MASSACHUSETTS MOSQUITO CONTROL
ANNUAL OPERATIONS REPORT

2010 Year of Report Date of Report: January 19, 2011

Project/District Name: **Bristol County Mosquito Control Project**

Address: 140 North Walker Street

City/Town: Taunton Zip: 02780

Phone: 508-823-5253 Fax: 508-828-1868

E-mail: brismosqmt@comcast.net, for spray requests only-

requestbristolmcp@comcast.net

Report prepared by: ***Priscilla Matton, M.Sc., Wayne Andrews, M.Sc., & Stephen Burns***

If you have a mission statement, please include it here: In conjunction with the belief that mosquito control is an important public health issue, the Bristol County Mosquito Control Project, under the guidance of the State Reclamation and Mosquito Control Board, strives to serve their membership communities by suppressing both nuisance and disease carrying mosquito populations.

Our goal is to bring mosquito populations to tolerable levels using a variety of scientifically effective methodologies consistent with applicable laws. Surveillance, water management, biological and chemical controls are performed in an environmentally sensitive manner to minimize potential effects on people, wildlife and the environment.

It is acknowledged that commissioners live or work in the county and that all decisions be made in a fiscally responsible manner. The Project advocates public outreach and education through cooperative efforts with local officials, school departments and the news media.

ORGANIZATION SETUP:

Please list your Commissioner's names:

Arthur F. Tobin- Chairman
Gregory D. Dorrance
Christine A. Fagan
Joseph Barile
Robert F. Davis

Please list the Supt./Director's name: Wayne N. Andrews, M.Sc.
Please list the Supt./Director's contact phone number: 508-823-5253

Please list your Asst. Supt./Asst. Director's name: Stephen Burns

Do you have a website? No

If yes, please list the web address here: http://

Please list your staffing levels for the year of this report:

Full time: 9
Part time:
Seasonal: 2
Other: (please describe)

Please break these down into the following areas:

Administrative staff: 1.5
Field staff: 7.5

Please check off all that apply, and list employee name(s) next to each category:
☒ Public relations Wayne Andrews, Priscilla Matton
☒ Information technology Priscilla Matton, Wayne Andrews
☒ Entomologist Priscilla Matton, Wayne Andrews
☒ Wetland Scientist Priscilla Matton
☒ Biologist Wayne Andrews, Priscilla Matton
☒ Education Priscilla Matton, Wayne Andrews
☒ Laboratory Wayne Andrews, Priscilla Matton
☒ Operations Stephen Burns
☒ Facilities Stephen Burns
☒ Other (please list) GIS- Priscilla Matton; Administrative Assistant- Barbara Johnson

For the year of this report, we maintained:
11 vehicles
2 modified wetland equipment (list type) (2) low ground pressure excavators, (1) low ground pressure mower, (1) Truck and trailer to transport , (1) Bulldozer, (1) Brushcutter attachment
8 ULV sprayers (list type) (4) Beecomist, (4) London Fog (GPS)
Larval control equipment (list type)
Other (please be specific):

Comments: This year we were able to purchase a Denis Cimaf DAH-080 brushcutter attachment for the low ground pressure excavators. This has greatly reduce the amount of time it takes to clean areas around our water management projects. The brushcutter reduces shrubs and small trees to mulch allowing for more visiblity and safer working conditions for the field technicans. We also acquired a Ford F250 with utlity body with a compressor and transport cradle for brush mower attachment.

How many cities & towns in your service area? 20
Please list: North Attleborough, Attleboro, Seekonk, Rehoboth, Mansfield, Norton, Dighton, Somerset, Swansea, Easton, Taunton, Raynham, Berkley, Freetown, Fall River, Westport, Dartmouth, New Bedford, Acushnet, Fairhaven

***Please attach a link to a map of your service area if possible. Attached**

INTEGRATED PEST MANAGEMENT (IPM):

DEFINITION: a comprehensive strategy of pest control whose major objective is to achieve desired levels of pest control in an environmentally responsible manner by combining multiple pest control measures to reduce the need for reliance on chemical pesticides; more specifically, a combination of pest controls which addresses conditions that support pests and may include, but is not limited to, the use of monitoring techniques to determine immediate and ongoing need for pest control, increased sanitation, physical barrier methods, the use of natural pest enemies and a judicious use of lowest risk pesticides when necessary.

