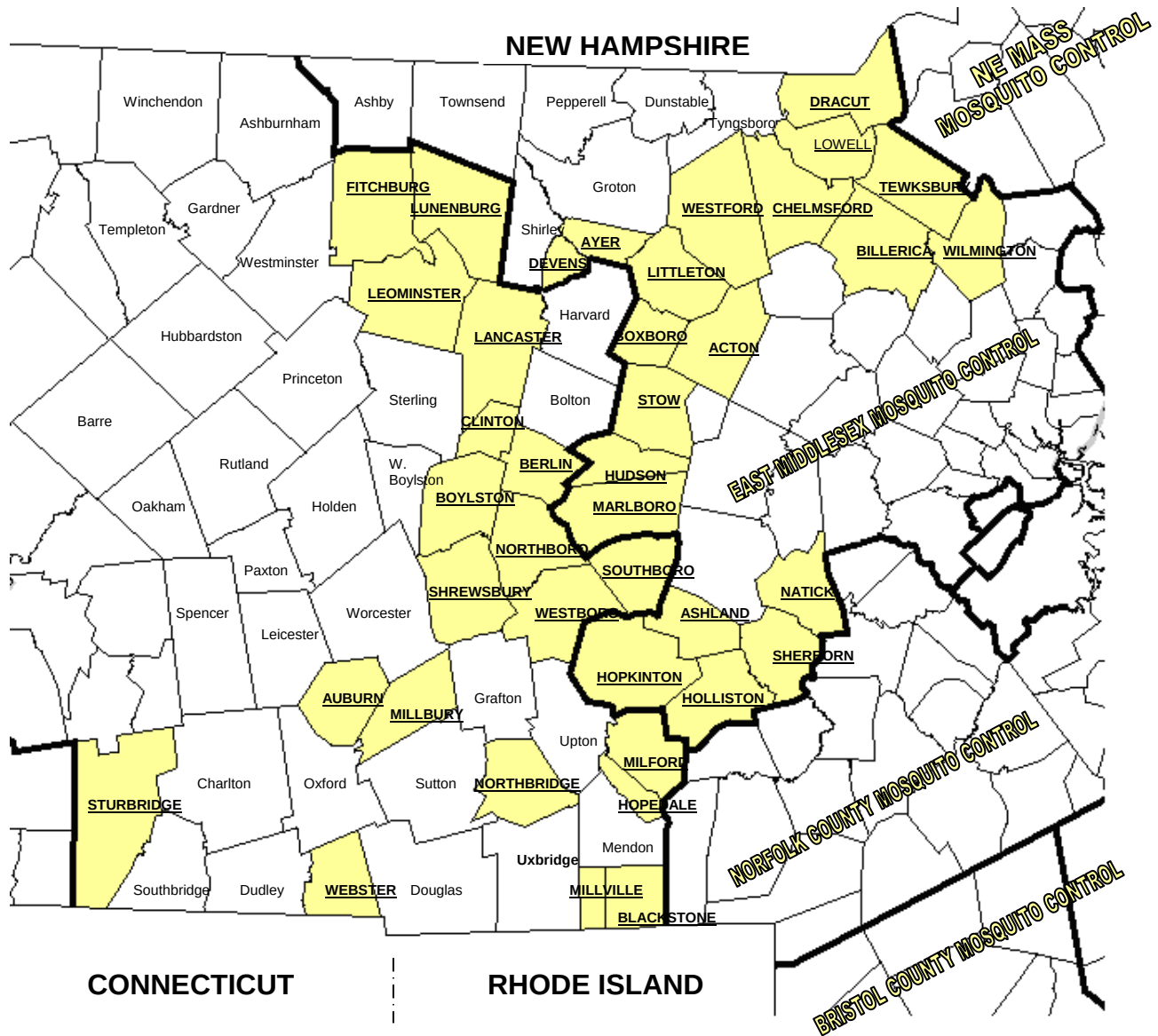
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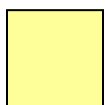
LIST OF MEMBER COMMUNITIES - 2014

<u>TOWN</u>	<u>SQUARE MILES</u>
DISTRICT ONE	
BILLERICA	25.96
CHELMSFORD	22.70
DRACUT	20.90
LOWELL	14.50
LITTLETON	16.60
TEWKSBURY	20.70
WESTFORD	30.60
WILMINGTON	17.12
DISTRICT TWO	
ACTON	20.00
AYER	9.00
BOXBOROUGH	10.40
DEVENS	5.28
FITCHBURG	27.80
LANCASTER	27.70
LEOMINSTER	28.90
LUNENBURG	26.40
STOW	17.60
DISTRICT THREE	
BERLIN	12.90
BOYLSTON	16.00
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
WEBSTER	12.50
Total Square Miles	705.85

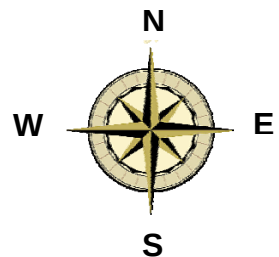
CMMCP SERVICE AREA



~ 2014 ~



= member towns



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. One method employed is called "water management" or "ditch maintenance". This method reduces or eliminates the source of potential mosquito larval habitat, and consists of cleaning road-side ditches and culverts, removal of brush and accumulated debris from ditches. This method permits water to flow freely and reduces the likelihood for stagnant areas, areas in which the larval mosquito needs to develop. This program is practiced year-round, and is done only after extensive examination by our wetland scientist 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 control method for mosquito larvae called "larviciding". After a field technician has determined that larval mosquitoes are present, a small amount of environmentally sensitive product (usually a bacteria) 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 March to September or October as conditions warrant.

A third method is to attempt to control the adult mosquito. The control of adult mosquitoes is called "adulticiding" and 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, our technicians 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 from mosquitoes 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. A new program for senior citizens was established in 2011.

"Source reduction" is reducing or eliminating the source of mosquito larval habitat. We offer a tire recycling program in our member communities at no additional cost to residents because used tires in the environment are larval habitat for several mosquito species, some of which carry West Nile Virus.

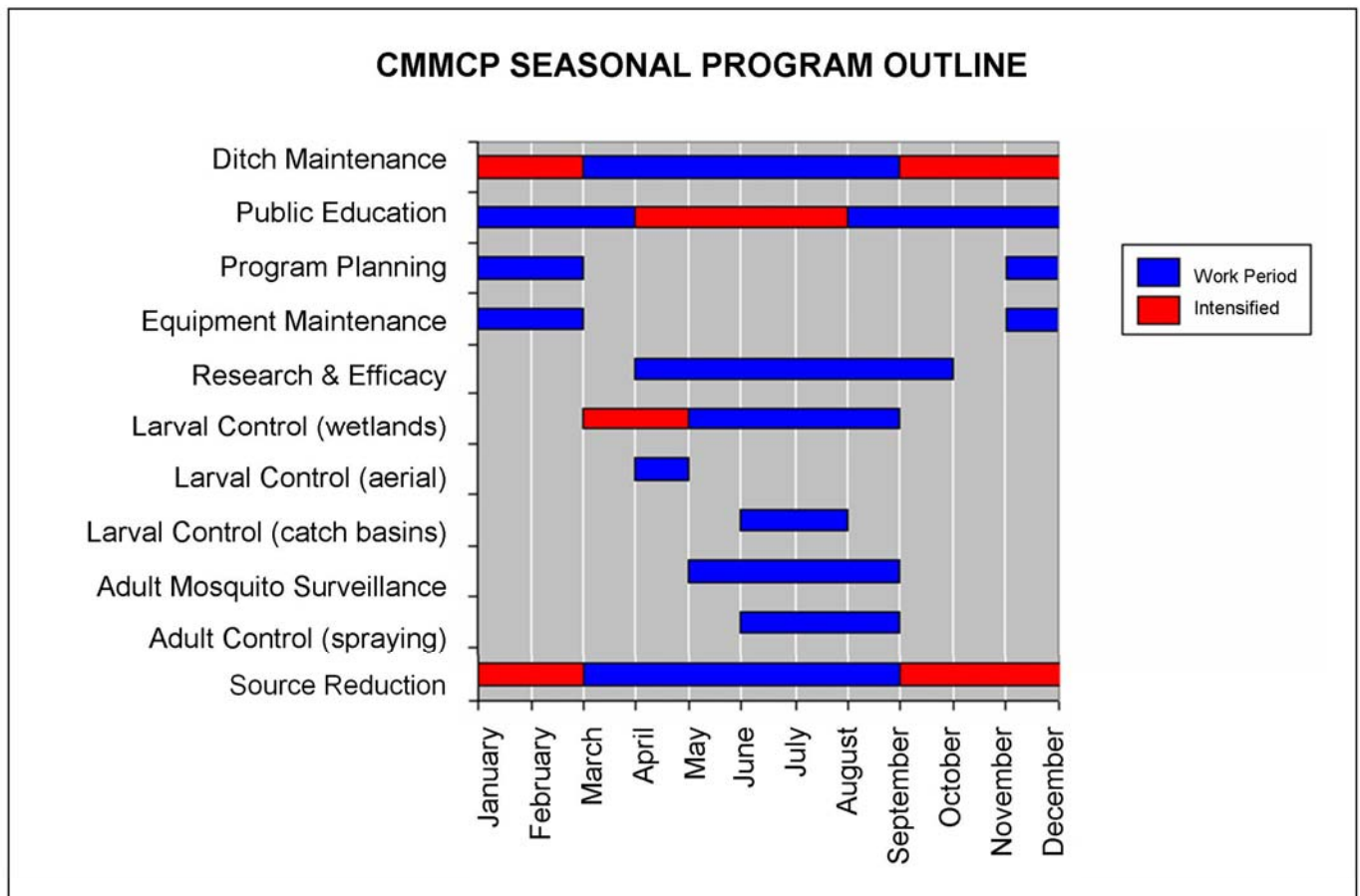
PROGRAM EVALUATION

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. Wetlands Restoration/Ditch maintenance - throughout the year, intensified September through February
2. Public Education - throughout the year, intensified April through August
3. Program Preparation - December through March
4. Equipment Maintenance - December through February
5. Research & Efficacy - April through October
5. Larval Control (wetlands) - March through September (aerial work is only done in 3 towns at this time and by supplemental funding)
6. Larval Control (catch basins) - June through September
7. Adult mosquito Surveillance - May through September/October
8. Adulticiding - June through September/October
9. Source reduction - throughout the year, intensified September through February

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:

1. **LARVAL CONTROL:** Wetlands and suspected mosquito breeding sites are monitored from March through September to determine the need for applications of environmentally sensitive products (typically a bacteria called Bti) to control and/or eliminate the larval mosquito. By controlling mosquitoes in their larval stage the need for adult mosquito spraying is reduced.
2. **SOURCE REDUCTION:** Reducing or removing larval habitat by recycling, waste disposal or other means is a permanent solution. Mosquito larvae are opportunistic and will create habitat in any container that holds water for more than a week. Empty and clean birdbaths and kiddie pools each week, cover or store inside anything that may capture and hold water, and dispose of or recycle any containers that are no longer needed. CMMCP now has a tire recycling program to allow residents a means to dispose of these important larval habitats.
3. **WETLAND RESTORATION/DITCH MAINTENANCE:** Mosquitoes need still, stagnant water to complete their metamorphosis from egg to adult. CMMCP conducts maintenance on ditches, culverts and man-made ponds to improve water quality and increase water flow, reducing the potential for mosquito breeding.
4. **SURVEILLANCE:** Mosquito populations are monitored in both the larval and adult stages to determine the appropriate control methods to be employed, prevalent mosquito species, and disease transmission potential. CMMCP has instituted a program to supplement the Dept. of Public Health's arbovirus surveillance program for monitoring West Nile Virus in Massachusetts, using mosquito gravid traps. These traps will be placed throughout out service area and can be quickly broken down and moved to respond to the immediate needs of monitoring for this and other mosquito-borne diseases. When WNV or EEE is confirmed in a member city or town, these traps are placed in areas that have been determined to harbor this virus. Additional types of traps able to sample mammal-biting mosquitoes will also be placed to determine WNV levels and risk to the local populace.
5. **PUBLIC EDUCATION:** Educating the public about mosquitoes and their biology is an important aspect of our program. We offer a comprehensive program in member communities geared towards school-aged children from Kindergarten to High School. This program is tailored to meet the needs of intended audience. In 2011 we developed a specialized program geared towards senior citizens. The Project produces public relations handouts, and all member Town Halls are stocked with information on CMMCP, our programs, and how the homeowner can reduce mosquito populations in their own area. Project staff is available to meet with civic organizations, town/city boards, and to participate in Health Fairs. Tours of the Project's headquarters can be arranged by calling our office.
6. **ADULT MOSQUITO CONTROL:** When adult mosquito populations reach intolerable levels, hand-held or truck mounted sprayers are used to reduce the adult mosquito levels in residential areas. CMMCP has worked diligently over the past 20 years to achieve the goal of reducing the dependency on adulticiding by increasing the emphasis on larviciding, public education, water management and source reduction.
7. **RESEARCH AND EFFICACY:** While CMMCP is an agency charged with the control of mosquitoes, we strive to check for efficacy of our products and techniques, and whenever possible perform research in new or different areas of mosquito control.

SOURCE REDUCTION/TIRE RECYCLING REPORT 2014

For Earth Day 2010, CMMCP officially announced a tire recycling program added as a value added service to our member cities and towns. This program operates under grant monies received and the CMMCP operating budget. Tire piles provide suitable areas for larval mosquito development, including those species known to carry West Nile virus. During the course of one season, the potential exists for hundreds or even thousands of mosquitoes to emerge from just one tire. If tires infested with mosquito eggs, larvae or pupae are transported, the potential to introduce mosquito species into new areas and/or the potential for the spread of arboviruses and their transmission may increase significantly.

For these reasons and as a value added service to our member cities and towns, CMMCP has developed a used tire program, consisting of the following guidelines:

- We accept passenger and light truck tires only
- The maximum number tires from one property will be 10 at one time, subject to change without notice
- Requests for tire removal shall be done according to established procedures
- We reserve the right to refuse anything determined to be unsuitable for this program

Tires accepted as part of this program are sent to an approved facility for recycling or disposal. This program is subject to end without notice.

We have been removing tire piles in member cities and towns on an intermittent basis. If you know of a tire pile in your area, or would like to participate in a curbside pickup in the future, please send the following information to used_tires@cmmcp.org; NAME, ADDRESS, TOWN, PHONE, E-MAIL, # of TIRES (off the rim), LOCATION OF TIRES, ANY COMMENTS. When we schedule a curbside pickup event in your area you will be notified in advance.

ELIGIBILITY: to qualify for this program you must be a resident or municipal official in a CMMCP member city or town and the tires must be in or from that locality. Businesses are not eligible at this time.

COST: there is no additional cost to residents or municipalities; this program is part of the full suite of mosquito control services offered.

2014 Tire Collection Data:

In 2014 CMMCP collected and recycled 26.46 tons of tires. This year over 50% of the tires recycled by CMMCP originated from tire recycling events held throughout Central Massachusetts. The remainder of the recycling efforts originated from large tire recycling projects, residential tire removal, and roadside clean-ups. Since the inception of this tire program in 2010 CMMCP has recycled 143.55 tons of tires.

2014 TIRES COLLECTION DATA:

Town	Tires collected	Town	Tires collected
Ashland	65	Lowell	25
Auburn	113	Lunenburg	8
Billerica	65	Milford	259
Blackstone	2	Millbury	434
Boxboro	38	Natick	1
Boylston	126	Northboro	37
Chelmsford	1	Northbridge	3
Clinton	4	Shrewsbury	102
Fitchburg	364	Southboro	2
Hopedale	1	Stow	11
Hopkinton	175	Sturbridge	4
Hudson	29	Tewksbury	236
Lancaster	206	Webster	24
Leominster	259	Westboro	4
Littleton	20	Westford	28

U.S. Environmental Protection Agency - Region 1



Environmental Merit Award

presented to

*Central Mass Mosquito
Control Project*

for outstanding efforts in
preserving New England's environment

April 2014

WETLANDS RESTORATION PROGRAM REPORT 2014

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 drainage systems through ditch maintenance and wetland restoration projects. These projects will effectively reduce and prevent mosquito breeding sources and can reduce or often eliminate the need for periodic applications of pesticides.

Wetland restoration/water management projects are planned per the *Massachusetts Best Management Practices and Guidance for Freshwater Mosquito Control* and the *Mechanical Wetlands Management Activity Post-Monitoring Guidelines*. Wetlands projects are designed to minimize wetlands impacts.

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, site 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. 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 resources such as historical aerials and spatial data from the MassGIS online mapping program to develop a project site plan. The site plan includes project specifications which 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, notification letters are sent to MA 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 a 30 day grace period. During this time, property owners and 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.

The presence of beaver in the watershed has become an increasing concern for residents, town officials and CMMCP. Active beaver create beaver dams along streams and within wetland areas creating beaver ponds often resulting in flooding. Increase in flooding may cause can cause health and safety issues for residents and municipalities. Increased flooding typically causes stagnant standing water which is prime mosquito habitat. CMMCP offers assistance and guidance relating to beaver management. CMMCP consults with local boards of health, conservation commissions to comply with state laws. CMMCP is in the practice of removing beaver dams and this year began installing water flow devices both on a case by case basis. Several inquiries were made for trapping by town officials and residents. Trapping is not a provided service at this time.

SUMMARY OF WORK FOR 2014:

In 2014, 66 sites were assessed by the Wetland Project Coordinator. Of these sites, 22 were visited multiple times to best survey, implement, and monitor water management work at each site. Of the sites, 31 were brought to the attention of the Project through resident requests (46%), 21 sites were requested by town officials (32%), and 7 were identified by CMMCP staff (10%). Seven were requested from a combination of residents, officials, and/or CMMCP staff (10%). Ten sites were assessed with regard to beaver complaints. Installation of water flow devices and/or culvert protection was installed at (3) three sites. Sites where flow devices were installed were watched closely and the dams breached intermittently per Emergency Orders from the Board of Health.

Fifty-three water management jobs were set up and completed, with ongoing maintenance. Thirteen of these jobs involved the use of the low ground pressure excavator. Fifty-one jobs of these water management job included hand work.

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

Deceiving the Beavers in Wenakeening Woods



by Paul Saulnier
December 22, 2014



Jonathan Briggs of CMMC (Central Mass Mosquito Control) starts the deceiving process by breaching the dam on Chicken Brook that the beavers have worked so hard to maintain over the last year.

Chicken Brook meanders through Holliston, crossing under Washington Street between Underwood and Oak Streets, under the rail trail between Cross and Summer streets, where it enters the 104 acre preserve owned by the Upper Charles Conservation Land Trust (<http://www.uppercharles.org/>). Beavers have dammed up the brook near the Summer Street entrance to Wenakeening Woods, adjacent to 200 Summer Street (Wilde Company). The dam has raised the water level in yards upstream and flooded the footbridge from Mission Springs to the athletic fields.

CMMC is responsible for reducing or eliminating stagnant ponds that breed mosquitoes so installing beaver deceivers is a good fit for them to keep busy in the winter. CMMC recently completed the installation of a deceiver on Hopping Brook for the Conservation Commission and is considering

constructing one in a beaver dam on a stream that runs between Mill and North Mill streets.



A beaver deceiver consists of several parts. The metal cage above shrouds the 15" pipe, keeping the inlet of the deceiver open and away from beavers eager to plug it up.





The cage is floated out into the pond and another section of pipe is added (above and below).



Sean Healy, above right, joins Jonathan Briggs in the deep end as other employees of CMMC push the completed beaver deceiver out into the pond.



When the floats are removed the cage and pipe sink and everything is held down with concrete blocks (above). The other end of the pipe is placed in the breached dam, with the high point of the pipe establishing the final level of the pond (below). Workers then put back most of the sticks and branches for the beavers to come in and finish the job of sealing the dam. But now no matter how high they build the dam, the water will remain at the level of the outlet pipe, which will also be covered with a cage to keep the beavers at bay.







The entire process was filmed for Heartbeat of Holliston to be aired in January, 2015, on HCAT. Above Mary Greendale interviews Katrina Proctor, Wetlands Program Manager for CMMC (<http://www.cmmcp.org/>).

Comments (3)

So glad to see this approach being used.

- Laura | 12/26/14 7:43 PM

Great!

- Andrew Mades | 12/22/14 6:09 PM

Great article and description of how the deceiver works. Seems like a good balance between protecting the environment and the interests of abutters.

- Ted | 12/22/14 7:09 AM

CMMCP MEDICAL ENTOMOLOGY LABORATORY REPORT 2014

The mission of the Medical Entomology Laboratory is to refine and maximize the Central Massachusetts Mosquito Control Project's ongoing effort to control mosquitoes. During 2014 Medical Entomology Laboratory personnel carried this mission forward in the following ways.

The Staff Entomologist made 58 educational presentations before 2,265 elementary school students in 13 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.

During 2014, three technicians were employed for the season to operate the mosquito surveillance traps. Using their knowledge of mosquito behavior and the local terrain, these skilled and experienced personnel monitored the adult mosquito population. 1,450 collections were made during 2014.

Collections of mosquitoes were made using Modified Reiter Gravid Traps, BG Sentinel Traps and New Standard Miniature Light Traps. Modified Reiter Gravid Traps are attractive to *Culex* mosquito species. *Culex* species are implicated in the maintenance and transmission of West Nile virus in the United States of America. BG Sentinel traps are attractive to a mosquito species named *Aedes albopictus*. *Aedes albopictus*, commonly known as the "Asian Tiger Mosquito", is an invasive mosquito species that is threatening to make inroads into Massachusetts. The species is an aggressive daytime biter and has proven capable of carrying and transmitting a variety of viral diseases. New Standard Miniature Light Traps use light and/or carbon dioxide gas to attract the vectors of both West Nile and Eastern Equine Encephalitis. The addition of carbon dioxide gas results in larger collections. Eastern Equine Encephalitis is caused by a virus that has been found in a variety of mosquito species. Ongoing research implicates *Culiseta melanura*, as the most important vector of Eastern Equine virus. *Culiseta melanura* utilizes Red Maple swamps as a breeding habitat. Red Maple swamps are found throughout the CMMCP service area.

The collected mosquitoes were identified to species by the Staff Entomologist. Members of species known to play a role in the transmission of disease were set aside for further processing. During 2014, 18,697 mosquitoes representing 10 species were submitted for testing. For efficiency they were divided into 1,026 groups or pools. These pools of mosquitoes were tested for West Nile virus and Eastern Equine virus infection. Of the 1,026 pools tested one proved positive for West Nile virus and one proved positive for Eastern Equine virus. The findings are listed below.

In response to the positive test results the CMMCP increased surveillance of mosquitoes in these areas. Mosquito control measures were augmented as well. The data from these collections was shared with the Massachusetts Department of Public Health.

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

Arbovirus Surveillance Results - CMMCP

Collection Date	Species	Town	Test Type	Result
7/3/2014	Culex species	Clinton	WNV	Positive
9/23/2014	Culex species	Tewksbury	EEE	Positive

WNV Surveillance Summary - Statewide	2014
Mosquito Pools Positive	55
EEE Surveillance Summary - Statewide	2014
Mosquito Pools Positive	32
CMMCP Surveillance Summary	2014
Mosquitoes Collected and Tested	18,630
Mosquito Pools Submitted for testing	1,026
Mosquito Pools Positive WNV	1
Animals Positive WNV	0
Humans Positive WNV	0
Mosquito Pools Positive EEv	1
Animals Positive EEv	0
Humans Positive EEv	0

Northboro Surveillance Data
2014

Town	Trap Set Date	Pool ID	Trap Site	Pool Size	Species	Result
Northborough	5/28/2014	CM14NS-0036	Emerson Rd.	0	<i>No Collections Recorded</i>	not submitted
Northborough	5/29/2014	CM14NS-0046	Ball St.	0	<i>No Collections Recorded</i>	not submitted
Northborough	6/10/2014	CM14NS-0140	Auger Ave.	0	<i>No Collections Recorded</i>	not submitted
Northborough	6/11/2014	CM14NS-0145	Deacon St.	2	<i>Culex species</i>	not submitted
Northborough	6/17/2014	CM14-0069	Auger Ave.	13	<i>Culex species</i>	Negative
Northborough	6/18/2014	CM14-0113	Deacon St.	50	<i>Culex species</i>	Negative
Northborough	6/18/2014	CM14-0114	Deacon St.	10	<i>Culex species</i>	Negative
Northborough	6/18/2014	CM14-0115	Deacon St.	50	<i>Culex species</i>	Negative
Northborough	6/24/2014	CM14-0161	Emerson Rd.	50	<i>Culex species</i>	Negative
Northborough	6/24/2014	CM14-0162	Emerson Rd.	29	<i>Culex species</i>	Negative
Northborough	6/25/2014	CM14-0180	Crawford St.	7	<i>Culex species</i>	Negative
Northborough	7/1/2014	CM14-0221	Ball St.	14	<i>Culex species</i>	Negative
Northborough	7/2/2014	CM14-0236	Church St.	23	<i>Culex species</i>	Negative
Northborough	7/8/2014	CM14-0278	Howard St.	5	<i>Culex species</i>	Negative
Northborough	7/9/2014	CM14-0296	Catherine Dr.	6	<i>Culex species</i>	Negative
Northborough	7/15/2014	CM14-0369	Auger Ave.	36	<i>Culex species</i>	Negative
Northborough	7/15/2014	CM14-0370	Auger Ave.	7	<i>Oc. japonicus</i>	Negative
Northborough	7/16/2014	CM14-0390	Deacon St.	28	<i>Culex species</i>	Negative
Northborough	7/22/2014	CM14-0448	Emerson Rd.	5	<i>Culex species</i>	Negative
Northborough	7/23/2014	CM14-0463	Crawford St.	7	<i>Culex species</i>	Negative
Northborough	7/29/2014	CM14-0526	Ball St.	5	<i>Culex species</i>	Negative
Northborough	7/29/2014	CM14-0527	Ball St.	7	<i>Oc. japonicus</i>	Negative
Northborough	7/30/2014	CM14-0538	Catherine Dr.	7	<i>Culex species</i>	Negative
Northborough	7/30/2014	CM14-0539	Catherine Dr.	9	<i>Oc. japonicus</i>	Negative
Northborough	8/5/2014	CM14-0597	Howard St.	50	<i>Cq. perturbans</i>	Negative
Northborough	8/12/2014	CM14-0674	Church St.	6	<i>Cq. perturbans</i>	Negative
Northborough	8/12/2014	CM14-0685	Howard St.	5	<i>Culex species</i>	Negative
Northborough	8/12/2014	CM14-0686	Howard St.	5	<i>Oc. japonicus</i>	Negative
Northborough	8/13/2014	CM14-0695	Emerson Rd.	6	<i>Oc. japonicus</i>	Negative
Northborough	8/19/2014	CM14-0757	Auger Ave.	6	<i>Ae. vexans</i>	Negative
Northborough	8/20/2014	CM14-0764	Deacon St.	5	<i>Culex species</i>	Negative
Northborough	8/26/2014	CM14-0813	Catherine Dr.	50	<i>Cq. perturbans</i>	Negative
Northborough	8/27/2014	CM14-0830	Ball St.	9	<i>Oc. japonicus</i>	Negative
Northborough	9/9/2014	CM14-0920	Emerson Rd.	5	<i>Culex species</i>	Negative
Northborough	9/9/2014	CM14-0921	Emerson Rd.	7	<i>Ae. vexans</i>	Negative
Northborough	9/24/2014	CM14-0996	Catherine Dr.	5	<i>Oc. japonicus</i>	Negative
		36 collections		529	mosquitoes collected	
		32 collections submitted for testing		527	submitted for testing	



FIELD BIOLOGIST REPORT 2014

The Research and Efficacy Department continued investigating and evaluating the control practices of CMMCP in 2014. Efficacy trials of the CMMCP adulticide program were conducted in conjunction with resistance testing of local mosquito populations to the associated products. Surveillance of *Coquillettidia perturbans* around retention ponds was performed again, with half of these historical sites being treated with a novel formulation of *Bacillus sphaericus* and *Bacillus thuringiensis israelensis*. Additionally, surveillance reports were created on a weekly basis to review mosquito activity from the CMMCP service area. Public education was also conducted through several venues including the Mosquito Education Program for Seniors.

To help evaluate the CMMCP residential adulticide program, efficacy trials were conducted in 2014. Mosquito surveillance traps were established at a residential site prior to treatment, and also at nearby locations that were designated as controls, and not treated. Several nightly collections were made at both the treatment and non-treatment sites before and following the applications utilizing ANVIL® 10+10 (EPA Reg. No. 1021-1688-8329). Weather events surrounding these applications were noted as well as changes in species collected until abundance returned to pre-application intensity.

In conjunction with the efficacy trials of the CMMCP residential adulticide program, bottle assays were conducted to determine presence of resistance to ANVIL® 10+10. Standard Centers for Disease Control and Prevention bottle assay methods were used, as has been in the past. The results once again indicated that the current CMMCP protocols are effective against local mosquito populations. With a potential change in primary adulticide product for 2015, the resistance program will need to be modified to ensure the control practices of CMMCP remain successful. Additional mosquito collection sites in the CMMCP service area would provide a more comprehensive view of the resistance situation in central Massachusetts.

Surveillance of *Cq. perturbans* around local retention ponds was maintained in 2014 with half of the ponds being treated with a novel formulation of *Bacillus sphaericus* and *Bacillus thuringiensis israelensis*. This product, FourStar CRG® (EPA Reg. No. 85685-2), was applied prior the emergence of *Cq. perturbans* in order to reduce the number of mammal-biting adults. Results of the applications were inconclusive, but product representatives did note that there may have been potential issues with the early manufacturing of the new formulation. This project may be continued in 2015, possibly using an increased application within the label rate spectrum.

Progress was made on the CMMCP geographic information system including the addition of the catch basin applications, surveillance trap sites, arbovirus findings, and wetlands management work of the 2014 season. The Sentinel GIS program was utilized on a limited basis once again, with a larger integration possible for 2015. Proposed application maps were developed for CMMCP and health officials to review following arbovirus identification in the surveillance program. Typically map sets of four were developed for upcoming wetlands management projects and distributed to involved parties. It is anticipated that during 2015 the CMMCP geographic information system software will be upgraded to ESRI ArcGIS version 10.3.

Along with the research projects, several opportunities were taken to educate the public on mosquitoes and the diseases they can carry. More specifically, this was the fourth season of the Mosquito Education Program for Seniors, which included an extremely well attended meeting with the "Friends of Shrewsbury" group. The informational booklet designed for the program was utilized for a second year as well, being distributed at the presentations and all other senior centers in the CMMCP service area. Other public education opportunities included the "Big E" exposition in Springfield, MA.

Several projects are anticipated for the 2015 season, including continued field and laboratory tests for FourStar CRG®, FourStar BTI CRG® (EPA Reg. No. 85685-4), and possibly Clarke NATULAR G30 (EPA Reg. No. 8329-83). Resistance surveillance for the current residential adulticide product in local mosquito populations will be conducted in conjunction with the efficacy trials of the program. Evaluation of the Blackstone Photonics CO₂ generation system may also occur in 2015.

Respectfully submitted,

Frank H. Cornine III, Field Biologist

Bottle Assays of Field Collected Mosquitoes for Level of Resistance to ANVIL® 10+10 in Central Massachusetts (Update 2014)

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ABSTRACT

The Central Mass. Mosquito Control Project conducted bottle assays in 2014, 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. This was the eighth season of resistance surveillance by CMMCP in this manner. 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 if possible.

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 synergist¹. In this ongoing study to monitor resistance levels in its service area, CMMCP continued conducting bottle assays in the summer of 2014 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 is 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,

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

44.34µg/ml, and 88.68µg/ml), which 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 CO₂ 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. These potentially resistant mosquitoes were then run against the baseline concentration from the unexposed population, as well as control bottles coated with only acetone. Over the past eight seasons of resistance surveillance, several collection sites have been used, with slight modifications year to year depending on habitat and seasonal population changes.

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)

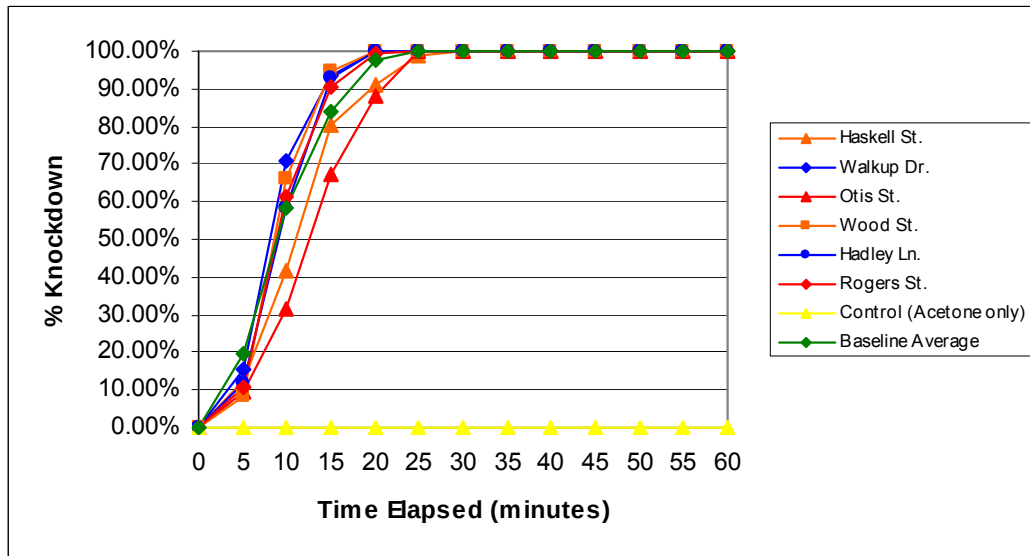
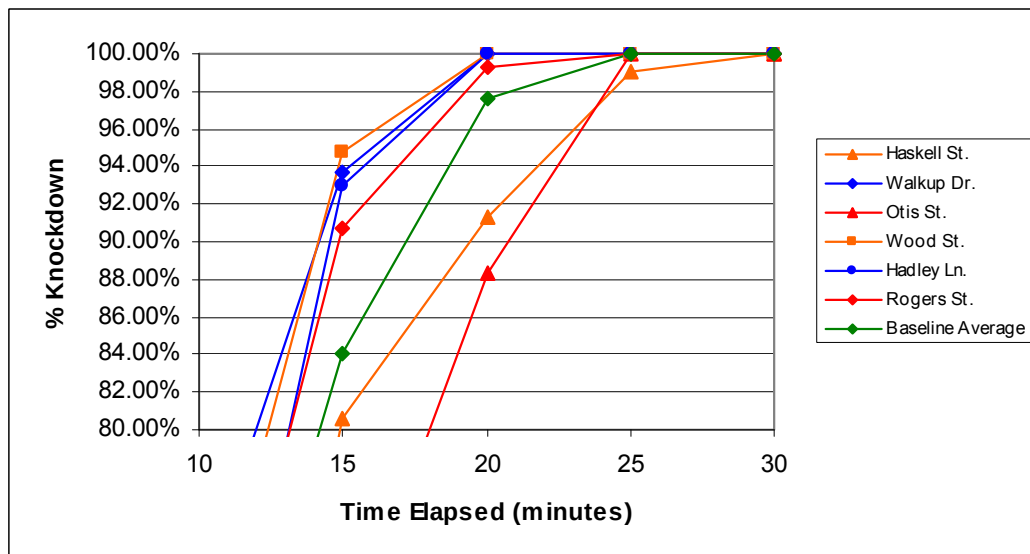


Figure 2: 2007 Time-% Knockdown Curves of Bottle Assays (2) for ANVIL® 10+10 (22.17µg/ml)



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)

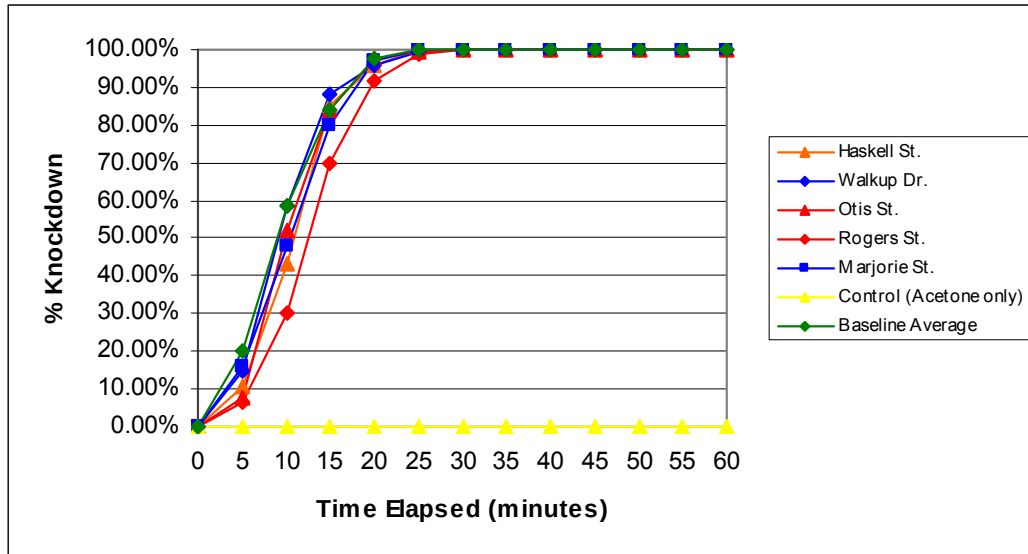
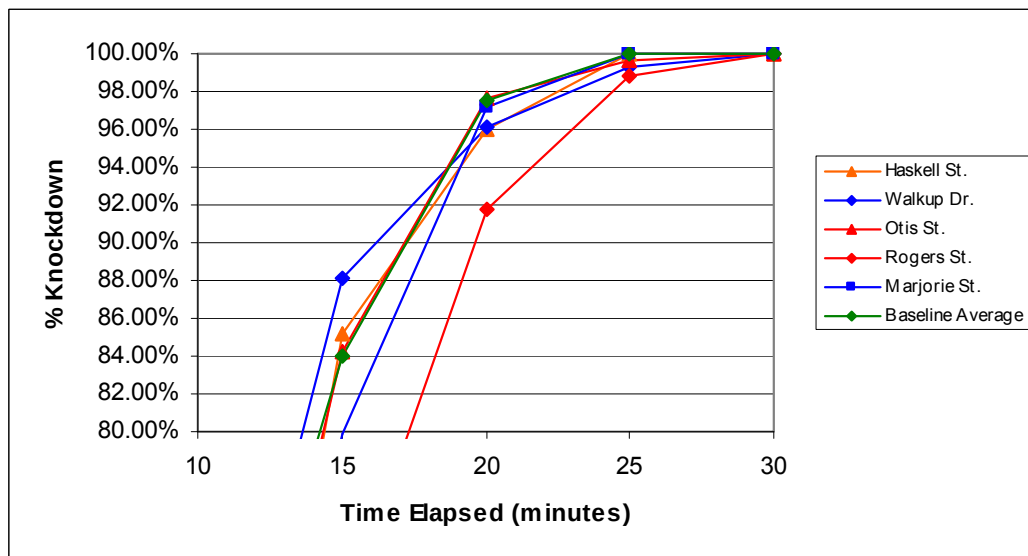


Figure 4: 2008 Time-% Knockdown Curves of Bottle Assays (2) for ANVIL® 10+10 (22.17µg/ml)



Bottle assays preformed 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)

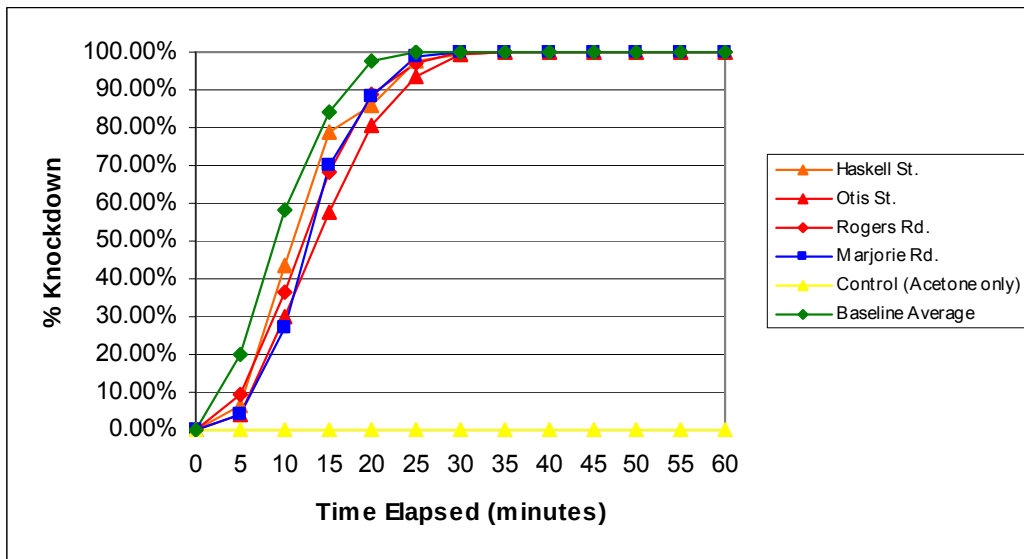
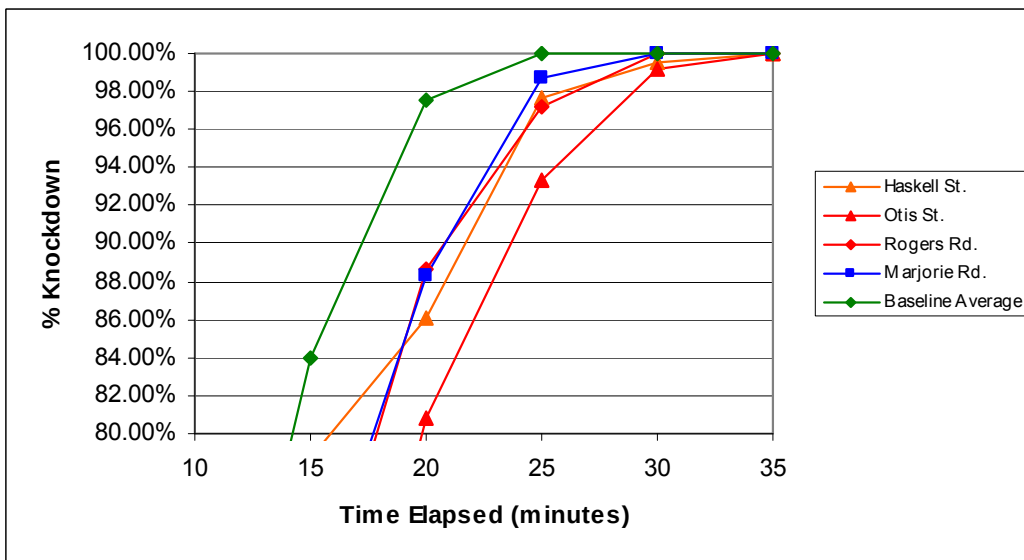


Figure 6: 2009 Time-% Knockdown Curves of Bottle Assays (2) for ANVIL® 10+10 (22.17µg/ml)



The bottle assays performed in 2010 showed an increase in the knockdown rate compared to the previous year (Figures 7, 8). At the 20, 25, and 30 minute mark, the knockdown percentages were 98.52%, 99.86%, and 100% of the specimens respectively. This rate is more consistent with the baseline average and also with the trials conducted in 2007 and 2008. The acetone only control exhibited zero knockdown effect on the specimens (Figure 7).