Please check off all of the services that you currently provide to your member cities and towns as part of your IPM program; details of these services are in the next sections.

☒ **Larval mosquito control**
☒ **Adult mosquito control**
☒ **Source reduction**
☒ **Ditch maintenance**
☒ **Open Marsh Water Management**
☒ **Adult mosquito surveillance**
☒ **Education, Outreach & Public education**
☒ **Research**
☒ **Other (please list): GIS and Mapping**

Comments: _____

LARVAL MOSQUITO CONTROL:

Do you have a larval mosquito suppression program? Yes

If yes, please describe the purpose of this program: To reduce the emergence of adult mosquitoes in areas where larval mosquitoes are present, using biorational techniques. This includes applications to catch basins and storm water structures, primarily to control Culex mosquitoes, a vector of WNV in the area. A database of mosquito larval development sites are checked, treated as necessary, and recorded for historical information.

Please give the time frame for this program: See Timeline at the end of the document

Describe the areas that this program is used: Throughout Bristol County in wetlands, salt marshes, catch basins, storm water structures, containers, tires, and any other areas holding water.

Do you use:
☒ **Ground applied (includes hand, portable and/or backpack)**
☐ **Helicopter applications**
☐ **Other (please list):**
Comments: _____

What products do you use in – (please use product name and EPA#)

Wetlands: Vectobac G #73049-10
Catch basins: VectoLex WSP #73049-20
Containers: VectoLex WSP #73049-20
Other (please list): Cattail areas: Altosid Pellets #2724-448

Please list the rates of application for the areas listed above:

Wetlands: 2.5 lbs/acre
Catch basins: 1 pouch per catch basin
Containers: 1 pouch per 50 sq ft
Other: 2.5 lbs/acre

What is your trigger for larviciding operations? (check all that apply)

☒ Larval dip counts – please list trigger for application: 1+ per 5 dips
☒ Historical records
☒ Best professional judgment

Comments: All of the approximately 2,000 larval monitoring sites have GPS coordinates and are mapped for use in the truck computers. Some mosquitoes, like Cq. perturbans are difficult to sample and applicators use other indicators when making applications. The Federal EPA requested information on application methods and rates for larvicides and adulticides for upcoming NPDES permit compliance. The document sent along to this data request is included in the appendix.

***Please attach a link to maps of treatment areas if possible. Attached**

ADULT MOSQUITO CONTROL:

Do you have an adult mosquito suppression program? Yes

If yes, please describe the purpose of this program: Vector Control 95%; Nusiance 5% Each year Bristol County experiences both West Nile virus and Eastern Equine Encephalitis throughout its 20 cities and towns.

Please give the time frame for this program: See Timeline at the end of the document

Describe the areas that this program is used: Area wide and targeted adulticide throughout the 20 cities and towns.

Do you use:
☒ **Truck applications**
☐ **Portable applications**
☒ **Aerial applications**
☐ **Other (please list):**
Comments: An aerial application of Anvil® 10 + 10 ULV was made to approximately 284,000 acres in Bristol and Plymouth counties to control Eastern Equine Encephalitis. This application was coordinated by MDAR and the State Reclamation and Mosquito Control Board, MA DPH and various other state agencies. Parts of Acushnet, Berkley, Dartmouth, Easton, Fairhaven, Freetown, New Bedford, Norton, Taunton and Raynham were included in this application. The application was conducted over three-nights from August 5-7, 2010. Pre- and post- trapping resulted in an 85% overall reduction in the mosquito population and a 90% reduction in mammal biting mosquitoes.

Please list the names of the products used with EPA #:
1). Anvil 10+10 ULV, EPA Reg # 1021-1688-8329
2).
3).
4).
5).
6).

Please list your application rates for each product:
1). 0.21fluid oz per acre - 0.62 fluid oz per acre
2).
3).
4).
5).
6).

Please describe the maximum amounts or frequency used in a particular time frame such as season and areas

The application rate would be dependent upon vector control activities, physical characteristics of the area and/or environmental issues. Anvil 10+10 is only applied every other day in the same area.

What is your trigger for adulticiding operations? (check all that apply)

☐ Landing rates - please list trigger for application
☒ Light trap data - please list trigger for application 5 per trap
☒ Complaint calls - please list trigger for application 2 per square mile
☒ Arbovirus data
☒ Best professional judgment

Comments: The Project received 17,508 adulticiding spray request in 2010 and 15,964 in 2009. The Federal EPA requested information on application methods and rates for larvicides and adulticides for upcoming NPDES permit compliance. The document sent along to this data request is included in the appendix.

***Please attach a link to maps of treatment areas if possible. Please see attached**

SOURCE REDUCTION

Do you perform source reduction methods such as tire/container removal? Yes

If yes, please describe your program: Containers and tire removal from problem areas, sometimes in conjuction with town programs. Property inspections are an important component in source reduction. Educate home and business owners how to reduce and remove standing water on their property conducive to larval habitat.

What time frame during the year is this method employed? See Timeline at the end of the document

Comments: Source reduction is an important component of an IPM plan, however source reduction does not equal permenant control.

DITCH MAINTENANCE

Do you have a ditch maintenance program? Yes

Please check all that apply:
☒ Inland/freshwater
☒ Saltmarsh

If yes, please describe: Our goal is to remove debris, silt and vegetation from drainage ditches throughout our service area, to improve water flow through the areas. This includes both hand and mechanized work. Proper water flow will eliminate standing water conducive to larval mosquito development.

Please check off all that apply INLAND DITCH MAINTENANCE:

☒ **Hand tools**
☒ **Mechanized equipment**
☒ **Other (please list): Erosion Control Materials**
Comments: The Project has contiuned to implement the use of environmentally sensitive silt and erosion control materials to stabilizes soils disturbed by our operations. This includes but not limited to: straw and coconut blankets, straw bales, jute mats, conservation seed and sedi-stop rolls within the waterway.

Please check off all that apply SALTMARSH DITCH MAINTENANCE:

☒ **Hand cleaning**
☒ **Mechanized cleaning**
☒ **Other (please list): Erosion Control Materials**
Comments: The Project has contiuned to implement the use of environmentally sensitive silt and erosion control materials to stabilizes soils disturbed by our operations. This includes but not limited to: straw and coconut blankets, straw bales, jute mats, conservation seed and sedi-stop rolls within the waterway.

Please give an estimate of cumulative length of ditches maintained from the list above **INLAND**:

Hand cleaning 54,737 feet
Mechanized cleaning 8,296 feet
Other (please list): Brush cut- 33,447 feet and mechanized brush mowed- 2.76 acres

Comments: _____

Please give an estimate of cumulative length of ditches maintained from the list above **SALTMARSH**:

Hand cleaning 2,325 feet
Mechanized cleaning 4,360 feet
Other (please list): Brush cut- 200 feet and mechanized brush mowed- 6.9 acres

What time frame during the year is this method employed? See Timeline at the end of the document

Comments: Bristol County Mosquito Control Project completed 26 mechanized ditch maintenance projects within our member communities. We have created a Best Management Practice document to better explain how and why we perform water management. We work closely with the member towns to find sites that will benefit the

communities. MA MCDs wetlands coordinators meet regularly to discuss issues and techniques used in our water management projects.

***Please attach a link to maps of ditch maintenance areas if possible.**

MONITORING (Measures of Efficacy)

Please describe monitoring efforts for each of the following:

Aerial Larvicide – wetlands: **We do not conduct aerial larvicide applications in Bristol County.**

Larvicide – catch basins: **Same as for hand/small area larviciding.**

Larvicide-hand/small area **Larvicide monitoring is done at approximately 10% of treatment locations. Before and after an application, a standard issue white 350 ml "dipper" is used to dip for immature mosquitoes. A dip is typically one smooth motion into the water / submerged vegetation and out keeping the dipper level upon exiting so that the sample does not spill. If there is no available water to sample at the site it is considered dry. The observer specifically notes dip samples that contain mosquito pupae. The observer will count and may indicate developmental stages of the larvae (instar – 1st, 2nd, 3rd, or 4th) or indicate "pupae". The observer may indicate condition of the sample i.e., live, moribund or dead as applicable.**