Figure 7: 2010 Time-% Knockdown Curves of Bottle Assays for ANVIL® 10+10 (22.17µg/ml)

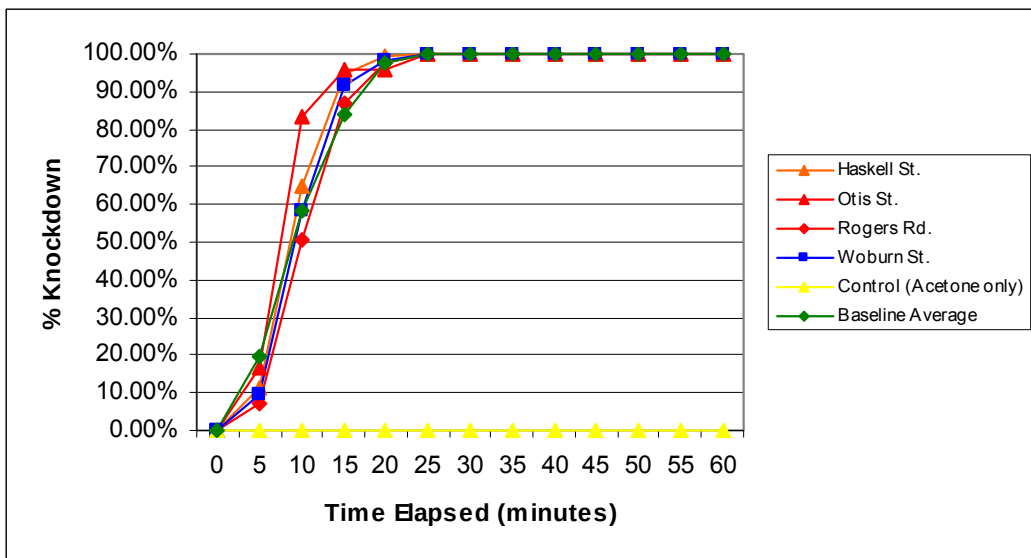
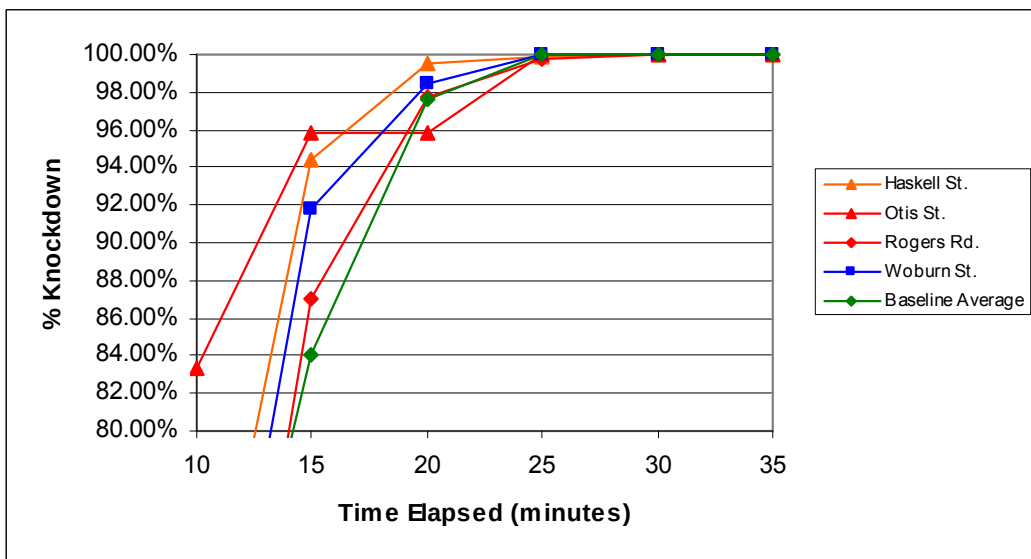


Figure 8: 2010 Time-% Knockdown Curves of Bottle Assays (2) for ANVIL® 10+10 (22.17µg/ml)



The 2011 bottle assays were very similar to the previous year, with all sites within the spectrum of the baseline average (Figures 9, 10). Overall, all of the specimens were knocked down by the 30 minute mark, with 97.60% and 99.69% down at the 20 and 25 minute marks respectively. The control bottles coated with acetone alone had zero knockdown effect as one would expect (Figure 9).

Figure 9: 2011 Time-% Knockdown Curves of Bottle Assays for ANVIL® 10+10 (22.17µg/ml)

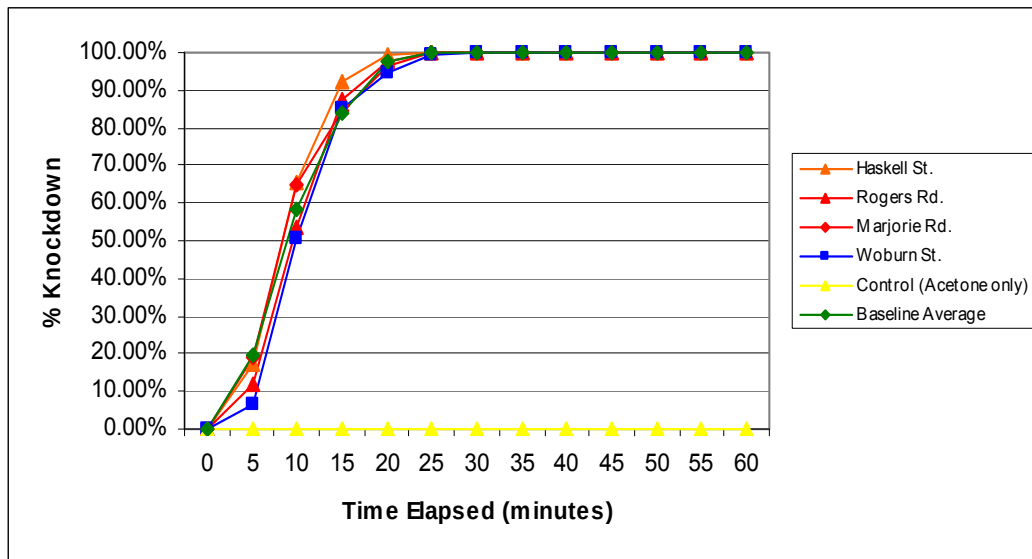
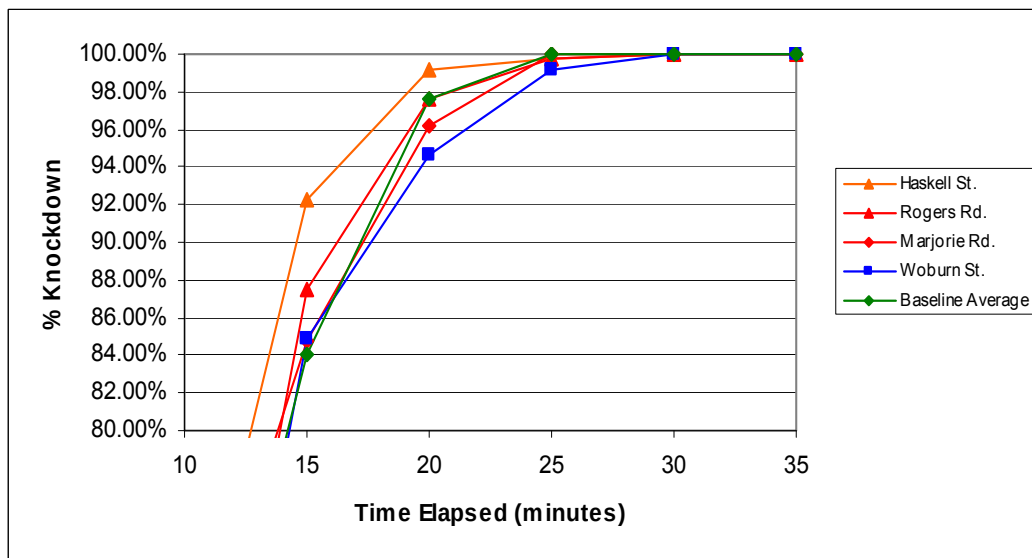


Figure 10: 2011 Time-% Knockdown Curves of Bottle Assays (2) for ANVIL® 10+10 (22.17µg/ml)



The bottle assay results from the 2012 season continued to reflect the baseline averages (Figures 11, 12). Overall, 99.94% of the specimens were knocked down by the 30 minute mark, with 96.23% and 99.74% down at the 20 and 25 minute marks respectively. The acetone only coated bottles had zero knockdown effect (Figure 11).

Figure 11: 2012 Time-% Knockdown Curves of Bottle Assays for ANVIL® 10+10 (22.17µg/ml)

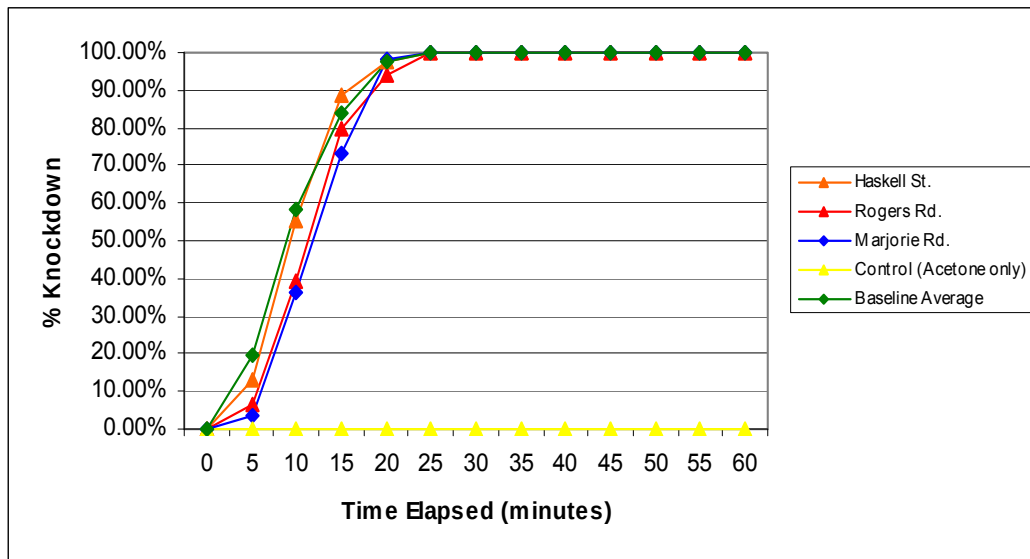
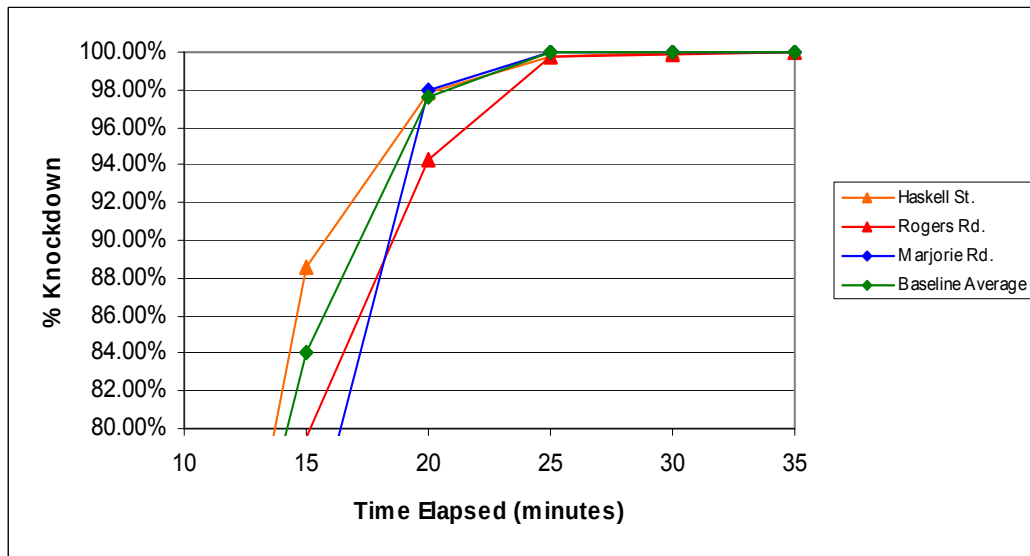


Figure 12: 2012 Time-% Knockdown Curves of Bottle Assays (2) for ANVIL® 10+10 (22.17µg/ml)



The bottle assay results from the 2013 season were slightly off the baseline averages (Figures 13, 14). Overall, 97.78% of the specimens were knocked down by the 30 minute mark, with 93.13% down at the 25 minute mark. The few remaining individual specimens became knocked down shortly after. The acetone only coated bottles had zero knockdown effect (Figure 13).

Figure 13: 2013 Time-% Knockdown Curves of Bottle Assays for ANVIL® 10+10 (22.17µg/ml)

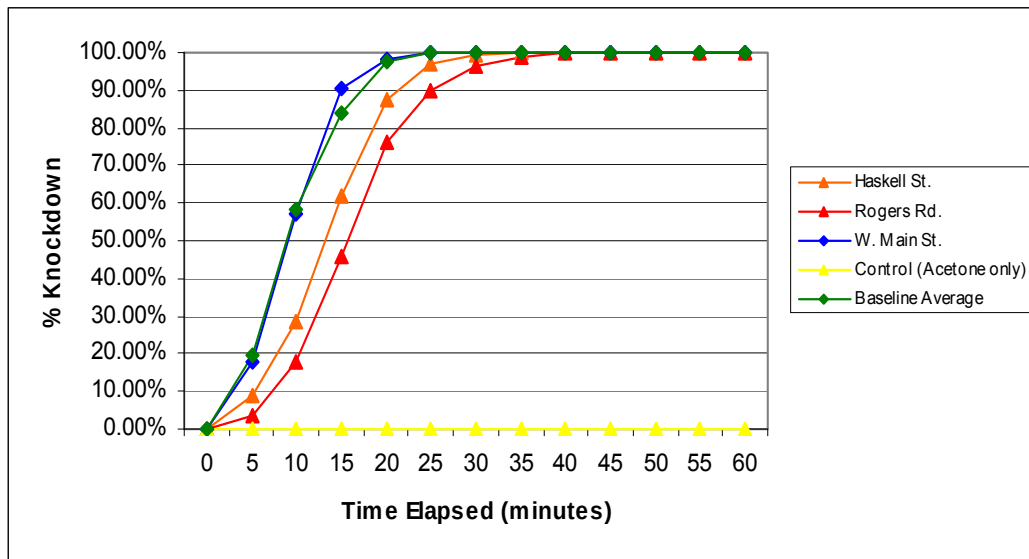
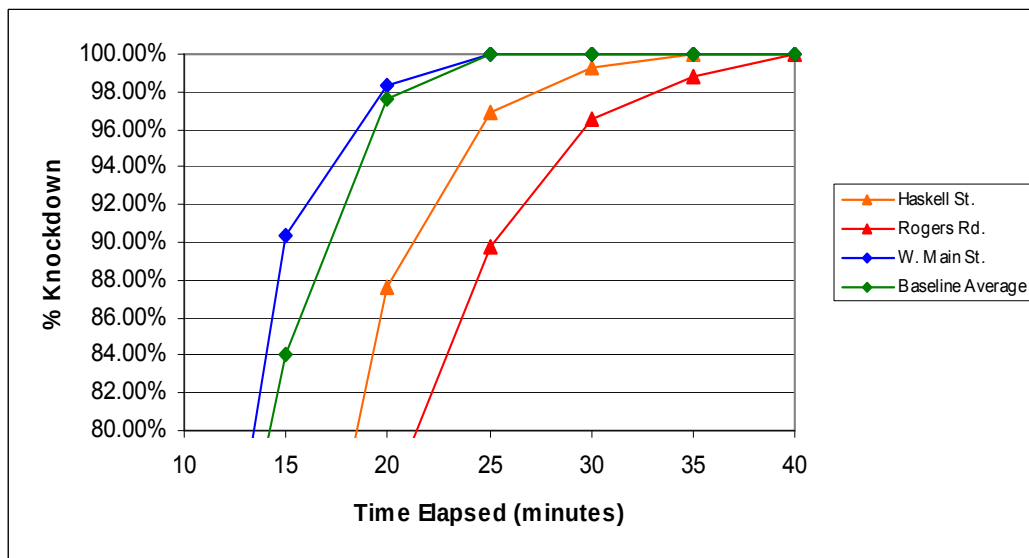


Figure 14: 2013 Time-% Knockdown Curves of Bottle Assays (2) for ANVIL® 10+10 (22.17µg/ml)



The bottle assay results from this past season indicated a slower knockdown curve compared to the original basement average (Figures 15, 16). Despite this reduction, overall there remained a 96.26% knockdown at the 30 minute mark. Few individual mosquito specimens remained after this point for varying amounts of time. The acetone only coated bottles had negligible knockdown effect as the bottle assay control (Figure 15).

Figure 15: 2014 Time-% Knockdown Curves of Bottle Assays for ANVIL® 10+10 (22.17µg/ml)

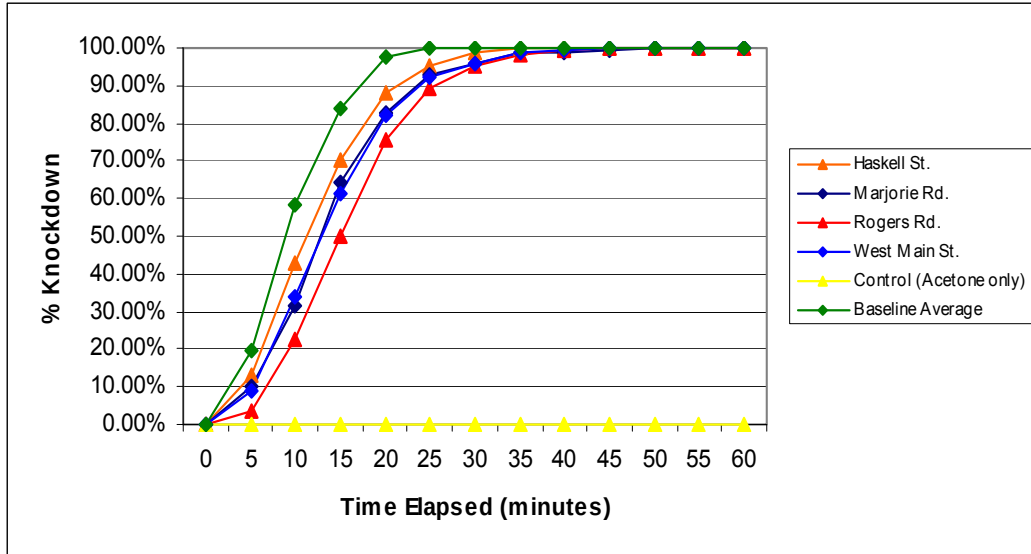
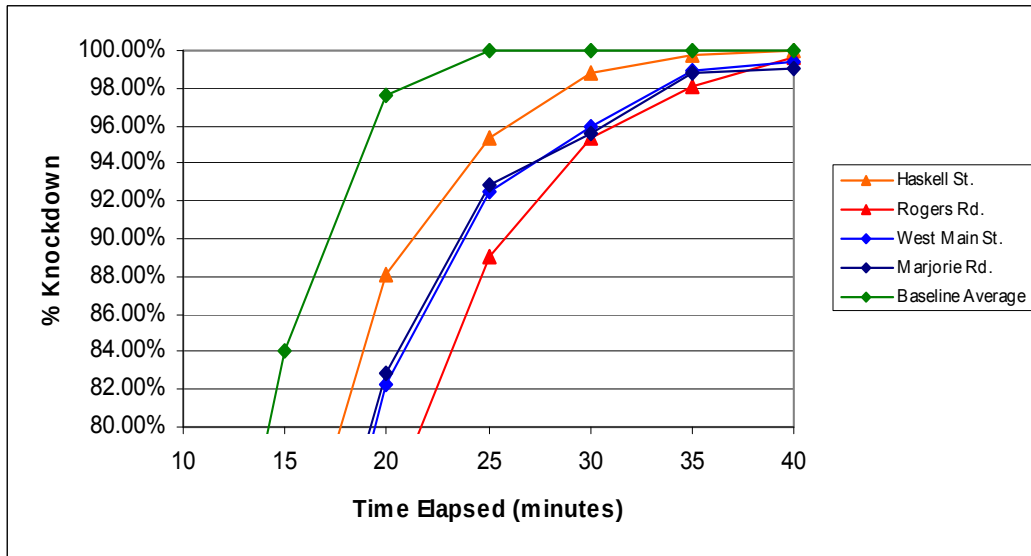
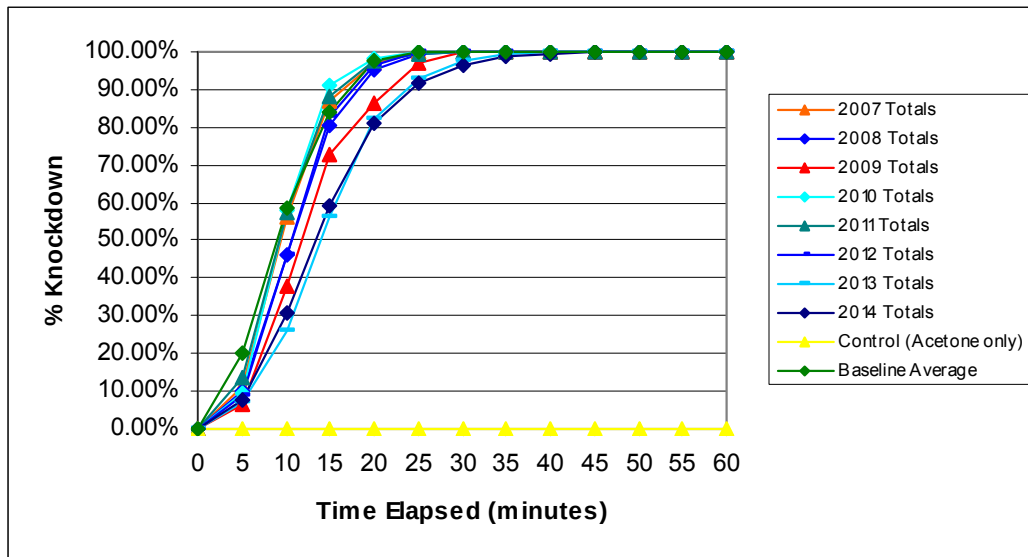


Figure 16: 2014 Time-% Knockdown Curves of Bottle Assays (2) for ANVIL® 10+10 (22.17µg/ml)



Looking at the yearly totals from the eight seasons of bottle assays, one can observe that the knockdown rate has been relatively consistent around the baseline average. Three years, 2009 and the past two seasons had knockdown rates that were slightly lower than the baseline average. The acetone only coated bottles have consistently provided a proper control measure with non-significant knockdown (Figure 17).

Figure 17: Yearly Comparison of Time-% Knockdown Curves of Bottle Assays for ANVIL® 10+10 (22.17µg/ml)



DISCUSSION

The results of the bottle assays continue to 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 40 cities and towns, with non-member municipalities having 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). It is anticipated that the primary adulticide product utilized by CMMCP will change to Zenivex® E20 (EPA Reg. No. 2724-791). Bottle assays will need to be modified if this chemical change occurs. One attractive feature of this synthetic pyrethroid is the absence of PBO synergist.

Bottle assays in subsequent seasons will provide additional data for resistance management in the CMMCP service area. In conclusion, the results of the bottle assay 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. The slight decrease in knockdown rate observed the past two seasons is noted, and only reinforces the importance of this program moving forward. As shown this past season, resistance surveillance is a vital tool to ensure control practices remain effective in protecting the public health.

ACKNOWLEDGEMENTS

I would like to thank the following people and groups for their help and guidance throughout this project: Timothy Deschamps, Timothy McGlinchy, Jamas Branchaud, past research assistants, and The Central Mass. Mosquito Control Project Commissioners.