Ground ULV Adulticide: **The Project places mosquito traps in locations where an application will take place, to check if the pesticide is coming into contact with the mosquitoes. When the trap is collected, the number of dead or dying mosquitoes are noted on the collection form. We conduct pre and post traps collections in certain ecological areas to assess efficacy.**

Source Reduction: **Massachusetts Best Management Practices and Guidance for Freshwater Mosquito Control document is attached. On water management projects, 100% of the locations are monitored for efficacy. At approximately 10% of our source reduction locations, the Project applicators will return to a site to look for temporary and permenant containers that have returned.**

Open Marsh Water Management: **Please see the attached May 2010 OMWM Standards**

Other (please list): **The SRMCB Massachusetts Mosquito Control Surveillance Protocol for Evaluation of Efficacy of Aerial Adulticide Application(s) Regarding Mosquito-Borne Disease is attached.**

Provide or list standard steps, criterion, or protocols regarding the documentation of efficacy, (pre and post data) and resistance testing (if any): **Pre and Post efficacy data from the 2010 aerial application is provided in the attachments.**

OPEN MARSH WATER MANAGEMENT

Do you have an OMWM program? Yes

If yes, please describe: No projects were completed in 2010. However the goal of the program is to create greater access for mosquito-eating fish to areas on the marsh that support mosquito larval development. Attached is the current OMWM standards.

Please give an estimate of total square feet or acreage: None

What time frame during the year is this method employed? See Timeline at the end of the document. Activities may take place based on time restrictions for endangered species or other environmental factors.

Comments: Participatied with MA Coastal Zone Management and other MCDs with OMWM programs along with many other state agencies to establish new standards.

***Please attach a link to maps of OMWM areas if possible.**

ADULT MOSQUITO SURVEILLANCE

Do you have an adult mosquito surveillance program? Yes

Please list the number (not location) of MDPH traps in your service area: 10

Please check off all the types of surveillance that apply to your program:

- ☒ Gravid traps
- ☒ Resting boxes
- ☒ CDC light traps ☐ Canopy
- ☒ CDC light traps w/CO_2 ☐ Canopy
- ☐ ABC light traps ☐ Canopy
- ☐ ABC light traps w/CO_2 ☐ Canopy
- ☒ NJ light traps ☐ Canopy
- ☐ NJ light traps w/CO_2 ☐ Canopy

Other (please describe): UV light trap with and without CO2

Please describe the purpose of this program: There are two reasons to do surveillance: to monitor the mosquito population and virus levels in these mosquitoes. We work in conjunction with the MA Department of Public Health for testing of samples that are collected. This helps us monitor the EEE and WNV activity in the local mosquito populations. With this information we make pesticide applications, public outreach and water management decisions. We participated in the annual collection survey for Cs. melanura with MA DPH, to estimate the population and risk of EEE.

Do you maintain long-term trap sites in any of your areas? Yes

If yes, please describe how you chose these long-term sites. Originally based on EEE human cases in these areas.

Please check off the species of concern in your service area:

- ☒ *Ae. albopictus*
- ☐ *Ae. cinereus*
- ☒ *Ae. vexans*
- ☐ *An. punctipennis*
- ☐ *An. quadrimaculatus*
- ☒ *Cq. perturbans*
- ☒ *Cx. pipiens*
- ☒ *Cx. restuans*
- ☒ *Cx. salinarius*
- ☒ *Cs. melanura*
- ☒ *Cs. morsitans*
- ☐ *Oc. abserratus*
- ☒ *Oc. canadensis*
- ☒ *Oc. cantator*
- ☐ *Oc. excrucians*
- ☐ *Oc. fitchii*
- ☒ *Oc. j. japonicus*
- ☐ *Oc. punctor*
- ☒ *Oc. sollicitans*
- ☐ *Oc. stimulans*
- ☒ *Oc. taeniorhynchus*
- ☒ *Oc. triseriatus*
- ☐ *Oc. trivittatus*
- ☐ *Ps. ferox*
- ☐ *Ur. sapphirina*