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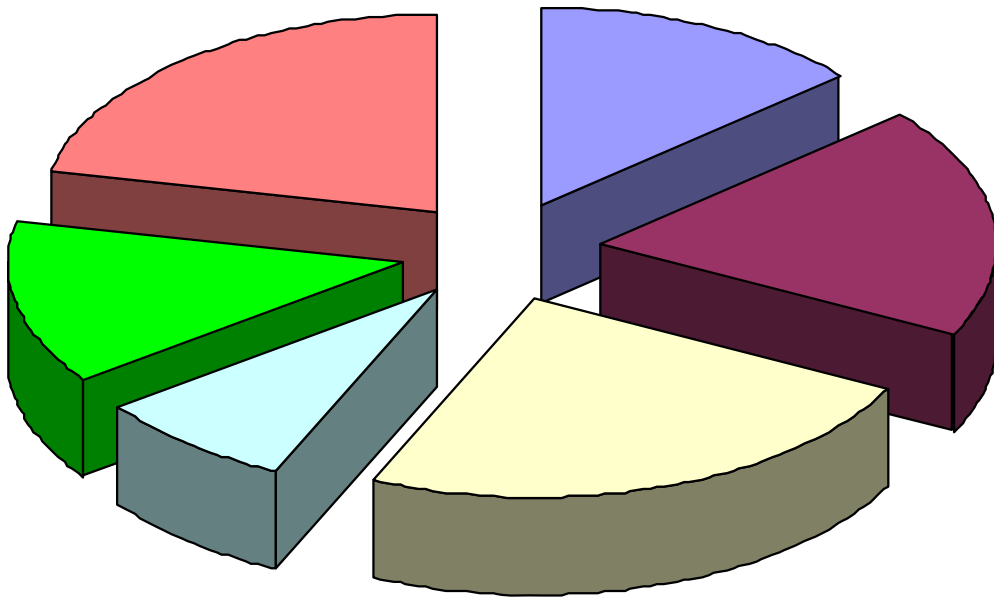
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CENTRAL MASS MOSQUITO CONTROL PROJECT

www.cmmcp.org



RESIDENT SURVEY 2014

INTRODUCTION

Member residents request assistance 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 these requests 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 received service in 2014 to determine if our staff was meeting acceptable levels of customer satisfaction. This is the same survey that was done in 2005-2013 (excluding 2006). 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.

SURVEY METHODOLOGY

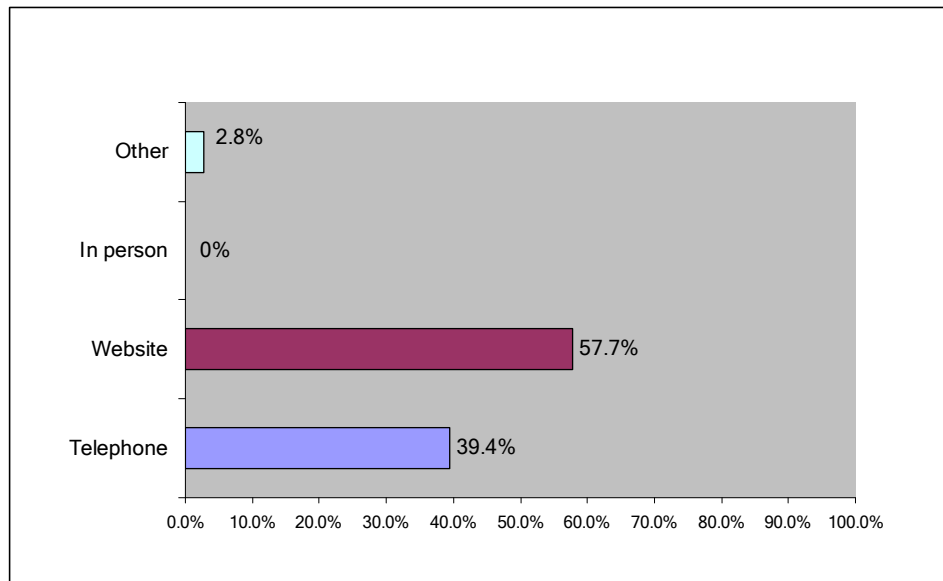
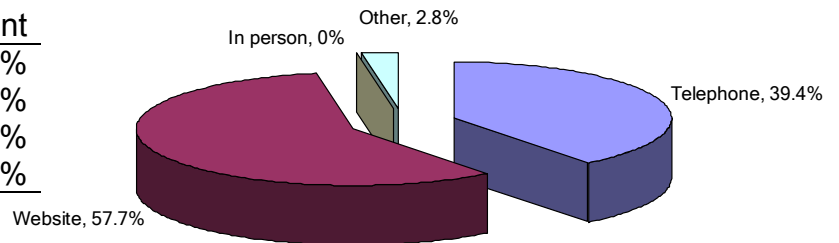
In 2014 we received 15,738 requests for service, ranging from adulticiding to larval control, an increase of 15.3% from 2013 (13,646). 9,091 adulticiding calls were filtered (duplicates removed) and placed into a separate database. Service calls were sorted according to town, and each town was tabulated for total requests received in 2014. 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 has determined that 1,500 postcards would be a representative sample of the service calls received this year (this is an increase of 500 over the first 3 surveys but the same as 2009-2013). The survey was designed to be as easy as possible for residents to access and complete. An online survey was created through SurveyMonkey®, and the postcards would include unique identifiers that the residents would use. The postcards contained a blind weblink to the survey so that uninvited 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 all previous resident surveys.

From 1,500 postcards mailed, 213 responses were received (14.2%). The results are outlined in this report.

TIMOTHY D. DESCHAMPS, Executive Director
Central Mass. Mosquito Control Project
111 Otis Street Northborough, Massachusetts 01532
www.cmmcp.org ♦ deschamps@cmmcp.org

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

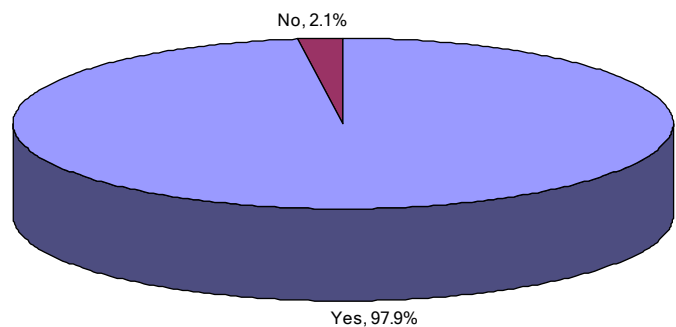
	Number	Percent
Telephone	84	39.4%
Website	123	57.7%
In person	0	0%
Other	6	2.8%
Total	213	



Comments: the website outpaces the phone system as the most popular method of reaching our staff.

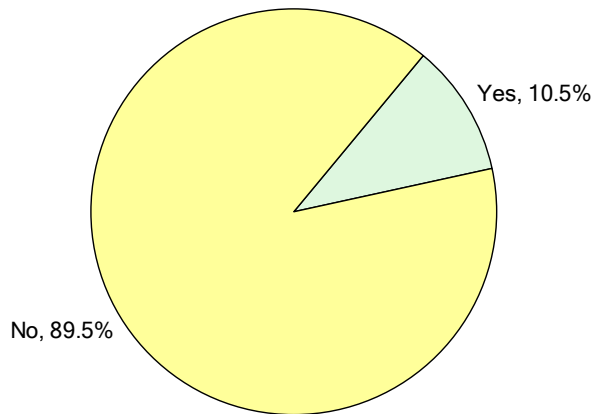
2). If by telephone or in person at the CMMCP office, were your questions or concerns answered to your satisfaction?

	Number	Percent
Yes	95	97.9%
No	2	2.1%
Total	97	

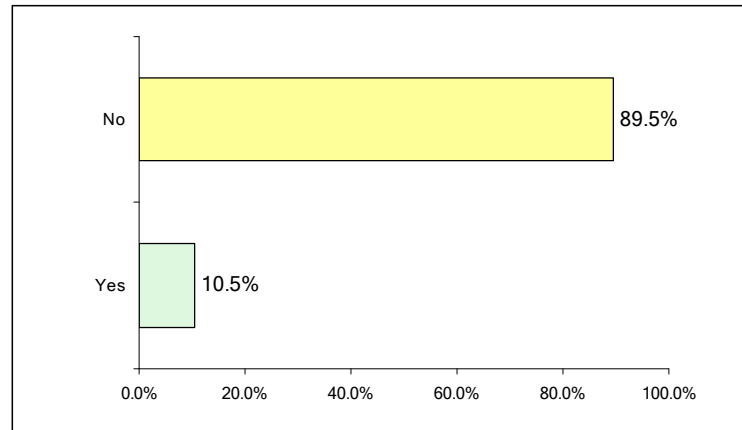


Comments: communication from the operators of the telephone system is clear and effective.

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



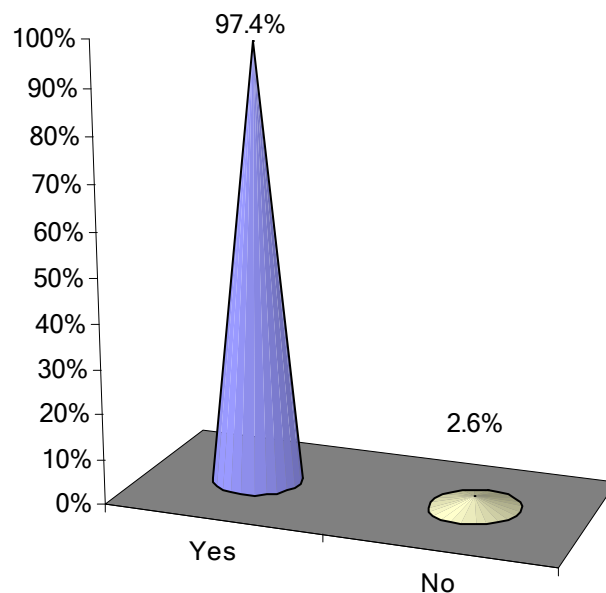
	Number	Percent
Yes	10	10.5%
No	85	89.5%
Total	95	



Comments: nearly 90% of residents polled did not experience any problems reaching our staff through the current system.

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

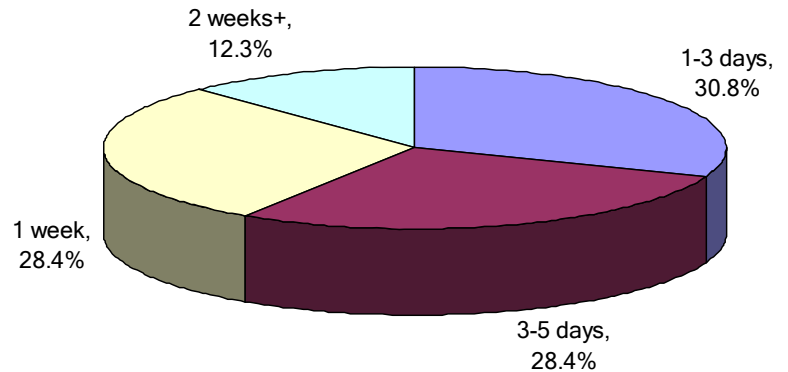
	Number	Percent
Yes	150	97.4%
No	4	2.6%
Total	154	



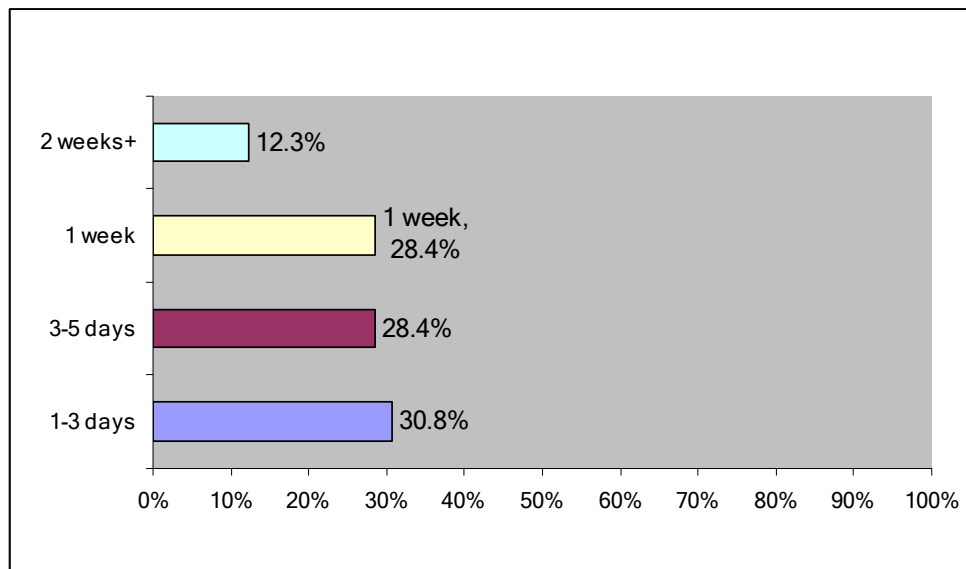
Comments: nearly all respondents found the information they required on the website without difficulty.

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

	Number	Percent
1-3 days	65	30.8%
3-5 days	60	28.4%
1 week	60	28.4%
2 weeks+	26	12.3%
Total	211	



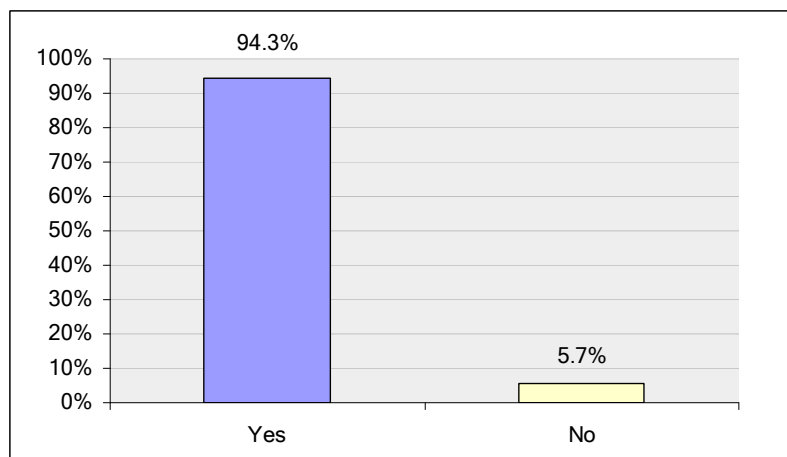
Comments: 87.7% were serviced within one week or less



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

	Number	Percent
Yes	199	94.3%
No	12	5.7%
Total	211	

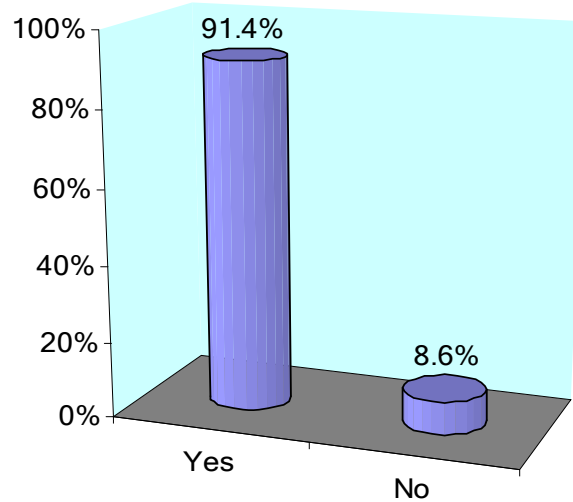
Comments: a majority thought that the response time was reasonable.



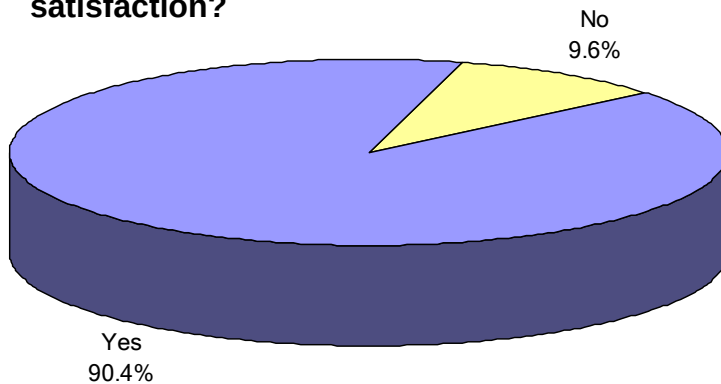
7). When you received service, did our field representative appear knowledgeable and competent about his/her profession?

	Number	Percent
Yes	181	91.4%
No	17	8.6%
Total	198	

Comments: Our staff projects a positive and professional image to the public. Of the respondents that said no, many stated they did not speak to a rep. from CMMCP.



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



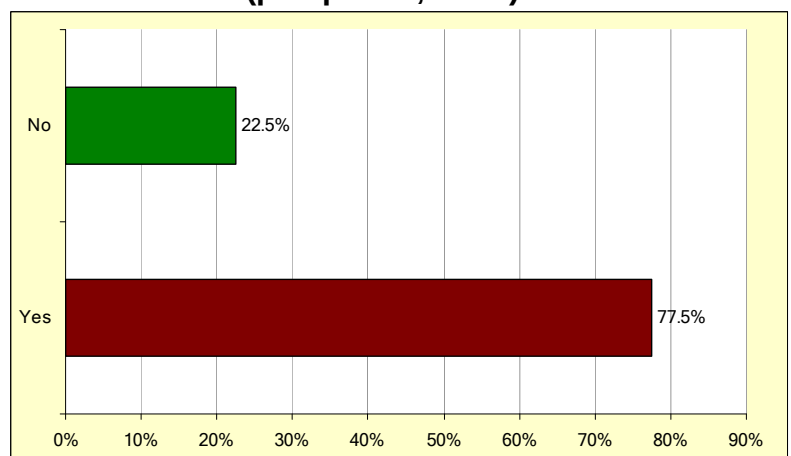
	Number	Percent
Yes	179	90.4%
No	19	9.6%
Total	198	

Comments: most residents polled thought our Technicians answered their questions to their satisfaction.

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

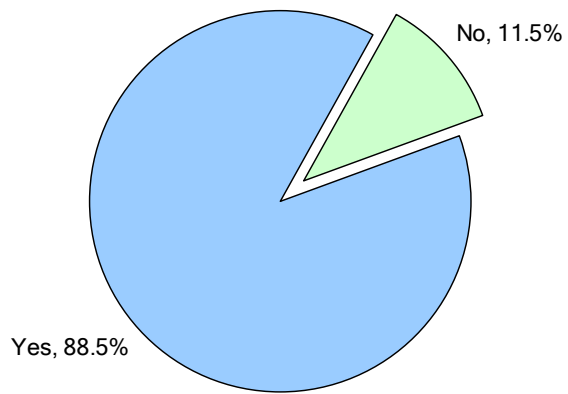
	Number	Percent
Yes	162	77.5%
No	47	22.5%
Total	209	

Comments: more residents are receiving our written information and this number has improved or held steady from year to year.



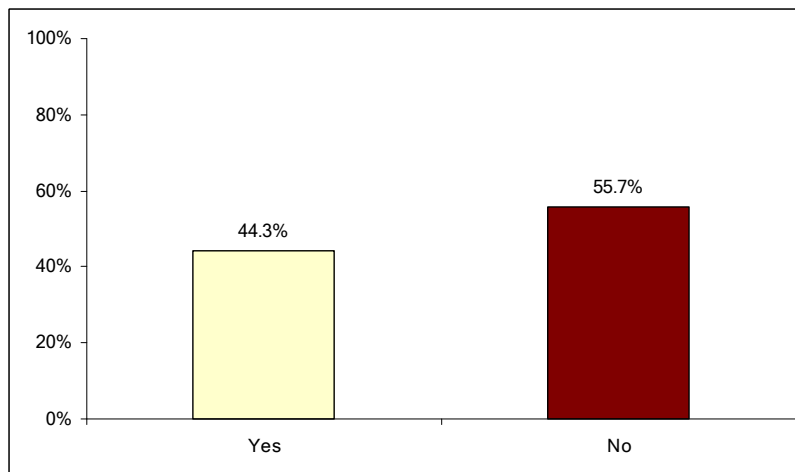
10). Did you find this information useful?

	Number	Percent
Yes	154	88.5%
No	20	11.5%
Total	174	



Comments: our written educational materials are useful to residents when they receive it.

11). Did you request service more than once in 2014?

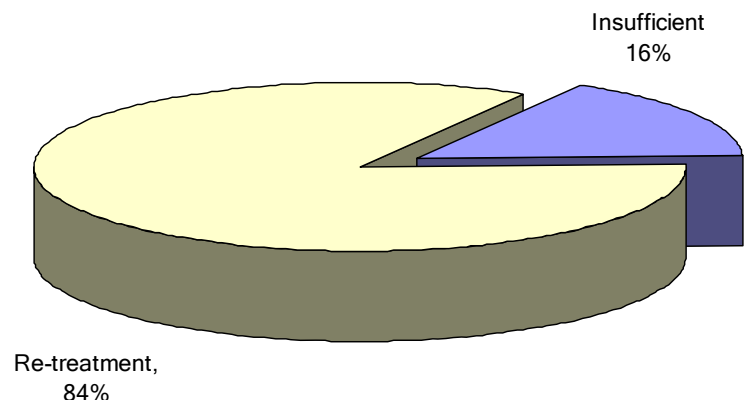


	Number	Percent
Yes	93	44.3%
No	117	55.7%
Total	251	

Comments: less than 1/2 of our service calls are repeat calls according to the residents polled.

12). If you requested additional service in 2014, was it because the original application was insufficient to meet your needs, or for a later re-treatment or follow up?

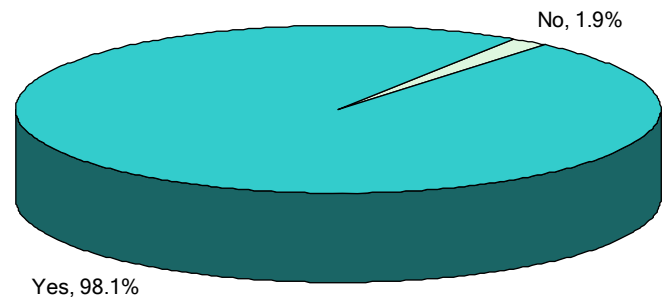
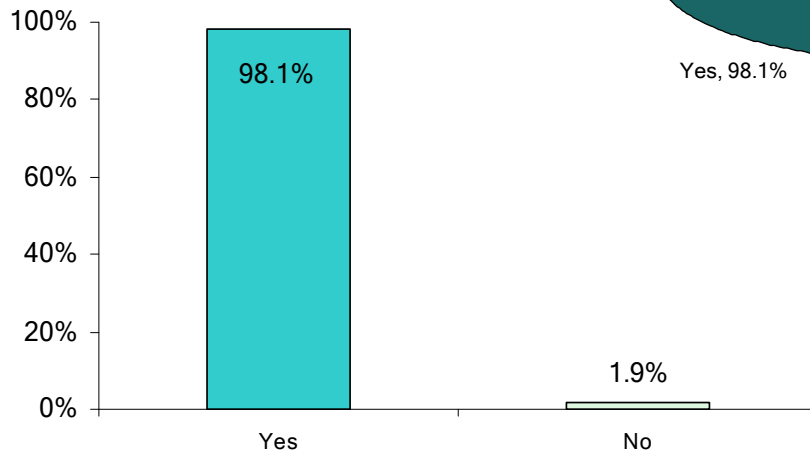
	Number	Percent
Retreatment	84	84%
Insufficient	16	16%
Total	100	



Comments: over 80% of our repeat calls are for additional service, not because the first application didn't meet their needs.

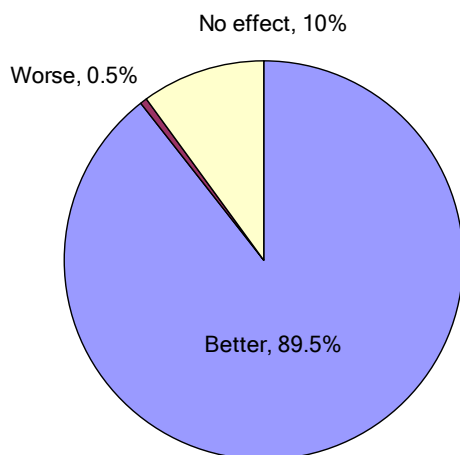
13). Would you/did you recommend our service to others in the future?

	Number	Percent
Yes	207	98.1%
No	4	1.9%
Total	211	

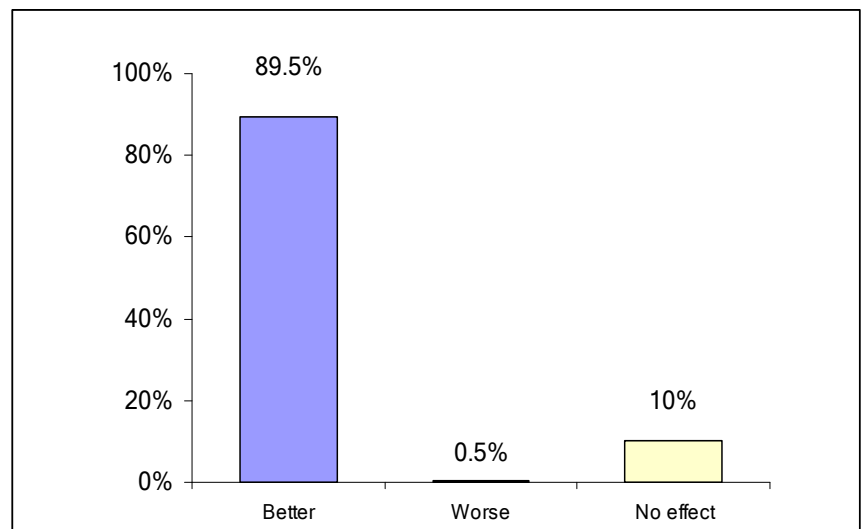


Comments: nearly all residents polled would recommend our services to others.

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

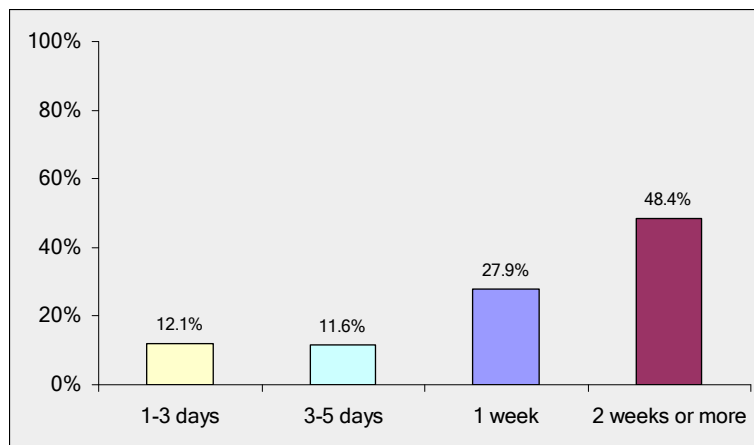


	Number	Percent
Better	188	89.5%
Worse	1	0.5%
No Effect	21	10%
Total	210	



Comments: nearly all residents received relief from mosquitoes from our program.

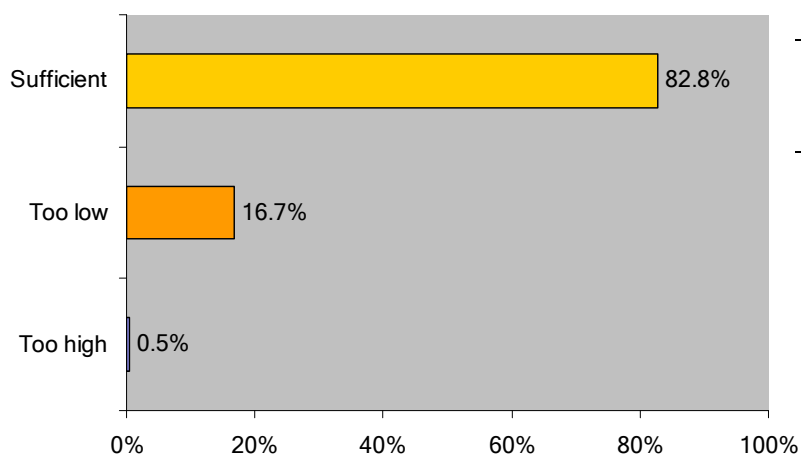
15). If you think your area improved, can you give an approximate length of time you experienced relief from mosquito annoyance?



	Number	Percent
1-3 days	23	12.1%
3-5 days	22	11.6%
1 week	53	27.9%
2 weeks+	92	48.4%
Total	190	

Comments: over 2/3 of residents reported relief of 1 week or more, nearly half report greater 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?

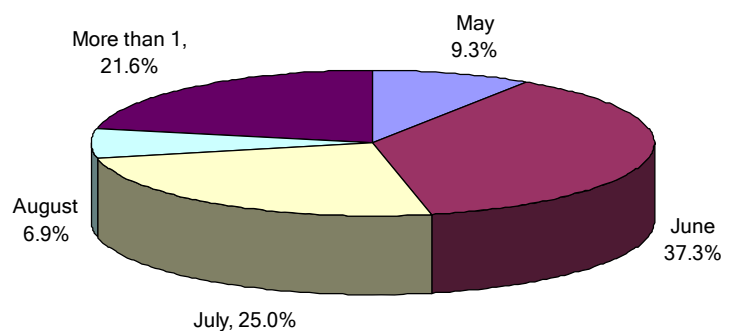


	Number	Percent
Sufficient	168	82.8%
Too Low	34	16.7%
Too High	1	0.5%
Total	203	

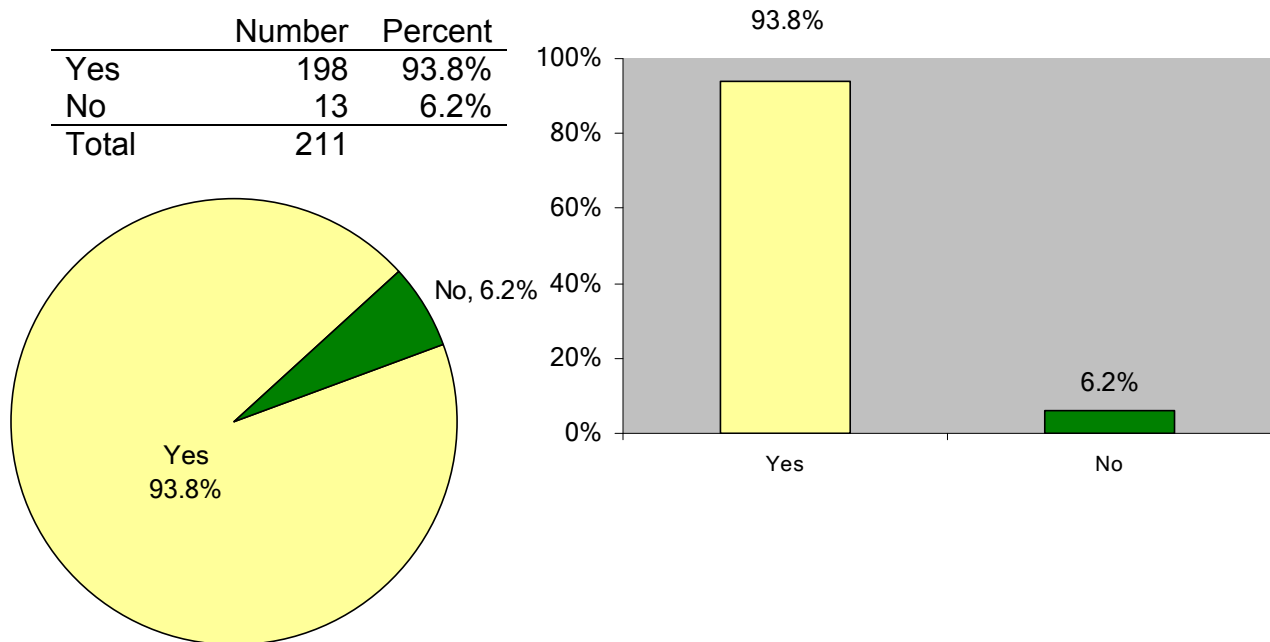
Comments: most residents are satisfied with the assessments paid from local taxes for our services.

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

	Number	Percent
May	19	9.3%
June	76	37.3%
July	51	25%
August	14	6.9%
More than 1	44	21.6%
Total	204	

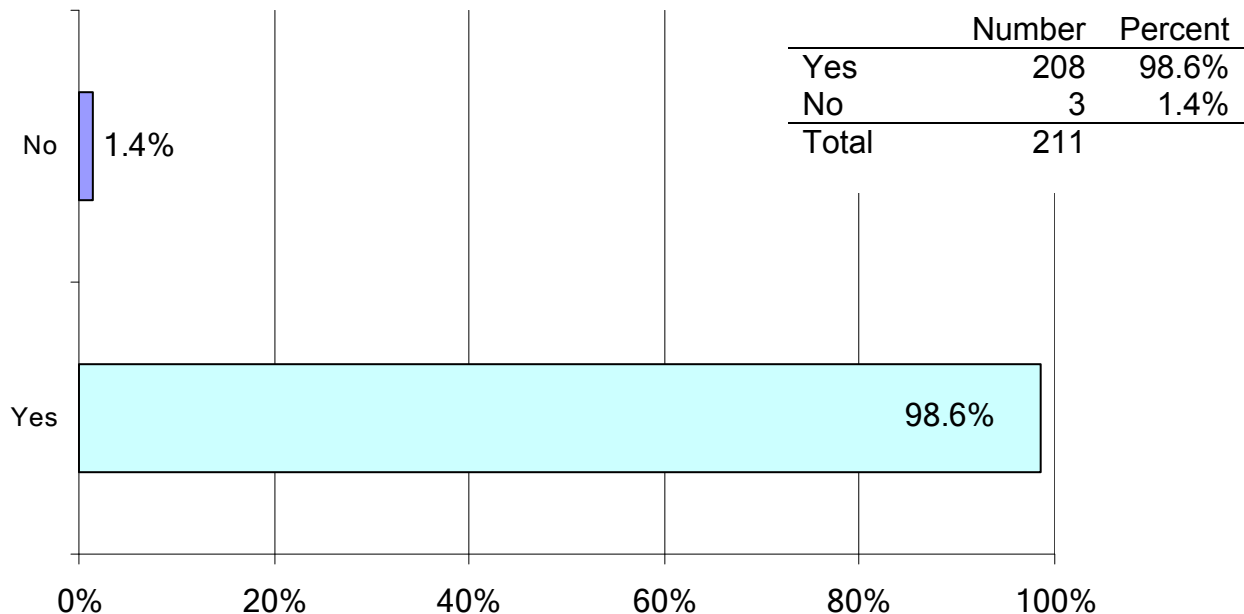


18). Overall, are you happy with the service provided this year by CMMCP?



Comments: over 9 out of 10 residents were happy with the services provided by CMMCP in 2014.

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

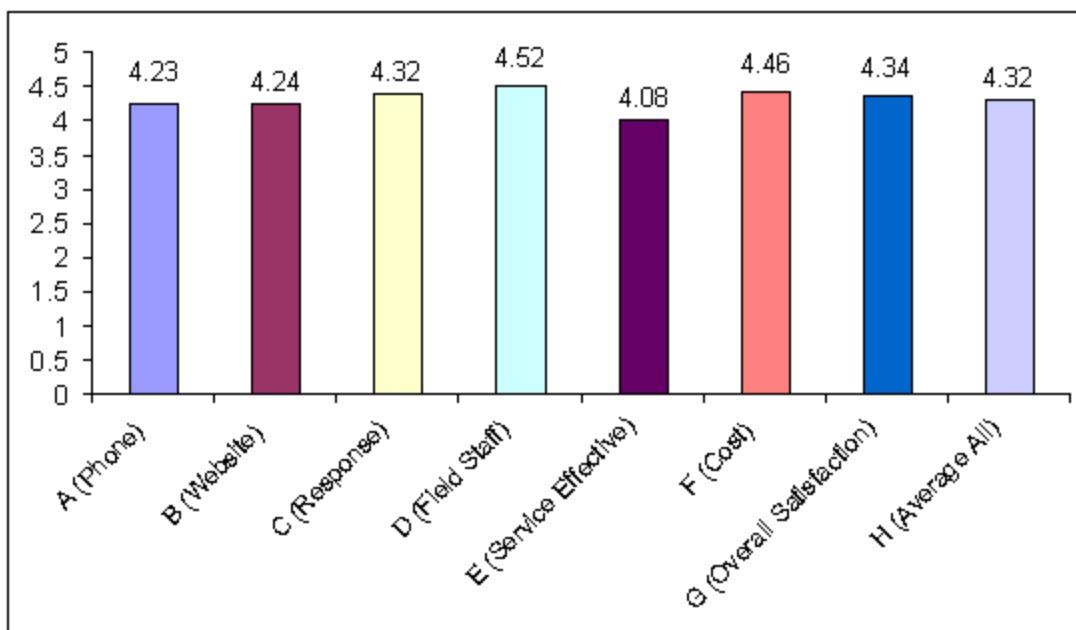


Comments: nearly all residents that used our service will do so again in the future.

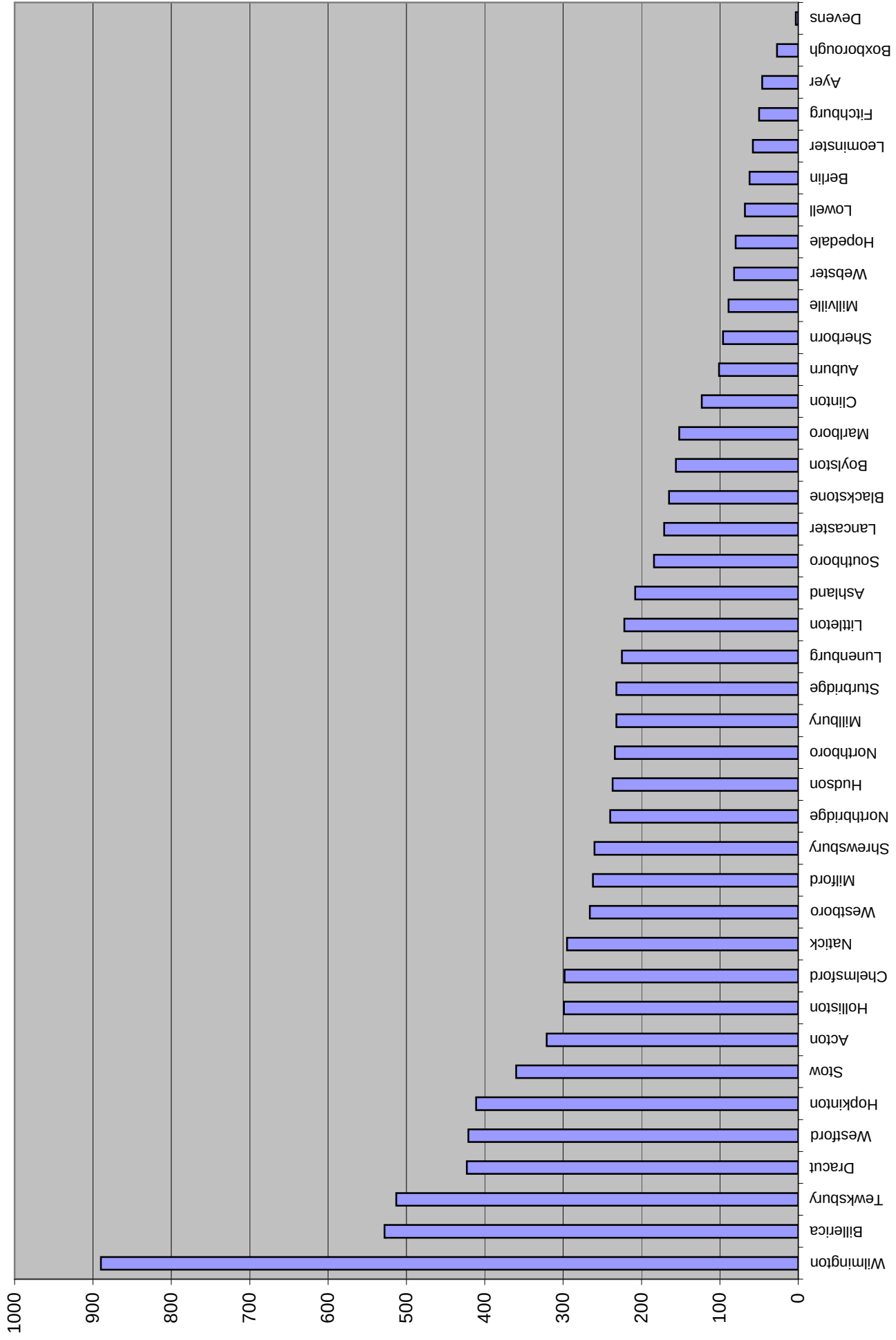
Please rate our performance for 2014 from 0 to 5, where 5 is the best rating, 0 is the worst rating:

- A. The information you received over the phone was informative & helpful: 419 points from 495 (99 respondents) – **4.23 average** from 5
- B. The information on our website is easily available and helpful: 751 points from 885 (177 respondents) – **4.24 average** from 5
- C. The response time for service is reasonable: 894 points out of 1,035 (207 respondents) – **4.32 average** from 5
- D. Our field staff that responded is knowledgeable and competent: 845 points out of 935 (187 respondents) – **4.52 average** from 5
- E. The service provided was effective: 845 points out of 1,035 (207 respondents) – **4.08 average** from 5
- F. This service is reasonable compared to the cost: 759 points out of 850 (170 respondents) – **4.46 average** from 5
- G. Please rate your overall satisfaction with the service received in 2014: 894 points out of 1,030 (206 respondents) – **4.34 average** from 5

Total satisfaction rating: 5,407 points out of 6,265 possible – 4.32 average
1,253 total responses to questions



2014 Service Requests by Town



CONCLUSION

Overall satisfaction was 93.8%, and 98.6% would use our services again in the future. Answer to question #9 shows a steady increase over past years in regards to residents receiving public relations materials. Overall this survey shows high satisfaction amongst the respondents, with some variability in some ratings than in past surveys.



Reprints of this document are available by calling our office at (508) 393-3055 or sending an e-mail to cmmcp@cmmcp.org. This survey has been sent to all cities and towns in our service area, as well as members of the State Reclamation & Mosquito Control Board. This has also been posted on our website on the "Research and Efficacy" link (from the "Our Services" page).

The author would like to thank the staff at CMMCP and the CMMCP Commission, and especially the residents and public officials in the member cities and towns we provided service to in 2014.

CMMCP AERIAL MOSQUITO LARVAL CONTROL PROGRAM



SPRING 2014

FRANK H. CORNINE III & TIMOTHY D. DESCHAMPS

Central Mass. Mosquito Control Project
111 Otis Street Northborough, MA 01532
(508) 393-3055 • www.cmmcp.org



AERIAL MOSQUITO LARVAL CONTROL PROGRAM – SPRING 2014

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ABSTRACT

The Central Mass. Mosquito Control Project has the capacity to utilize aerial applications of mosquito larvicide to reduce the number of early summer pestiferous adult mosquitoes. This program is a supplement to the ground-based larvicide program, and targets larger, inaccessible wetland bodies with *Bacillus thuringiensis israelensis* granules. Participating towns in the 2014 spring aerial larvicide application included Billerica, Boxborough, and Chelmsford. The application for all three towns took place over two days, April 22nd and 23rd. Pre- and post application larval surveillance showed an 85.93% overall reduction in the emergence of spring mosquito species at treated monitoring sites, while untreated areas displayed a population decline of 20.18%.

OBJECTIVE

Following a winter that left sufficient snow pack on the region, the temporary woodland pools of the Central Mass. Mosquito Control Project (CMMCP) service area were suitable for mosquito development. *Ochlerotatus abserratus* and *Ochlerotatus excrucians* are two mosquito species in particular that this type of habitat fosters each spring. Both of these species are quite pestiferous, but fortunately are univoltine, having only one generation per year. Any eggs laid by the adults of this species will not hatch until the following spring. In addition to *Oc. abserratus* and *Oc. excrucians*, the species *Ochlerotatus canadensis* may develop in these temporary pools, but unlike the other two species, *Oc. canadensis* can be multivoltine. This species may therefore have multiple generations, and more troublesome, can harbor West Nile virus and Eastern Equine Encephalitis among others (Andreadis 2005). Due to their early season emergence, these species tend to account for most of the mosquito related issues in the beginning portion of

the summer months. A greater level of control can be achieved by addressing these mosquitoes when they are still in the larval stage, as opposed to the adult stage. Once on the wing, these adult mosquitoes can disperse making it more difficult to reach the same degree of control as found in the aerial larvicide application. By targeting *Oc. abserratus*, *Oc. excrucians*, and *Oc. canadensis*, a significant number of pestiferous mosquitoes can be reduced, and in the case of *Oc. canadensis*, a potential vector of mosquito-borne disease.