☐ Other (please list):

Do you participate in the MDPH Arboviral Surveillance program? Yes

How many pools do you submit weekly on average? 10

Please check off the arboviruses found in your area in the past 5 years:

- ☒ West Nile Virus
- ☒ Eastern Equine Encephalitis
- ☒ Other Please list: Highlands J

Did the above listed diseases cause human or horse illnesses? Yes

Please explain: We have had more EEE activity in our County than any other mosquito control program in the US. We have collected over 100 isolations from both WNV and EEE in the past 5 years. We had 6 reported WNV human cases and 2 EEE human cases.
2008 Horse case- Freetown

At what arbovirus risk level did the year begin in your area? (If more than one please list)

WNV: Westport, Dartmouth and New Bedford are in the Moderate-risk category. Remaining towns are in the Low-risk category.
EEE: Easton, Raynham, Freetown, Acushnet, Fairhaven and New Bedford are in Moderate-risk category.

Remaining towns are in a Low-risk category.

At what arbovirus risk level did the year end in your area? (If more than one please list)

WNV: The towns of Westport, Dartmouth and New Bedford are in the Moderate-risk category for WNV.
EEE: The towns of Taunton, Berkley, Raynham, Freetown, Acushnet, Fairhaven and New Bedford are in the High-risk category for EEE. The towns of Easton, Norton, Dighton, Somerset, Fall River, and Dartmouth are in the Moderate-risk category for EEE.

What time frame during the year is this method employed? See Timeline at the end of the document

Comments: A total of 477 square miles (305,301 acres) were at a Moderate/High risk for EEE and WNV in 2010. This is 69% of our service area. There are no reported human or horse cases for WNV or EEE in Bristol County. The highly invasive Asian Tiger Mosquito (Aedes albopictus) was collected in New Bedford on two separate dates in 2010. It now has been found in the same area two years in a row, with no evidence of overwintering or expansion into Fairhaven, Dighton or Swansea. However it should be noted that it was reported in Rhode Island along our western boarder. Weekly reports are submitted to the State Reclamation and Mosquito Control Board and MA DPH and are attached to this document.

***Please attach a link to maps of surveillance areas if possible. Attached**

EDUCATION, OUTREACH & PUBLIC RELATIONS

Do you have an education/public outreach program program? Yes

If yes, please describe: Numerous radio, TV and newspaper events.

Please check off all that apply:

☒ School based program
☐ Website
☒ PR brochures/handouts
☒ Community events
☒ Science fairs
☒ Meeting presentations
☒ Other (please describe): Meetings at the request of organizations, Boards of Health, schools and Town/City officials. Press Releases

Please give an estimate of attendance/participants in this program: 5,000+

Please list some events you participated in for the year of this report:

American Mosquito Control Association Annual Meeting, Lexington, KY, March 2010 (presented and attended) "Determining the susceptibility of Culiseta melanura to a biorational mixture of Bacillus sphaericus (Serotype H5a5b Strain 2362) in a laboratory bioassay."
New Jersey Mosquito Control Association Annual Meeting, March 2010 (presented and attended) "EEE in the Northeast"
The Entomologist/ Biologist Research Workshop held in Palmetto, FL in April 2010 (presented and attended) "The Detection for EEE, WNV and St. Louis from Mosquitoes"
Clarke Mosquito Training Central, MA, April 2010 for CEUs
Washington Day Conference, Washington, D.C., May 2010
Presented "Enhancing EEE Surveillance" at the Northeastern EEE Conference in Concord, NH in May 2010
Bristol County Mosquito Control Project's Budget Meeting for cities and towns October 25, 2010.
Pennsylvania Vector Control Association Annual Meeting, State College, PA, November 2010
Northeastern Mosquito Control Association Annual Meeting, Hyannis, MA, December 2010
Mutiple MA DPH meetings, conference calls and site visits throughout the season
Radio Talk Show with residental call in, covering several towns within our membership area.
NE-IPM Competitive Grants Program Relevancy Panel
Beekeepers Association
Water management meeting with DCR at Lloyd State Park to discuss water mangement issues on state properties (August).
Taunton High School Intership
Whittenton Family Day in Taunton in June which included handouts and personal interaction.
Holy Ghost Festival in Fall River in August which included handouts and personal interaction.
Assowampsett Pond Complex meeting with local State Representatives, residents, MA DEP, Plymouth County MCP and other state agencies (July).
Army Corp of Engineers and Representative James McGovern's office meeting in Seekonk to dicuss water management issue in September.
Open Marsh Water Management working group with Coastal Zone Management, Mass Audubon, Mosquito Controls and other State organizations.
Water Management meeting with Mosquito Control Districts and Army Corp of Engineers.
Best Management Practices for Inland Freshwater Maintenance working group.
High School Science Fairs- mentor and judge
Board of Health meetings and site visits
Health Fairs in member cities and towns.

What time frame during the year is this method employed? See Timeline at the end of the document.

Have you performed any research projects, efficacy, bottle assays, etc.? Yes

If yes, please elaborate on your research projects:
Determining the susceptibility of Culiseta melanura to a biorational mixture of Bacillus sphaericus (Serotype H5a5b Strain 2362) and Bacillus thuringiensis var. isrealensis (Strain AM65-52) in a laboratory bioassay. Work was completed at the Project's laboratory in conjunction with Valent BioSciences Corporation. (Poster is attached)
Aedes albopictus survey in member towns to check for new introduction and establishment.

Are you involved in any collaboration with academia, industry, environmental groups, etc.? Yes

If yes, please elaborate on your collaborations this past year: Determining the susceptibility of Culiseta melanura to a biorational mixture of Bacillus sphaericus (Serotype H5a5b Strain 2362) and Bacillus thuringiensis var. isrealensis (Strain AM65-52) in a laboratory bioassay. Work was completed at the Project's laboratory in conjunction with Valent BioSciences Corporation. (Poster is attached)

Please provide a list of technical reports, white/grey papers, publication in journal or trade magazines, etc. None

Does your staff participate in educational opportunities? Yes

If yes, please list the training and education your staff received this year:
Clarke Mosquito Training Central, MA, April 2010 for CEUs
American Mosquito Control Association Annual Meeting, Lexington, KY, March 2010 (presented and attended)
New Jersey Mosquito Control Association Annual Meeting, March 2010 (presented and attended)
Entomologist/ Biologist Research Workshop held in Palmetto, FL in April 2010 (presented and attended)
Washington Day Conference, Washington, D.C., May 2010
New Jersey Mosquito Control Association sponsored "Wetlands Webinar" April 2010
Federal EPA sponsored Clean Water Act and NPDES permit training in Boston in June 2010
Federal EPA sponsored Clean Water Act and NPDES permit webinar June 2010
Northeastern Mosquito Control Association, Carver, MA, October 2010. The day long training was arranged by staff at the Bristol County Mosquito Control Project on erosion control structures by EJ Prescott and Stream Ecology by Alex Hackman- Department of Fish & Game- Division of Ecological Restoration
Northeastern Mosquito Control Association Annual Meeting, Hyannis, MA, December 2010
Field technicians have partcipated in Roadway Worker Protection programs and On-track Safety program from Mass Coastal Railroad.

Please list the certifications and degrees held by your staff:
Wayne Andrews- B.S in Biology, M.Sc. in Entomology, Certified Pesticide Applicator
Stephen Burns- B.S. in Business Management, Certified Pesticide Applicator, CDL license, Hoisting Engineer License, FEMA certified, Chainsaw Certification
Priscilla Matton- B.S in Zoology, M.Sc. in Entomology, Certified Pesticide Applicator
Jonathan Gibbs- Certified Pesticide Applicator, CDL license, Hoisting Engineer License, Chainsaw Certification
Drew Bushee-Certified Pesticide Applicator, CDL license, Hoisting Engineer License, Chainsaw Certification
John Moniz- Licensed Pesticide Applicator, CDL license, Hoisting Engineer License, Chainsaw Certification
John Raposo- Licensed Pesticide Applicator, Chainsaw Certification
Joshua Nickerson- Licensed Pesticide Applicator, CDL license, Hoisting Engineer License, Chainsaw Certification
Edward Onley- Licensed Pesticide Applicator

Comments: Participated in science fairs in member towns as judges and mentors. Provide annual Town Reports to member communities outlining the activities that have taken place within their towns. Hold monthly public commission meetings at the Project's headquaters and residents are encouraged to participate and comment.