METHODS AND MATERIALS

As with previous aerial larvicide applications by CMMCP, *Bacillus thuringiensis israelensis* (Bti), under the product name of VectoBac G® (EPA Reg. No. 73049-10), was used to reduce the number of mosquito larvae in target areas. Bti is a bacterium that naturally occurs in certain soils, and when applied to an application medium can be utilized as a larvicide. The “biopesticide” product used in this aerial application is the same one that is used

in the ground larvicide program of CMMCP (CMMCP 2014). Control is achieved through this bacterium strain when a target specific toxin is created and ingested by the mosquito larvae. Normal digestion is disrupted within the larvae, and typically results in control within a 48 hour window (Extension Toxicology Network 1996). With the approach of pupation, feeding begins to slow for mosquito larvae in the 4th instar stage and is nonexistent once pupation occurs. Because of this factor the Bti product is most effective in the early to mid larval development. The application rate of VectoBac G® used for this aerial application was 5lbs/acre (2.5-10lbs/acre label range) (low rate; VectoBac G® label).

North Fork Helicopters (Cutchogue, New York) was chosen to perform the aerial application with CMMCP assisting at the staging areas. Several factors were involved in the selection of aerial targets. These included historical mosquito activity, proximity to human activity, pre-application surveillance, and size. Targeted wetlands tend to be at least 5 acres and difficult to treat by field technicians on the ground. These wetland bodies are categorized through DEP as wooded swamp, deciduous, conifer, mixed, shallow marsh, or shrub swamp (MassGIS 2013). Other wetlands in the area not meeting these classifications are investigated and treated by CMMCP field technicians if warranted through ground larviciding. The Billerica and Chelmsford portion of the application took place on April 22nd, using Warren Farm in Chelmsford as a staging area for the helicopter. The Boxborough portion of the aerial larvicide program was conducted the following day, April 23rd. Minute Man

Airfield (Stow, MA) was used as a staging area for the Boxborough application. In 2014 approximately 600, 880, and 540 acres were designated for treatment in Billerica, Boxborough, and Chelmsford respectively. As per 333CMR 13.04 (7) a legal notification of the aerial larvicide was placed in The Boston Globe on February 5th, 2014, and also posted on the CMMCP website (<http://www.cmmcp.org/>) (Appendix A).

The Generic Environmental Impact Report (GEIR) establishes a standard for monitoring aerial applications in Massachusetts (Massachusetts Department of Agricultural Resources 1998). This protocol involves recoverable dip stations (RDS) where each town involved must contain at least one treatment RDS for every 250 acres treated. For a control comparison, an additional RDS outside the application areas must be established for each town. The relative level of control achieved by the aerial intervention can then be determined by comparing the larval amounts observed prior to the application to afterwards. At target wetlands selected to become RDS, ten positions are marked and larval surveillance occurs at each, prior to and following the aerial application. This also occurs at the untreated site designated to be the control RDS for each town. Documented observations include the number of mosquito larvae and instar stage, as well as presence or absence of Bti granules following the application. When sampling prior to the application, any larvae collected are immediately returned to the RDS as to not skew the post-application results. Larvae may be collected from other areas of the target wetlands to determine what mosquito species are

present at time of application.

RESULTS

The Billerica, Boxborough, and Chelmsford treatment RDS indicate that the 2014 spring aerial larvicide had an overall observed larval reduction of 85.93% from pre-application levels.

Individually, the Billerica treatment RDS exhibited a 95.45% decrease, the Boxborough treatment RDS a 49.38% decrease, and the Chelmsford treatment RDS showed an 87.29% decrease. There was an overall decrease of 20.18% from pretreatment levels for the three untreated (control) RDS (Table 1; Figures 1-4).

Table 1: Larval Surveillance of Treatment and Control RDS

Treatment Sites	Pre-application	Post-application	Observed Change
BIL116	111	5	-95.50%
BIL112	73	3	-95.89%
BIL408	146	7	-95.21%
BOX128	11	5	-54.55%
BOX8	18	7	-61.11%
BOX92	31	14	-54.84%
BOX121	32	20	-37.50%
CHM81	21	0	-100.00%
CHM279	35	5	-85.71%
CHM236	62	10	-83.87%
Control Sites	Pre-application	Post-application	Observed Change
BIL227	110	71	-35.45%
ACT37	64	54	-15.63%
CHM146	44	49	11.36%
Overall:	218	174	-20.18%
BIL227	110	71	-35.45%

Figure 1: Billerica Treatment RDS Results Pre- and Post Application

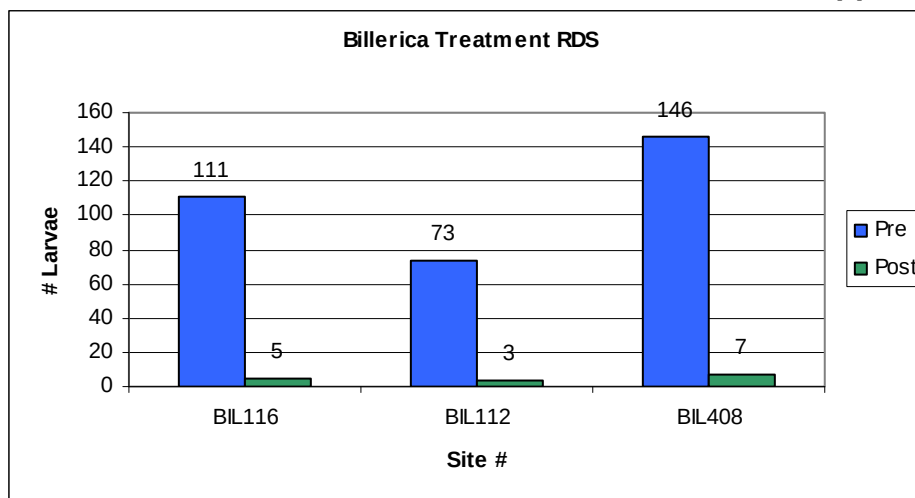


Figure 2: Boxborough Treatment RDS Results Pre- and Post Application

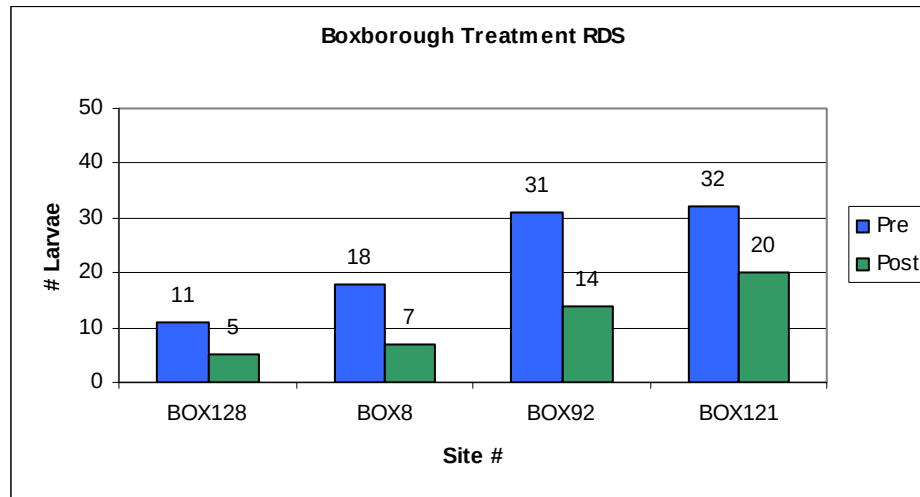


Figure 3: Chelmsford Treatment RDS Results Pre- and Post Application

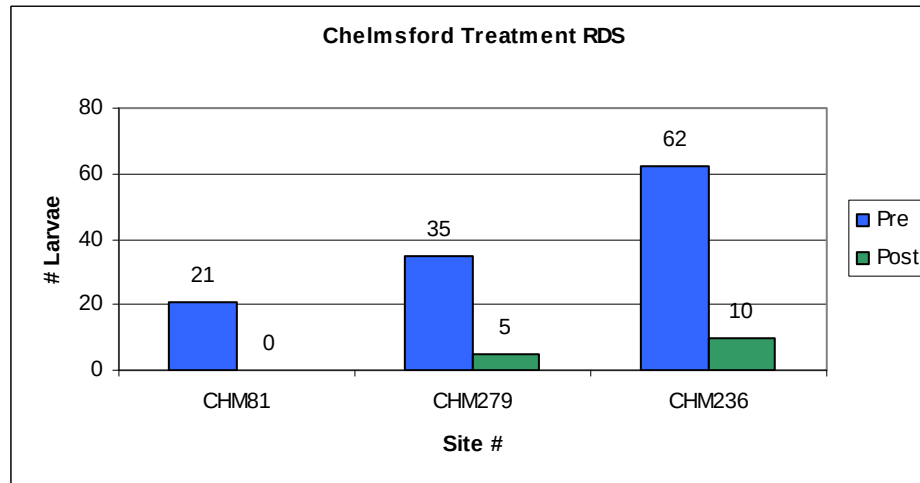
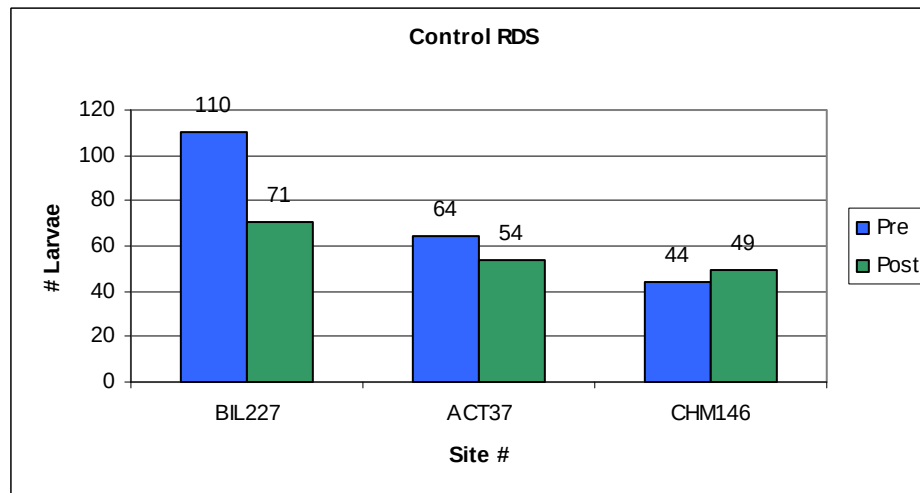


Figure 4: Control RDS Results Pre- and Post Application



DISCUSSION

Larval inspections prior to the application indicated suitable levels of mosquito development for the intervention. The application for Billerica and Chelmsford was planned for and conducted on April 22nd, with Boxborough anticipated for the following day. Despite challenging weather conditions involving wind and rain, the Boxborough portion of the aerial larvicide was finished on April 23rd. Through post-application surveillance, it was shown that the treatment events resulted in a high level of control with an 85.93% overall reduction in target mosquito species. The 20.18% decrease observed in mosquito larvae at untreated control sites seems to lessen the significance of these findings, but it should also be noted that the rain events did expand the size of control areas following the initial observations. Traditionally there tends to be a slight increase in mosquito larvae abundance at these sites. With significant rains expanding the pools, dilution of larvae concentration was likely.

All of the Billerica and Chelmsford treatment RDS had thorough Bti coverage, but some of the RDS for Boxborough experienced intermittent product around the surveillance flags, as well as low numbers recorded in some dip stations prior to the application. These situations simulated a lower than anticipated rate of control for Boxborough. Although larvicide product may have been irregular at these particular RDS, subsequent investigations by technicians a few days later in several other treated wetland areas showed the majority of targeted wetlands in

Boxborough contained sufficient product and low/no larval counts. For future applications, the RDS's in Boxborough will be reviewed to insure that sufficient larval counts are recorded at each RDS to make a proper determination of control/lack of control.

Typically, *Oc. abserratus* and *Oc. excrucians* are the primary targets of this spring aerial larvicide, with the potential for some *Oc. canadensis* control. This was the situation observed for the 2014 aerial application as larval samples pointed toward further developed instars of *Oc. abserratus* and *Oc. excrucians* with a limited sample of early stage *Oc. canadensis* present. This spring aerial larvicide application has demonstrated significant control of mosquito larvae populations for the aforementioned species. As these mosquitoes constitute the majority of late spring/early summer pestiferous mosquitoes, this reduction should create a significant measure of relief for residents in the participating towns, as well as a decrease in the amount of adulticide intervention required. CMMCP will review all aspects of this program to ensure future applications experience continued success.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the towns of Billerica, Boxborough, and Chelmsford for participating in this program; North Fork Helicopters for conducting the aerial application; Clarke Mosquito Control Products for supplying the Vectobac G®; Don McPherson of Minute Man Airfield, Stow and Frank Warren of Warren Farm, Chelmsford for providing loading zones; the CMMCP Commission, and the CMMCP staff for

larval monitoring, larval identification, site selection, map development and assisting with the helicopter application.

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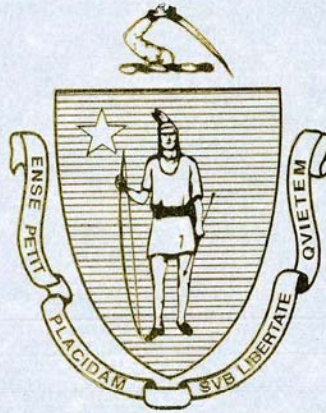
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The Boston Globe

BURKEM

Performance Recognition



*In recognition of your contribution
to the goals of*

State Reclamation and Mosquito Control Board

The Commonwealth of Massachusetts presents the

Citation for Outstanding Performance

to

Central Massachusetts Mosquito Control Project

on this 7th day of May 2014

Agency Head

A large, stylized blue ink signature of the Governor of Massachusetts is written over the word "Governor".

Governor

2014 SUMMARY

The Central Massachusetts Mosquito Control Project (the Project) currently provides its services to 40 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 2014 the Project received fifteen thousand, seven hundred and thirty-seven (15,737) requests for service from town residents and officials. Ten thousand and ten (10,010) pounds of Bti (*Bacillus thuringiensis israelensis*) was applied by helicopter over two thousand and two (2,002) acres in 3 towns, Chelmsford, Billerica & Boxborough, and four thousand, eight hundred and fifty-eight (4,858) pounds by hand over nine hundred and seventy-one (971) acres throughout our service area were applied to area wetlands to reduce the emergence of adult mosquitoes. This represents over two thousand, nine hundred and seventh-four (2,974) acres of wetland that was treated with this mosquito-specific bacterium, significantly reducing adult mosquito populations in these areas. Sixty six thousand, four hundred and sixty-seven (66,467) 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. Two thousand, eight hundred and thirty-three (2,833) 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 two hundred and fifteen thousand, nine hundred and twenty-nine (215,929) feet of streams, brooks and ditches. This represents nearly forty-one (41) miles of waterways which were cleaned and improved by Project personnel in 2014.

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 2014, CMMCP laboratory personnel and other administrative staff made fifty-eight (58) educational presentations before two thousand two hundred and sixty-five (2,265) students in thirteen (13) Elementary schools. CMMCP gave a presentation on our program to 8 Clarke University students in the Clarke Vector Ecology program and exhibited at six (6) public meetings such as health fairs, Earth Day celebrations and other public events. The administrative staff also presented to five (5) member community town boards at their request, three (3) member community cable access channels, seven (7) annual or special town meetings, and 1 requests from non-member town for information on our program. 2011 marked the start of the "CMMCP Mosquito Education Program for Seniors" in which presentations are conducted at local senior centers to increase mosquito-borne disease awareness. Four (4) presentations to 95 senior citizens were conducted in 2014 and this program continues to grow. Over 1,000 specialized brochures for this program were distributed through this program, funded by a grant received from the Northeastern Mosquito Control Association.

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. One thousand

and twenty-six (1,026) pools (collections) of mosquitoes totaling eighteen thousand, six hundred and ninety-seven (18,697) specimens were tested for mosquito-borne viruses this year. Two (2) collections were identified positive this year; one with West Nile Virus (WNV) and one with Eastern Equine Encephalitis (EEE)- details are available in the Medical Entomology report in this document. CMMCP lab personnel processed one thousand four hundred and fifty (1,450) collections of mosquitoes containing twenty three thousand, two hundred and sixty-three (23,263) individual specimens, representing ten (10) mosquito species.

Some additional highlights from 2014:

- 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 93.8%, 98.6% plan to use our services again (see full report).
- CMMCP participates in the EPA's WasteWise program, tracking our source reduction (tire recycling) efforts. Our efforts in this program were recognized by the EPA - Region 1 with an "Environmental Merit Award" for pesticide reduction.
- Our staff was recognized by the Commonwealth of Massachusetts with a "Citation for Outstanding Performance".

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 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.

For Earth Day 2010, CMMCP officially announced a tire recycling program added as a value added service to our member cities and towns. This program operates under grant monies received and the CMMCP operating budget. Tire piles provide suitable areas for larval mosquito development, including those species known to carry West Nile virus. During the course of one season, the potential exists for hundreds or even thousands of mosquitoes to emerge from just one tire. In 2014 we collected a total of two thousand, six hundred and forty-six (2,646) tires in thirty (30) member cities and towns - details are available in the Source Reduction/Tire Recycling report in this document. Collections will continue as time and resources allow.

We recently stated a pilot program for beaver mitigation in member communities. More information can be found by calling our office at (508) 393-3055 or on our website at www.cmmcp.org/beaver_program.htm.

We would like to thank you for your support during 2014 and we look forward to helping you and your community with its mosquito problems in 2015 and beyond.

Respectfully submitted,

Timothy D. Deschamps, Executive Director

TOWN OF NORTHBORO

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
01-06-14	Larval Site Survey GPS coordinates	Main Street, Moore Lane, Brewer Street, Pleasant Street, Lincoln Street, Hudson Street
02-11-14	Administrative Contact	Town Clerk's Office - Town's map
02-24-14	Larval Site Survey GPS coordinates	Bartlett Street, Bearfoot Road, Boundary Street
02-25-14	Larval Site Survey GPS coordinates	Lawrence Street, Southwest Cutoff, Church Street, Smith Road, West Street, Howard Street, Moore Lane, Stone Drive, Coolidge Circle, Carriage Hill Road, Oak Avenue
02-28-14	Exclusionary GPS coordinates	Brewer Street, Howard Street, Green Street, Tri Corner Circle, West Main Street, Green Street, Howard Street, Moore Lane, Overlook Park Drive, West Street, Crawford Street, Reservoir Road, Howard Street, Edmunds Way, Rice Avenue, Bartlett Street, Oak Avenue, Cedar Hill Road, Talbot Road, Lawrence Street, Smith Road, Coolidge Circle, Maynard Street, Moore Lane, Scott Lane, Mentzer Avenue, Church Street, Maple Lane, Warren Drive, Wesson Terrace, Copley Drive, John Edward Drive, Oak Avenue, Joseph Road, Balcom Drive, Patriot Drive, Summer Street, Winn Street, Juniper Brook Road, Sunset Drive, Wiles Farm Road, Chesterfield Road, Davis Street, Meadow Road, Northgate Road, Cedar Hill Road
03-10-14	Stream Cleaning 30'	Northgate Road
	Stream Cleaning 50'	Mayflower Road
	Stream Cleaning 20'	School Street
	Stream Cleaning 60'	Bearfoot Road
	Stream Cleaning 40'	Maynard Street
	Stream Cleaning 30'	Howard Street
	Stream Cleaning 30'	West Street
	Culvert Cleaning (26)	Davis Avenue, Adams Road, Longfellow Road, Northgate Road, Mayflower Road, Jefferson Road, School Street, Brigham Street, Collins Road, Maple Street, Rice Avenue, Colburn Street, Bearfoot Road, Maynard Street, Howard Street, Brewer Street, Church Street, West Street
03-14-14	Stream Cleaning 30'	Washburn Street
	Stream Cleaning 100'	Washburn Street
	Stream Cleaning 60'	Carriage Hill Road
	Stream Cleaning 20'	Church Street
	Culvert Cleaning (16)	Coolidge Circle, Morse Circle, Whitney Street, Washburn Street, Carriage Hill Road, Howard Street, Church Street
03-28-14	Larviciding	Coolidge Circle, Stone Drive, Smith Road, Church Street, Oak Avenue, Bearfoot Road, Carriage Hill Road, Moore Lane
04-01-14	Larval Survey	Oak Avenue, Carriage Hill Road, Bearfoot Road, Coolidge Circle, Stone Drive, Moore Lane, Smith Road, Church Street
04-03-14	Larviciding	Maynard Street
	Public Relations Larval Survey	Stone Drive Oak Avenue, Carriage Hill Road, Bearfoot Road, Coolidge Circle, Stone Drive, Moore Lane, Smith Road, Church Street
04-07-14	Larval Survey	Oak Avenue, Carriage Hill Road, Bearfoot Road, Coolidge Circle, Stone Drive, Moore Lane, Smith Road, Church Street
04-09-14	Larval Survey	Oak Avenue, Carriage Hill Road, Bearfoot Road, Coolidge Circle, Stone Drive, Moore Lane, Smith Road, Church Street
04-10-14	Larviciding Larval Survey	West Street, Southwest Cutoff, Otis Street Southwest Cutoff

TOWN OF NORTHBORO

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
04-11-14	Larviciding Larval Survey	Green Street, Howard Street, Moore Lane Green Street, Howard Street, Moore Lane, Oak Avenue, Carriage Hill Road, Bearfoot Road, Coolidge Circle, Stone Drive, Moore Lane, Smith Road, Church Street
04-16-14	Larval Survey	Oak Avenue, Carriage Hill Road, Bearfoot Road, Stone Drive, Coolidge Circle, Moore Lane, Smith Road, Church Street
04-18-14	Public Relations Larviciding	Carriage Hill Road Maynard Street, Beechwood Circle, Babcock Drive, Coolidge Circle
	Larval Survey	Maynard Street, Newton Street, Babcock Drive, Coolidge Circle, Carriage Hill Road
	Larval Survey Re-Check	Maynard Street
04-22-14	Larval Survey	Oak Avenue, Carriage Hill Road, Bearfoot Road, Coolidge Circle, Stone Drive, Moore Lane, Smith Road, Church Street
04-28-14	Public Relation Larviciding	Carriage Hill Road, Brewer Street, Smith Road, Wheeler Lane, Ridge Road, Maple Street Carriage Hill Road, Washburn Street, Smith Road, Ridge Road
	Larval Survey	Oak Avenue, Carriage Hill Road, Bearfoot Road, Coolidge Circle, Stone Drive, Moore Lane, Smith Road, Church Street, Washburn Street, Kerry Craig Circle, Colburn Street, Edmunds Way, Colburn Street, Brewer Street, Wheeler Lane, Ridge Road
	Larval Survey Re-Check	Babcock Drive, Beechwood Circle
05-05-14	Public Relations Larviciding	Colby Street Lawrence Street, Southwest Cutoff, Northboro Crossing, Colby Street
	Larval Survey	Otis Street, Lawrence Street, Thayer Street, Northboro Crossing, Southwest Cutoff
	Larval Survey Re-Check	Washburn Street, Carriage Hill Road
05-06-14	Larval Survey	Oak Avenue, Carriage Hill Road, Bearfoot Road, Coolidge Circle, Stone Drive, Moore Lane, Smith Road, Church Street
05-09-14	Public Relations Larviciding	Whitney Street, Boundary Street Coolidge Circle, Stone Drive, Bearfoot Road, Boundary Street
	Larval Survey	Whitney Street
	Stream Cleaning 40'	Maple Street
	Stream Cleaning 10'	Ridge Road
	Stream Cleaning 60'	Riley Road
	Culvert Cleaning (10)	Brigham Street, Maple Street, Ridge Road, Cedar Hill Road, Riley Road, Buena Vista Drive, School Street, South Street
05-12-14	Public Relations Larviciding	John Edward Drive, Brewer Street, Davis Street Carriage Hill Road, Church Street, Southwest Cutoff, Oak Avenue, Church Street, Smith Road, Moore Lane
	Larval Survey	Davis Street, Southwest Cutoff, John Edward Drive, Brewer Street
	Larval Survey Re-Check	Bearfoot Road, Boundary Street
05-19-14	Catch Basin Larviciding [53]	Castle Road, Reservoir Street, Old Orchard Circle, Cold Harbor Drive, West Street, Franklin Circle
05-20-14	Public Relations Larval Survey	Coram Farm Road, Whitney Street Coram Farm Road, Whitney Street
05-21-14	Trap Survey	Ball Street

TOWN OF NORTHBORO

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
05-22-14	Public Relations	Cherlyn Drive, Franklin Circle, Birch Hill Road, Zeh Elementary School - Howard Street
	Larval Survey	Cherlyn Drive, Crawford Street, Franklin Circle, Birch Hill Road
05-27-14	Public Relations	Maynard Street, Howard Street, Castle Road, Crawford Street
	Larval Survey	Maynard Street, Howard Street, Castle Road, Crawford Street, Southwest Cutoff, West Main Street, Church Street, Colby Street
05-28-14	Source Reduction Tire Removal [1]	Bridle Path Drive
	Set Up Trap	Emerson Road
05-29-14	Pick Up Trap	Emerson Road
	Set Up Trap	Ball Street
05-30-14	Pick Up Trap	Ball Street
06-02-14	Administrative Contact	Police Department
	Public Relations	Lawrence Street, Davis Street, Hoover Road, Mayflower Road, Northgate Road, Southwest Cutoff, Buck Hill Road, Franklin Circle, West Street, Crawford Street, Reservoir Street, Castle Road, Church Street, Green Street, Brewer Street, Howard Street, Maynard Street, Beechwood Circle, Newton Street, Cherlyn Drive, Coolidge Circle, Whitney Street, Brigham Street, School Street, Juniper Brook Road, Collins Road, Ridge Road, Bartlett Street
	Adulticiding	Lawrence Street, Davis Street, Hoover Road, Mayflower Road, Northgate Road, Southwest Cutoff, Buck Hill Road, Franklin Circle, West Street, Crawford Street, Reservoir Street, Castle Road, Church Street, Green Street, Brewer Street, Howard Street, Maynard Street, Beechwood Circle, Newton Street, Cherlyn Drive, Coolidge Circle, Whitney Street, Brigham Street, School Street, Juniper Brook Road, Collins Road, Ridge Road, Bartlett Street, West Main Street
06-03-14	Set Up Trap	Auger Avenue, Otis Street
06-04-14	Pick Up Trap	Auger Avenue, Otis Street
	Set Up Trap	Deacon Street
06-05-14	Pick Up Trap	Deacon Street
06-06-14	Administrative Contact	Police Department
	Public Relations	Oak Meadow Drive
	Adulticiding	Oak Meadow Drive
06-09-14	Administrative Contact	Police Department
	Public Relations	Crawford Street, Brewer Street, Howard Street, Green Street, Valentine Road, Coram Farm Road, Carriage Hill Road, Washburn Street, Lancaster Road, Stone Drive, Cherlyn Drive, Whitney Street, Winter Street, Rice Avenue, Hudson Street, John Edward Drive, Easy Street, Cyrus Way, Balcom Drive, Birch Hill Road, Cedar Hill Road, Assabet Hill Circle, Elmwood Drive, Fernbrook Road, South Street
	Adulticiding	Crawford Street, Brewer Street, Howard Street, Green Street, Valentine Road, Coram Farm Road, Carriage Hill Road, Washburn Street, Lancaster Road, Stone Drive, Cherlyn Drive, Whitney Street, Winter Street, Rice Avenue, Hudson Street, John Edward Drive, Easy Street, Cyrus Way, Balcom Drive, Birch Hill Road, Cedar Hill Road, Assabet Hill Circle, Elmwood Drive, Fernbrook Road, South Street, Intervale Farm Lane, Pheasant Hill Condominium, Fernbrook Road

TOWN OF NORTHBORO

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
06-09-14	Larval Survey	Coram Farm Road, Valentine Road, Carriage Hill Road, Lancaster Road, Stone Drive, Hudson Street, South Street
	Set Up Trap	Otis Street
06-10-14	Re-Set Trap	Otis Street
	Set Up Trap	Auger Avenue
06-11-14	Pick Up Trap	Auger Avenue
	Source Reduction	Emerson Road
	Tire Removal	
	[5]	
	Re-Set Trap	Otis Street
	Set Up Trap	Deacon Street
06-12-14	Pick Up Trap	Deacon Street, Otis Street
06-13-14	Public Relations	Bearfoot Road - Senior Center
06-16-14	Administrative Contact	Police Department
	Public Relations	Lawrence Street, Captain Eager Drive, Indian Meadow Drive, Bridle Path Drive, Davis Street, Hoover Road, Chesterfield Road, Northgate Road, Mayflower Road, Riley Road, Holloway Lane, Wheeler Lane, School Street, Joseph Road, Summer Street, Brigham Street, Leland Drive, Wesson Terrace, Fairway Drive, Collins Road, Ridge Road, Maple Street, Rogers Avenue, Bartlett Street, Jenkins Drive, Potter Circle, Colby Street, Davis Street, Buckhill Road, Crestwood Drive, Whitney Street, Lancaster Road, Coolidge Circle, Howard Street, Crawford Street, Castle Road
	Adulticiding	Lawrence Street, Captain Eager Drive, Indian Meadow Drive, Bridle Path Drive, Davis Street, Hoover Road, Chesterfield Road, Northgate Road, Mayflower Road, Riley Road, Holloway Lane, Wheeler Lane, School Street, Joseph Road, Summer Street, Brigham Street, Leland Drive, Wesson Terrace, Fairway Drive, Collins Road, Ridge Road, Maple Street, Rogers Avenue, Bartlett Street, Jenkins Drive, Potter Circle, Colby Street, Davis Street, Buckhill Road, Crestwood Drive, Whitney Street, Lancaster Road, Coolidge Circle, Howard Street, Crawford Street, Castle Road, Church Street, West Main Street
	Larval Survey	Hoover Road, Wheeler Lane, Maple Lane
	Set Up Trap	Otis Street
06-17-14	Re-Set Trap	Otis Street
	Set Up Trap	Auger Avenue
06-18-14	Pick Up Trap	Auger Avenue, Otis Street
	Set Up Trap	Deacon Street
06-19-14	Pick Up Trap	Deacon Street
	Public Relations	Indian Meadow Drive, Lawrence Street
	Adulticiding	Indian Meadow Drive
	Stream Survey	Lawrence Street
06-23-14	Set Up Trap	Otis Street
	Administrative Contact	Police Department
	Public Relations	Thayer Street, West Street, Crawford Street, Brewer Street, Howard Street, Carriage Hill Road, Lancaster Road, Washburn Street, Rice Avenue, Church Street, Cyrus Way, School Street, Catherine Drive, Brigham Street, Milk Porridge Circle, Wheeler Lane, Ridge Road, Brigham Street
	Adulticiding	Thayer Street, West Street, Crawford Street, Brewer Street, Howard Street, Carriage Hill Road, Lancaster Road, Washburn Street, Rice Avenue, Church Street, Cyrus Way, School Street, Catherine Drive, Brigham Street, Milk Porridge Circle, Wheeler Lane, Ridge Road, Brigham Street, South Street, Main Street

TOWN OF NORTHBORO

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
06-23-14	Larval Survey	West Street, Washburn Street, Catherine Drive
06-24-14	Re-Set Trap	Otis Street
	Set Up Trap	Emerson Road
06-25-14	Pick Up Trap	Emerson Road
	Set Up Trap	Crawford Street
	Re-Set Trap	Otis Street
06-26-14	Pick Up Trap	Crawford Street, Otis Street
06-30-14	Administrative Contact	Police Department
	Public Relations	Davis Street, Hoover Road, Mayflower Road, Southwest Cutoff, Davis Street, West Main Street, West Street, Crawford Street, Castle Road, Reservoir Street, Church Street, Dennis Circle, Pleasant Street, Potter Circle, Brewer Street, Howard Street, Cherlyn Drive, Mohawk Drive, Whitney Street, Winsor Lane, Maple Lane, School Street, Juniper Brook Road, Longfellow Road
	Adulticiding	Davis Street, Hoover Road, Mayflower Road, Southwest Cutoff, Davis Street, West Main Street, West Street, Crawford Street, Castle Road, Reservoir Street, Church Street, Dennis Circle, Pleasant Street, Potter Circle, Brewer Street, Howard Street, Cherlyn Drive, Mohawk Drive, Whitney Street, Winsor Lane, Maple Lane, School Street, Juniper Brook Road, Longfellow Road, Hoover Road, Lydia's Way, Church Street Village
	Set Up Trap	Otis Street
07-01-14	Re-Set Trap	Otis Street
	Set Up Trap	Ball Street
07-02-14	Pick Up Trap	Ball Street, Otis Street
	Set Up Trap	Church Street
07-03-14	Pick Up Trap	Church Street
07-07-14	Administrative Contact	Police Department
	Public Relations	Lawrence Street, Otis Street, Davis Street, Lanthorn Road, King Street, Franklin Circle, West Street, Church Street, Green Street, Brewer Street, Howard Street, Church Street, Colby Street, Assabet Hill Circle, Elmwood Drive, Sunset Drive, Brigham Street, Collins Road, Ridge Road, East Main Street
	Adulticiding	Lawrence Street, Otis Street, Davis Street, Lanthorn Road, King Street, Franklin Circle, West Street, Church Street, Green Street, Brewer Street, Howard Street, Church Street, Colby Street, Assabet Hill Circle, Elmwood Drive
	Catch Basin Larviciding [177]	Stirrup Brook Lane, Weber Lane, Jenkins Drive, Hemlock Drive, Laurel Avenue, Blueberry Lane, Berkley Road, Copley Drive, Dartmouth Drive, Little Pond Road, Tory Lane, Milestone Lane, Gates Lane, Gristmill Lane, Rodney Terrace, Leland Drive, Wesson Terrace, Fairway Drive, Mulligan Way, Winsor Lane
	Set Up Trap	Otis Street
07-08-14	Pick Up Trap	Otis Street
	Set Up Trap	Howard Street
07-09-14	Pick Up Trap	Howard Street
	Set Up Trap	Catherine Drive
07-10-14	Pick Up Trap	Catherine Drive
	Adulticiding	West Main Street
	Re-Set Trap	Otis Street
07-14-14	Administrative Contact	Police Department
	Public Relations	King Street, West Main Street, Easy Street, Pleasant Street, Beechwood Circle, East Main Street, Bartlett Street, Ridge Road, Collins Road, School Street, Sunset Drive, Brigham Street

TOWN OF NORTHBORO

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
07-14-14	Catch Basin Larviciding [261]	Deacon Street, Elizabeth Drive, Fiske Drive, Goodnow Circle, Allison Road, Bryant Lane, Chandler Way, Memorial Drive, Verjuniel Avenue, Warren Drive, Stratton Way, Kent Drive, Silas Drive, Vanessa Drive, Dunia Lane, Overlook Park, Howe Lane, Corey Way, Pondview Way, Edmunds Way, Forbes Road, Whitney Avenue, Coolidge Circle, Morse Circle, Stone Drive, Babcock Drive, Patrick Drive, Cherlyn Drive, Scott Lane, Macalister Drive, Old Mill Road, Beechwood Circle, Mohican Avenue, Carriage Hill Road, Iroquois Drive, Farmhouse Road, Treetop Circle, Sawmill Drive, Carruth Drive, Country Candle Lane, Holbrook Lane
07-15-14	Set Up Trap	Auger Avenue
07-16-14	Pick Up Trap	Auger Avenue
	Set Up Trap	Deacon Street
	Trap Survey	Catherine Drive
07-17-14	Pick Up Trap	Deacon Street
	Administrative Contact	Police Department
	Public Relations	Crawford St.
	Adulticiding	Crawford St.
07-21-14	Trap Survey	Old Mill Pond Road, Starr Circle, Babcock Drive
	Administrative Contact	Police Department
	Public Relations	Southwest Cutoff, West Main Street, Cyrus Way, Shady Lane Avenue, Leland Avenue, Easy Street, Pleasant Street, Potter Circle, Beechwood Circle, East Main Street, Bartlett Street, Ridge Road, Collins Road, School Street, Brigham Street, Sunset Drive, Davis Street
	Adulticiding	West Main Street, Cyrus Way, Shady Lane Avenue, Leland Avenue, Easy Street, Pleasant Street, Potter Circle, Beechwood Circle, East Main Street, Bartlett Street, Ridge Road, Collins Road, School Street, Brigham Street, Sunset Drive, Davis Street, Davis Avenue, Saddle Hill Drive, Bridle Path Drive, Southwest Cutoff
07-22-14	Trap Survey	Rice Avenue
	Set Up Trap	Emerson Road
07-23-14	Pick Up Trap	Emerson Road
	Set Up Trap	Crawford Street
07-24-14	Pick Up Trap	Crawford Street
07-28-14	Administrative Contact	Police Department, Board of Health
	Public Relations	Davis Street, Northgate Road, King Street, West Street, Church Street, Brewer Street, Moore Lane, Whitney Street, Increase Ward Drive, Cedar Hill Road, Elmwood Drive, Juniper Brook Road, Leland Drive
	Adulticiding	Davis Street, Northgate Road, King Street, West Street, Church Street, Brewer Street, Moore Lane, Whitney Street, Increase Ward Drive, Cedar Hill Road, Elmwood Drive, Juniper Brook Road, Leland Drive, West Main Street
	Catch Basin Larviciding [105]	Dennis Circle, Rutland Road, John Edward Drive, Mulberry Lane, Tri Corner Circle, Chestnut Hill Road, Prospect Street, Colby Street, Fay Lane, Valentine Road, Orchard Circle, Potter Circle, Coram Farm Road, Lydia's Way, Oak Avenue, Auger Avenue, Easy Street, Increase Ward Drive, Pine Haven Drive, Shady Lane Avenue, Cyrus Way, Leland Avenue, Sunny Hill Road, Jay Avenue, Wood Lawn Street
07-29-14	Set Up Trap	Otis Street, Ball Street
	Trap Survey	Old Mill Road

TOWN OF NORTHBORO

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
07-29-14	Catch Basin Larviciding [95]	Oak Meadow Drive, Old Colonial Road, Buckhill Road, Wiles Farm Road, Nelson Drive, Indian Meadow Drive, Abenaki Road, Agawam Drive, Tomahawk Drive, Mashpee Circle, Bridle Path Drive, Saddle Hill Drive, Thayer Street, Tomblin Hill Road, Captain Eagar Drive
07-30-14	Pick Up Trap	Otis Street, Ball Street
	Set Up Trap	Catherine Drive
07-31-14	Pick Up Trap	Catherine Drive
	Set Up Trap	Otis Street
08-01-14	Pick Up Trap	Otis Street
08-04-14	Administrative Contact	Police Department
	Public Relations	Potter Circle, West Street, Moore Lane, Lancaster Road, Rice Avenue, Whitney Street, Cyrus Way, Shady Lane Avenue, Milk Porridge Circle, School Street, Bartlett Street
	Adulticiding	Potter Circle, West Street, Moore Lane, Lancaster Road, Rice Avenue, Whitney Street, Cyrus Way, Shady Lane Avenue, Milk Porridge Circle, School Street, Bartlett Street, Church Street Village, Bigelow Farms
	Catch Basin Larviciding [205]	Hamilton Road, Hoover Road, Chesterfield Road, Meadow Road, Ruth Road, Forest Road, Meadow Road, Eliot Road, Longfellow Road, Alcott Drive, Emerson Road, Thoreau Road, Hawthorne Circle, Madison Road, Wilson Road, Adams Road, Lanthorn Road, Williamsburg Circle, Garrison Circle, Intervale Farm Lane, Greenwood Road, Kendall Drive, Bent Road, Jethro Peters Lane, Thaddeus Mason Road, Jacob Cobb Lane, Samuel Gamwell Road, Claflin Farm Road, Mayflower Road, Washington Road, Jefferson Road, Lexington Road, Charina Road
	Set Up Trap	Otis Street
08-05-14	Re-Set Trap	Otis Street
	Set Up Trap	Howard Street
08-06-14	Pick Up Trap	Howard Street
	Re-Set Trap	Otis Street
	Set Up Trap	Crawford Street
	Catch Basin Larviciding [171]	Brookside Lane, Riley Road, Fernbrook Road, Birch Hill Road, Woodland Road, Crestwood Drive, Crestwood Drive Extension, Elmwood Drive, Cedar Hill Road, Murdock Drive, Westbrook Road, Assabet Hill Circle, Wheelwright Drive, Patriot Drive, Liberty Drive, Monument Drive, Buena Vista Circle, Greenland Circle, Catherine Drive, Joseph Road, Kristyn Drive, Brendon Drive, School Street, Juniper Brook Road, Kimball Lane, Juniper Lane, Brigham Street, Sunset Drive, Rustic Drive, Wheeler Lane, Halloway Lane, Milk Porridge Circle
08-07-14	Pick Up Trap	Crawford Street
	Re-Set Trap	Otis Street
	Administrative Contact	Police Department
	Public Relations	School Street, Juniper Brook Road
	Adulticiding	School Street, Juniper Brook Road
08-08-14	Catch Basin Larviciding [39]	Woodstone Road, Fawcett Orchard Road
	Pick Up Trap	Otis Street
08-12-14	Re-Set Trap	Otis Street
	Set Up Trap	Church Street
08-13-14	Pick Up Trap	Church Street
	Set Up Trap	Emerson Road
08-14-14	Administrative Contact	Police Department
	Public Relations	Gates Lane
	Adulticiding	Gates Lane
	Pick Up Trap	Emerson Road

TOWN OF NORTHBORO

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
08-18-14	Administrative Contact Public Relations	Police Department Buckhill Road, Lincoln Street, Smith Road, Farm House Road, Hudson Street, Ridge Road, School Street, Juniper Brook Road, Milk Porridge Circle, Elmwood Drive, South Street
	Adulticiding	Buckhill Road, Lincoln Street, Smith Road, Farm House Road, Hudson Street, Ridge Road, School Street, Juniper Brook Road, Milk Porridge Circle, Elmwood Drive, South Street, West Main Street
	Larviciding	Farm House Road
	Catch Basin Larviciding [43]	Collins Road, Ridge Road, Railroad Drive, Talbot Road, Beeman Road, Danforth Drive, Rogers Avenue, Rooney Street, Johnson Avenue, Omaha Avenue, Harris Avenue, Lawrence Street, Hillside Road
08-19-14	Set Up Trap	Auger Avenue
08-20-14	Pick Up Trap	Auger Avenue
	Set Up Trap	Deacon Street
08-21-14	Pick Up Trap	Deacon Street
	Administrative Contact Public Relations	Police Department Brewer Street
	Adulticiding	Brewer Street, Melican Middle School, Ellsworth-McAfee Park
	Catch Basin Larviciding [173]	Fisher Street, Foxwood Lane, Crawford Street, Reservoir Street, Castle Road, West Street, Cold Harbor Drive, Cherry Street, Franklin Circle, Autumn Drive, Fall Drive, Brewer Street, Green Street, Howard Street, Moore Lane, Maynard Street, Edge Way, Mohawk Drive, Washburn Street, Lancaster Drive, Sawyer Road, Winter Street
08-25-14	Administrative Contact Public Relations	Police Department Buckhill Road, Potter Circle, Green Street, Brewer Street, Gates Lane, Bartlett Street, Juniper Brook Road, School Street, Elmwood Drive
	Adulticiding	Buckhill Road, Potter Circle, Green Street, Brewer Street, Gates Lane, Bartlett Street, Juniper Brook Road, School Street, Elmwood Drive
	Set Up Trap	Otis Street
08-26-14	Re-Set Trap	Otis Street
	Set Up Trap	Church Street
08-27-14	Pick Up Trap	Otis Street, Church Street
	Set Up Trap	Ball Street
08-28-14	Pick Up Trap	Ball Street
	Administrative Contact Public Relations	Police Department Easy Street, Sunset Drive
	Adulticiding	Easy Street, Sunset Drive
09-02-14	Set Up Trap	Otis Street
09-03-14	Re-Set Trap	Otis Street
	Set Up Trap	Howard Street
09-04-14	Pick Up Trap	Howard Street, Otis Street
	Catch Basin Larviciding [193]	South Street, Northgate Road, Davis Street, Otis Street, Davis Avenue, Nelson Drive, Thayer Street, Tomblin Hill Road, Indian Meadow Drive, Mashpee Circle, Tomahawk Drive, Agawam Drive, Abenaki Road, Lawrence Street, Hillside Road, Captain Eager Drive, Saddle Hill Drive
09-05-14	Source Reduction Tire Removal [12]	Crawford Street, Northgate Road, Newton Street
09-09-14	Set Up Trap	Emerson Road
09-10-14	Pick Up Trap	Emerson Road
	Set Up Trap	Church Street
09-11-14	Pick Up Trap	Church Street