BIOLOGICAL CONTROL EFFORTS

Do you have a biological control program? Yes

If yes, please describe: Ditch maintenance to remove blockages that restrict the movement of fish, allowing them to reach mosquito larvae.

Is this program the introduction of mosquito predators or the enhancement of habitat for native predators? Enhancement of habitat for native predators.

Please check off all that apply:

☒ Predatory fish
☒ Predatory invertebrates
☐ Other (please describe):

What time frame during the year is this method employed? See Timeline at the end of the document.

Comments: _____

INFORMATION TECHNOLOGY

Does your program use (check all that applies):

☒ Computers
☒ GIS mapping
☒ GPS equipment
☒ Computer databases
☒ Aerial Photography
☒ Other (please describe): Create maps and posters

Please describe your capabilities in these areas: Handheld and ULV based GPS for pesticide applications. MapPoint is used in the truck mounted computers to guide applicators when making pesticide applications.

Please describe your current GIS abilities: Advanced

Give details if possible on your GIS abilities: ArcMap and MapPoint are used to create maps, application locations and provide guidance. A Tremble with meter accuracy and the Pathfinder program are used to record locations.

Please describe any changes/enhancements in this area from the previous year: Field technicians learned new GIS and GPS training through True North Mapping.

Comments: A new residental spray request database was developed and put into place this year. The system helps to streamline the time and effort need to handle the amount of calls that we receive. Also a new email address- requestbristolmcp@comcast.net was created to accept requests. The system received 2892 request which then needed to be entered into the database. This is a very time consuming process and one that needs to be streamlined if the email request system will be continued.

REVENUES & EXPENDITURES

Please give a concise statement of revenues & expenditures for the prior fiscal year ending June 30.

See Fiscal Year Spreadsheet and corresponding cherry sheet at the end of the document.

List each **member municipality along with the corresponding (cherry sheet) funding assessment** dollar amount for the prior fiscal year.

Comments: A new State Reclamation and Mosquito Control Board policy required a public meeting with member cities and towns to discuss proposed budget requests. The Bristol County Mosquito Control Project's Budget Meeting for

cities and towns was held on October 25, 2010. Meeting minutes and PowerPoint presentation made at the meeting is included in the Appendix of this document.

PESTICIDE USAGE

Please total your pesticide usage with information from your Mass. Pesticide Use Report, WNV Larvicide Use records and contracted pesticide applications. Applications methods include; hand/backpack, aerial, ULV, mistblower, other (please explain)

Product Name: Anvil 10+10 ULV
EPA Reg. #: 1021-1688-8329
Application method: Truck-based GPS guided ULV
Targeted life stage: Adult
Total amount of concentrate applied: 451.6 gallons
Comments: There has been an increase in the amount used representing a substantial increase in service requests because of virus isolations.

Product Name: VectoBac G
EPA Reg. #: 73049-10
Application method: Hand
Targeted life stage: Larvae
Total amount of concentrate applied: 2,837.05 lbs
Comments: _____

Product Name: VectoLex WSP
EPA Reg. #: 73049-20
Application method: Hand
Targeted life stage: Larvae
Total amount of concentrate applied: 542.4 lbs
Comments: A total of 24,604 pouches were used in catch basins, retention/ detention ponds and abandoned swimming pools.

Product Name: Altosid Pellets
EPA Reg. #: 2724-448
Application method: Hand
Targeted life stage: Larvae
Total amount of concentrate applied: 5.0 lbs
Comments: For Cq. perturbans control and detention/retention ponds.