TOWN OF NORTHBORO

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
09-11-14	Larviciding Larval Survey	Southwest Cutoff Church Street, Fisher Street, Autumn Lane, Woodstone Road, Smith Road, Kendall Drive, Brookside Lane, Assabet Drive, South Street, Intervale Farm Lane, Collins Road, Lyman Street, Talbot Road, Beeman Street, Otis Street, Southwest Cutoff, Northboro Crossing
09-16-14	Set Up Trap	Auger Avenue
09-17-14	Pick Up Trap	Auger Avenue
	Set Up Trap	Deacon Street
09-18-14	Pick Up Trap	Deacon Street
09-23-14	Set Up Trap	Ball Street
09-24-14	Pick Up Trap	Ball Street
	Set Up Trap	Catherine Drive
09-25-14	Source Reduction Tire Removal [8]	Main Street - DPW
	Pick Up Trap	Catherine Drive
09-30-14	Set Up Trap	Howard Street
10-01-14	Pick Up Trap	Howard Street
	Set Up Trap	Crawford Street
10-02-14	Pick Up Trap	Crawford Street
10-07-14	Set Up Trap	Church Street
10-08-14	Pick Up Trap	Church Street
	Set Up Trap	Emerson Road
10-09-14	Pick Up Trap	Emerson Road
10-14-14	Trap Survey	Catherine Drive, Crawford Street
11-19-14	Source Reduction Tire Removal [16]	Winsor Lane
12-04-14	Stream Cleaning 50'	School Street
	Stream Cleaning 200'	School Street
	Stream Cleaning 100'	Maple Street
	Stream Cleaning 20'	Maple Street
	Stream Cleaning 75'	Maple Street
	Stream Cleaning 30'	Maynard Street
	Stream Cleaning 30'	Maynard Street
	Stream Cleaning 40'	Howard Street
	Stream Cleaning 70'	Howard Street
	Stream Cleaning 20'	Church Street
	Stream Cleaning 20'	Church Street
	Stream Cleaning 60'	Church Street
	Stream Cleaning 20'	Carriage Hill Road
	Stream Cleaning 50'	Carriage Hill Road
	Stream Cleaning 50'	Washburn Street
	Stream Cleaning 40'	Washburn Street
	Culvert Cleaning (22)	School Street, Joseph Road, Catherine Drive, Maple Street, Ridge Road, Bartlett Street, Lyman Street, Collins Road, Longfellow Road, Maynard Street, Howard Street, Green Street, Ball Street, Church Street, Brewer Street, Carriage Hill Road, Washburn Street
12-05-14	Stream Cleaning 25'	Bearfoot Road
	Stream Cleaning 175'	Bearfoot Road
	Stream Cleaning 80'	Bearfoot Road
	Stream Cleaning 70'	Bearfoot Road
	Stream Cleaning 55'	Newton Street
	Stream Cleaning 85'	Cherlyn Drive
	Stream Cleaning 65'	Coolidge Circle
	Stream Cleaning 50'	Rice Road
	Stream Cleaning 150'	Bearfoot Road
	Stream Cleaning 30'	Bearfoot Road

TOWN OF NORTHBORO

<u>DATE</u>	<u>WORK DONE</u>	<u>LOCATION</u>
12-05-14	Stream Cleaning 200'	Maynard Street
	Stream Cleaning 40'	Maynard Street
	Stream Cleaning 20'	Maynard Street
	Stream Cleaning 10'	Maple Street
	Stream Cleaning 40'	Howard Street
	Stream Cleaning 10'	Sparrow Lane
	Culvert Cleaning (12)	Bearfoot Road, Newton Street, Rice Road, Maynard Street, Maple Street, Howard Street, Sparrow Lane



Town of Northborough: Catch Basin Larvicide Program 2014

- Early Season/Multiple Treatments
- Catch Basins Surveyed/Treated

BOYLSTON

HUDSON

MARLBOROUGH

SOUTHBOROUGH

SHREWSBURY

WESTBOROUGH

(Catch Basins Treated: 1,515)

CMMCP (2014)
Select features of this map courtesy of:
Office of Geographic Information (MassGIS),
Commonwealth of Massachusetts
Information Technology Division

COMMONWEALTH OF MASSACHUSETTS
STATE RECLAMATION & MOSQUITO CONTROL BOARD

CENTRAL MASSACHUSETTS MOSQUITO CONTROL PROJECT
est. 1973



**EXECUTIVE SUMMARY
2014**

February 2015

CMMCP MISSION STATEMENT

The objective of the Central Massachusetts Mosquito Control Project (CMMCP) is to attain an efficient, economic mosquito control operation which will provide the best results possible and be consistent with all ecological aspects and the best interests of the member towns.

Our goal is to reduce mosquito exposure to the public, and the potential for disease transmission by mosquitoes, by utilizing proven, sound mosquito control techniques. CMMCP believes the best way to accomplish this task is by practicing an Integrated Pest Management (IPM) approach as it relates to mosquito control in Massachusetts. IPM utilizes a variety of control techniques and evaluation procedures. Control efforts are undertaken only after surveillance data has been collected and analyzed. Training, experience and common sense dictate our response in any given situation.

It is our desire and responsibility for this Project to have the best mosquito control for the communities that we serve.

INTRODUCTION:

The Central Massachusetts Mosquito Control Project currently provides its services to 40 cities and towns throughout Middlesex and Worcester Counties. The Project's headquarters is located at 111 Otis Street, Northboro, MA. Please call (508) 393-3055 during business hours for information. Twenty-one (21) full time and four (4) summer interns were employed at CMMCP in 2014. This the year we received a total of fifteen thousand, seven hundred and thirty-seven (15,737) requests for service from residents and officials. A map of our service area is on page 7.

EDUCATION:

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 residents to discuss mosquito biology, mosquito habitat, and control procedures. Much of the presentation is directed towards what can be done to prevent mosquitoes from breeding around their homes. This program is tailored to meet the needs of the specific audience. In 2014, CMMCP laboratory personnel and other administrative staff made fifty-eight (58) educational presentations before two thousand two hundred and sixty-five (2,265) students in thirteen (13) Elementary schools. CMMCP gave a presentation on our program to 8 Clarke University students in the Clarke Vector Ecology program and exhibited at six (6) public meetings such as health fairs, Earth Day celebrations and other public events. The administrative staff also presented to five (5) member community town boards at their request, three (3) member community cable access channels, seven (7) annual or special town meetings, and 1 requests from non-member town for information on our program. 2011 marked the start of the "CMMCP Mosquito Education Program for Seniors" in which presentations are conducted at local senior centers to increase mosquito-borne disease awareness. Four (4) presentations to

95 senior citizens were conducted in 2014 and this program continues to grow. Over 1,000 specialized brochures for this program were distributed through this program, funded by a grant received from the Northeastern Mosquito Control Association. Several different 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 in area Town/City Halls throughout the year. Bookmarks with educational information have been printed and stocked in member libraries and town halls, and are used as part of the education program. We also have a website at www.cmmcp.org that has extensive information on mosquito biology, our control procedures, products we use, etc.

DITCH MAINTENANCE & WETLAND RESTORATION:

As part of our effort to reduce the need for pesticides we continue to place great emphasis on our wetlands restoration program. By cleaning clogged, degraded and overgrown waterways, mosquito breeding from that area can be reduced or eliminated and drainage areas are restored to historic conditions. Two thousand, eight hundred and thirty-three (2,833) 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 two hundred and fifteen thousand, nine hundred and twenty-nine (215,929) feet of streams, brooks and ditches. This represents nearly forty-one (41) miles of waterways which were cleaned and improved by Project personnel in 2014.

ARBOVIRUS CONTROL:

As part of our West Nile Virus (WNV) prevention program, sixty six thousand four hundred and sixty-seven (66,467) catch basins were treated with larvicidal product to control the mosquitoes that seek out these cool dark wet areas to breed, including the *Culex* species of mosquito, a major target for West Nile Virus transmission. We identify priority areas in each town and treat the basins in these selected areas to reduce the emergence of this arbovirus. The priority areas are as follows: Prior year WNV activity; senior centers & over 55 housing developments; recreation areas; schools and neighborhoods (higher density first); industrial areas. We performed pre-emptive treatments in late May in areas that showed West Nile Virus in the prior year, with follow up treatments later in the season as part of our standard protocol treatment.

MOSQUITO SURVEILLANCE:

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. One thousand and twenty-five (1,025) pools (collections) of mosquitoes totaling eighteen thousand, six hundred and ninety-seven (18,697) specimens were tested for mosquito-

borne viruses this year. Two (2) collections were identified positive this year; one with West Nile Virus (WNV) and one with Eastern Equine Encephalitis (EEE). CMMCP lab personnel processed one thousand four hundred and fifty (1,450) collections of mosquitoes containing twenty three thousand, two hundred and sixty-three (23,263) individual specimens, representing ten (10) mosquito species.

Target Species	<i>Ae. vexans</i>	<i>Cq. perturbans</i>	<i>Cs. melanura</i>	<i>Oc. canadensis</i>	<i>Culex spp.</i>	All Species
No. Pools	43	199	66	42	720	1450
Total Specimens	437	7717	354	352	12238	23263
No. Pools WNV +	0	0	0	0	1†	1†
No. Pools EEE +	0	0	0	0	1†	1†

†Pool of WNV+ *Culex* Species collected in Clinton on 7/3/13

†Pool of EEE+ *Culex* Species collected in Tewksbury on 9/23/13

A table with the 2014 arbovirus information for our service area as well as the statewide results is included on page 8. Adult mosquito surveillance began in May and concluded in late September. Three (3) full time seasonable employees were hired for the summer to assist our Staff Entomologist in his duties.

LARVAL MOSQUITO CONTROL:

Bti (*Bacillus thuringiensis* var. *israelensis*) mosquito larvicide is a species specific, non-reproducing bacterium and is used to treat areas where mosquito larvae are found. Our field crews will investigate areas we have databased and treat the area if surveillance gathered at the time shows an imminent threat of mosquito emergence. Ten thousand and ten (10,010) pounds of Bti (*Bacillus thuringiensis israelensis*) was applied by helicopter over two thousand and two (2,002) acres in 3 towns, Chelmsford, Billerica & Boxborough, and four thousand, eight hundred and fifty-eight (4,858) pounds by hand over nine hundred and fifty-one (951) acres throughout our service area were applied to area wetlands to reduce the emergence of adult mosquitoes. This represents over two thousand, nine hundred and fifty-three (2,953) acres of wetland that was treated with this mosquito-specific bacterium, significantly reducing adult mosquito populations in these areas. We have several thousand areas catalogued that are checked and treated as needed on a routine basis, and many applications are small, measured in ounces. Larval control began in March and continued throughout the month of September.

ADULT MOSQUITO CONTROL:

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 under CMR 10.03 (21A) allows residents and/or town officials to

exclude areas under their control from this or any part of our program. We apply the spray product at the lowest label rate of .0012 pounds of active ingredient per acre (lb ai/A) unless mosquito-borne virus has been identified, and then we will consider other application rates depending on weather and other factors. One hundred and five (105) landing counts were performed by Project field staff as additional surveillance or prior to the application of sumithrin to confirm that pre-determined thresholds of mosquitoes were exceeded to warrant an application. Landing rates are suspended when WNV or EEE is identified in Mass. Adult control began in early June and ended in mid-September with the onset of low nighttime temperatures, reduced service requests and low mosquito population density.

RESEARCH AND EFFICACY

While CMMCP is an agency charged with the control of mosquitoes, we strive to check for efficacy of our products and techniques, and whenever possible perform research in new or different areas of mosquito control. Some of our 2014 Research projects were:

- Bottle Assays of Field Collected Mosquitoes for Levels of Resistance to Anvil® 10+10 in Central Massachusetts
- 2014 Resident Survey
- Aerial Larval Mosquito Control Program – 2014
- Retention Ponds Surveillance for *Coquilleltidia perturbans* and Other Select Mosquito Species

The addition of a fulltime Field Biologist in 2007 allowed these research projects to become more standardized, resulting in increased validity of the findings, reinforced by multiple seasons of trials. We have annual strategy sessions in the fall/winter seasons to plan for field trials and other anticipated research for the upcoming year. CMMCP departments as determined by the Executive Director will be expected to publish annually in such journals as the Journal of the AMCA (JAMCA), the NMCA or NJMCA Proceedings, Wing Beats, and other publications. The Field Biologist composes reports as directed, such as weekly surveillance, rainfall data, aerial larval control, etc. and will graph and track trends as directed. These reports will be disseminated to various parties, i.e. SRMCB, MDPH, CMMCP Commission, posted on the CMMCP website, etc.

SOURCE REDUCTION/TIRE RECYCLING

For Earth Day 2010, CMMCP officially announced a tire recycling program added as a value added service to our member cities and towns. This program operates under grant monies received and the CMMCP operating budget. Tire piles provide suitable areas for larval mosquito development, including those species known to carry West Nile virus. During the course of one season, the potential exists for hundreds or even thousands of mosquitoes to emerge from just one tire. If tires infested with mosquito eggs, larvae or pupae are transported, the potential to introduce mosquito species into new areas and/or the potential for the spread of arboviruses and their transmission may increase significantly.

For these reasons and as a value added service to our member cites and towns, CMMCP has developed a used tire program, consisting of the following guidelines:

- We accept passenger and light truck tires only
- The maximum number tires from one property will be 10 at one time, subject to change without notice
- Requests for tire removal shall be done according to established procedures
- We reserve the right to refuse anything determined to be unsuitable for this program

Tires accepted as part of this program will be sent to an approved facility for recycling or disposal. This program is subject to end without notice. There is no additional cost to residents or municipalities; this program is part of the full suite of mosquito control services offered. In 2014 we brought two thousand, six hundred and forty-six (2,646) tires from 30 member communities for recycling.

Some additional highlights from 2014:

- Resident satisfaction survey: conclusion; overall satisfaction with the adulticide program was 93.8%, 98.6% plan to use our services again (see full report).
- CMMCP voluntarily participates in the EPA's WasteWise program, tracking our source reduction (tire recycling) efforts.
- Our efforts in this program were recognized by the EPA – Region 1 with an “Environmental Merit Award” for pesticide reduction.
- Our staff was recognized by the Commonwealth of Massachusetts with a “Citation for Outstanding Performance”.



Member,
Northeastern
Mosquito Control
Association



Member,
New Jersey
Mosquito Control
Association

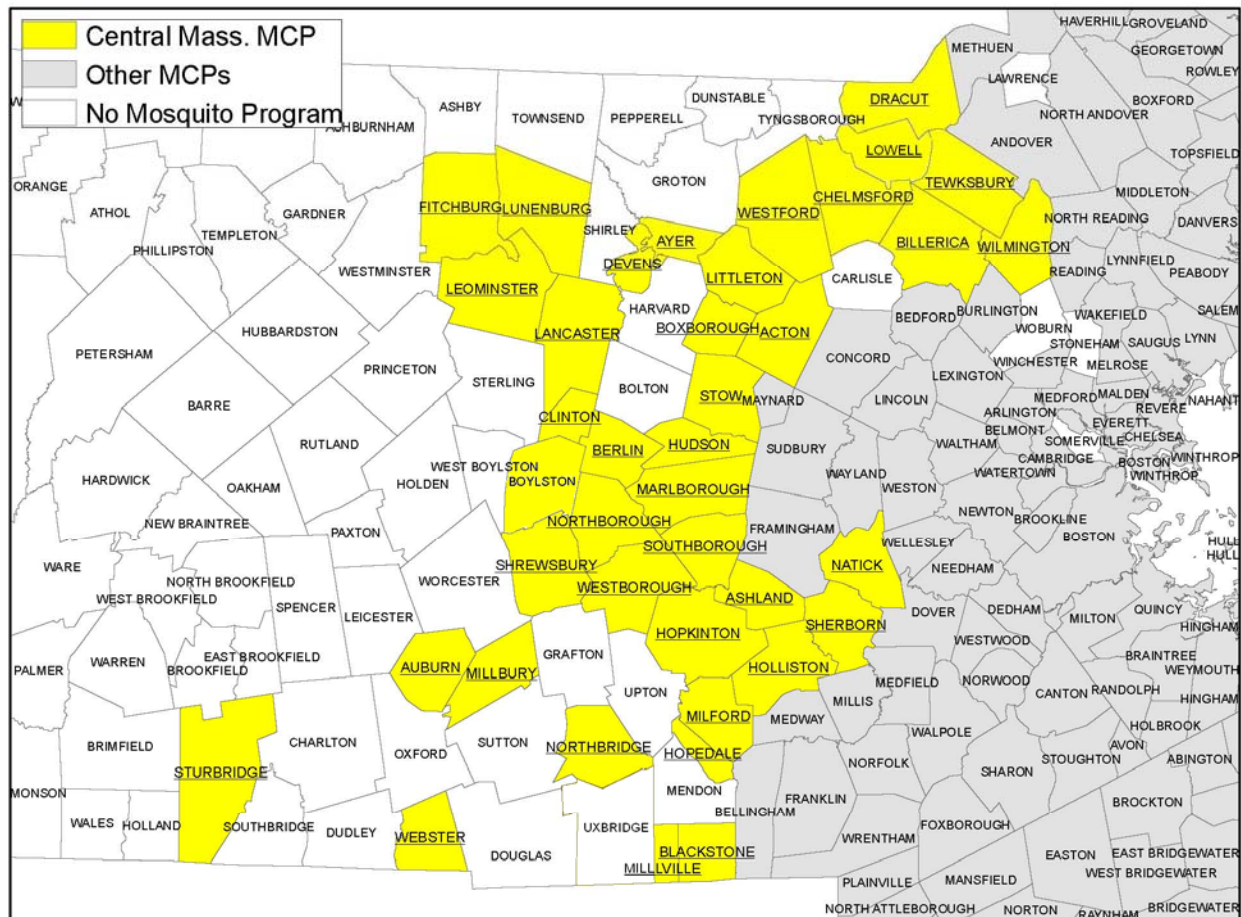


Partner,
EPA Pesticide
Environmental
Stewardship Program



Partner,
EPA WasteWise
Program

CMMCP SERVICE AREA – 2014



Frank Cornine, CMMCP
Select features of this map courtesy of:
Office of Geographic Information (MassGIS),
Commonwealth of Massachusetts
Information Technology Division

2014 SUMMARY TOTALS

NOTE: A full report of our work done in 2014 in each community is available on our website in detail at <http://www.cmmcp.org/14report.htm>.

Service Requests	Bti Lbs.	Bti Acres	Sumithrin Gallons	Sumithrin Acres
15,737	14,868	2,974	262	159,695

Pools Sent to MDPH	Landing Counts	Culverts Cleaned	Restoration Footage	Catch Basins Treated	Tires Recycled
1,025	157	2,833	215,929	66,467	2,646

ARBOVIRUS SUMMARY 2014

WNV Surveillance Summary – Statewide	2014
Mosquito Pools Positive	56
Animals Positive	0
Humans Positive	5
EEE Surveillance Summary – Statewide	2014
Mosquito Pools Positive	33
Animals Positive	2
Humans Positive	0
CMMCP Surveillance Summary	2014
Mosquitoes Collected and Identified	23,263
Mosquito Pools Submitted for testing	1,026
Mosquito Pools Positive WNV	1
Animals Positive WNV	0
Humans Positive WNV	0
Mosquito Pools Positive EEE	1
Animals Positive EEE	0
Humans Positive EEE	0

Town	Service Requests	Bti Pounds	Bti Acres	Sumithrin Gallons	Sumithrin Acres	Catch Basins	Mosquito Pools	Culverts Cleaned	Restoration Footage	# Tires Recycled
Acton	529	85.00	17.0	9.38	5,716	2,228	22	76	3,690	
Ashland	353	194.50	38.9	5.58	3,398	2,012	33	46	7,420	65
Auburn	198	88.50	17.7	2.80	1,710	1,772	26	69	11,755	113
Ayer	79	58.75	11.8	1.51	921	860	21	44	3,100	
Berlin	105	51.25	10.3	2.43	1,478	420	17	109	10,055	
Billerica	818	3091.75	618.4	11.07	6,748	2,573	23	29	11,895	65
Blackstone	292	252.00	50.4	4.46	2,719	1,379	31	108	4,650	2
Boxboro	62	4486.75	897.4	1.60	973	924	19	103	2,875	38
Boylston	241	75.50	15.1	4.90	2,984	687	18	93	2,855	126
Chelmsford	459	2811.00	562.2	6.91	4,210	3,672	32	39	7,235	1
Clinton	182	28.00	5.6	2.22	1,355	1,016	21	59	4,425	4
Devens	5	7.25	1.5	0.06	37	831	20	58	2,785	
Dracut	681	74.25	14.9	11.52	7,020	2,379	19	66	9,440	
Fitchburg	96	49.50	9.9	1.54	938	2,562	22	114	4,075	364
Holliston	494	233.75	46.8	10.42	6,350	1,672	40	38	4,135	
Hopedale	149	248.50	49.7	2.63	1,601	944	36	20	9,965	1
Hopkinton	693	240.00	48.0	10.54	6,422	2,211	23	68	3,605	175
Hudson	415	21.50	4.3	5.45	3,319	1,840	25	78	4,050	29
Lancaster	354	42.00	8.4	8.32	5,072	815	16	67	5,885	206
Leominster	108	73.00	14.6	1.82	1,110	3,096	22	97	7,254	259
Littleton	451	110.50	22.1	8.22	5,010	827	23	31	2,915	20
Lowell	100	36.25	7.3	0.78	476	2,468	31	23	3,020	25
Lunenburg	505	133.00	26.6	11.21	6,830	1,202	16	34	8,280	8
Marlboro	255	57.50	11.5	3.69	2,248	3,387	32	71	4,450	
Milford	441	193.50	38.7	6.91	4,214	1,535	27	48	2,530	259
Millbury	380	171.00	34.2	4.76	2,900	1,369	23	145	3,065	434
Millville	181	139.50	27.9	3.10	1,890	741	27	98	3,370	
Natick	527	174.25	34.9	8.86	5,400	1,327	30	49	5,025	1
Northboro	366	62.50	12.5	7.07	4,307	1,515	32	133	3,220	37
Northbridge	444	116.00	23.2	5.66	3,448	1,132	20	77	9,170	3
Sherborn	202	262.00	52.4	6.01	3,666	608	20	45	5,515	

Town	Service Requests	Bti Pounds	Bti Acres	Sumithrin Gallons	Sumithrin Acres	Catch Basins	Mosquito Pools	Culverts Cleaned	Restoration Footage	# Tires Recycled
Shrewsbury	427	79.00	15.8	6.88	4,190	3,613	32	120	3,830	102
Southboro	254	73.00	14.6	4.97	3,030	1,486	18	131	2,955	2
Stow	735	81.00	16.2	13.59	8,285	1,421	20	31	3,530	11
Sturbridge	528	159.00	31.8	7.52	4,586	1,154	32	138	10,850	4
Tewksbury	832	210.00	42.0	11.73	7,147	3,065	39	32	6,740	236
Webster	117	118.00	23.6	1.47	896	1,058	38	103	3,230	24
Westboro	406	134.50	26.9	8.58	5,231	431	33	50	3,390	4
Westford	755	210.00	42.0	17.35	10,578	2,273	21	55	3,585	28
Wilmington	1518	134.50	26.9	18.88	11,506	1,962	25	38	6,110	
Totals	15,737	14,868	2,974	262.37	159,695	66,467	1,025	2,833	215,929	2,646