Product Name:
EPA Reg. #:
Application method:
Targeted life stage: Choose one
Total amount of concentrate applied:
Comments: _____

Product Name:
EPA Reg. #:
Application method:
Targeted life stage: Choose one
Total amount of concentrate applied:
Comments: _____

Product Name:
EPA Reg. #:
Application method:
Targeted life stage: Choose one
Total amount of concentrate applied:
Comments: _____

Product Name:
EPA Reg. #:
Application method:
Targeted life stage: Choose one
Total amount of concentrate applied:
Comments: _____

Product Name:
EPA Reg. #:
Application method:
Targeted life stage: Choose one
Total amount of concentrate applied:
Comments: _____

LARGE AREA EXCLUSIONS

Do you have large areas of pesticide exclusion, such as estimated or priority habitats? Yes

If yes, please explain, and attach maps or a web link if possible. Map of Canoe River and Hockomock ACEC's and areas of Priority Habitat.

SPECIAL PROJECTS

Do you perform any inspectional services such as inspections at sewage treatment facilities or review sub division plans? Yes

If yes, please elaborate Perform entomological work when requested by member towns. Review, inspect and treat detention/ retention ponds in sub divisions.

Do you work with DPW departments or other local or state officials to address stormwater systems, clogged culverts or other areas that you have identified as man-made mosquito problem areas? Yes

If yes, please elaborate: Completed a 3-year stormwater system project at UMass Dartmouth. Completed ditch maintanence projects at the New Bedford and Mansfield Airports. Extensive work is done with member towns and local governmental agencies such as the DPW, Boards of Health, Conservation Commissions, Engineering departments and Mass Highway District 5. We are often contacted to clean drainage ditched that are clogged with sand and debirs before it is discharged into the adjacent wetland.

Have you worked with these departments on long term solutions? Yes

If yes, please elaborate: Worked with Mass Division of Ecological Restoration on a saltmarsh project and Phragmites control at Dublin Street in Somerset. This project aims to increase salt water into the area to reduce Phragmites and increase natural predatory fish movement.

Did you conduct or participate in any cooperative research or restoration projects?

If yes, please elaborate: A habitat restoration project of Marsh Island in Fairhaven, in conjunction with NOAA, New Bedford Harbor Trustee Council and the Fairhaven Board of Public Works, is currently in the planning stages. The plan is to remove fill that was placed on the site between 1935-1955 and excavate marsh creeks and pools/pannes along with planting of marsh grasses. Bristol County Mosquito Control Project has commented and made site visits to the area to help develop the plan. Also consulted on a West Island Beach culvert replacement and marsh restoration project with NOAA in the town of Fairhaven. Worked with Mass Division of Ecological Restoration on a saltmarsh project and Phragmites control at Dublin Street in Somerset. This project aims to increase salt water into the area to reduce Phragmites and increase natural predatory fish movement.

Did you or participate on any **State/Regional/National workgroups or panels or attend any meeting pertaining to the above**?

If yes, please elaborate: Wayne Andrews is a member of the American Mosquito Control Association's Public Relations Committee. Also a member of the EPA NE-IPM Competitive Grants Program Relevancy Panel.
Priscilla Matton is a member of the Northeastern Mosquito Control Association's Executive Board and the American Mosquito Control Association's Training and Member Education Committee.
Joshua Nickerson is the vendor coordinator for the Northeastern Mosquito Control Association.
We currently sit on a variety of workgroups within the state including but not limited to: Open Marsh Water Management working group with Coastal Zone Management, Mass

Audubon, Mosquito Controls and other State organizations; Water Management meeting with Mosquito Control Districts and Army Corp of Engineers; Best Management Practices for Inland Freshwater Maintenance working group; Aquatic Restoration Task Force and MA DPH joint workgroups.

CHILDREN AND FAMILIES PROTECTION ACT

Is your program impacted by the Children and Families Protection Act? Yes

If yes, please explain: We have approximately 265 day cares and 150 locations of private, parochial and public school properties.

If you have data on compliance with this Act and your program, please list here: There are currently 16 daycares and 9 schools in Bristol County that are not in compliances with the Act. This does not mean that all the other locations have mosquito control listed in their outdoor plans.

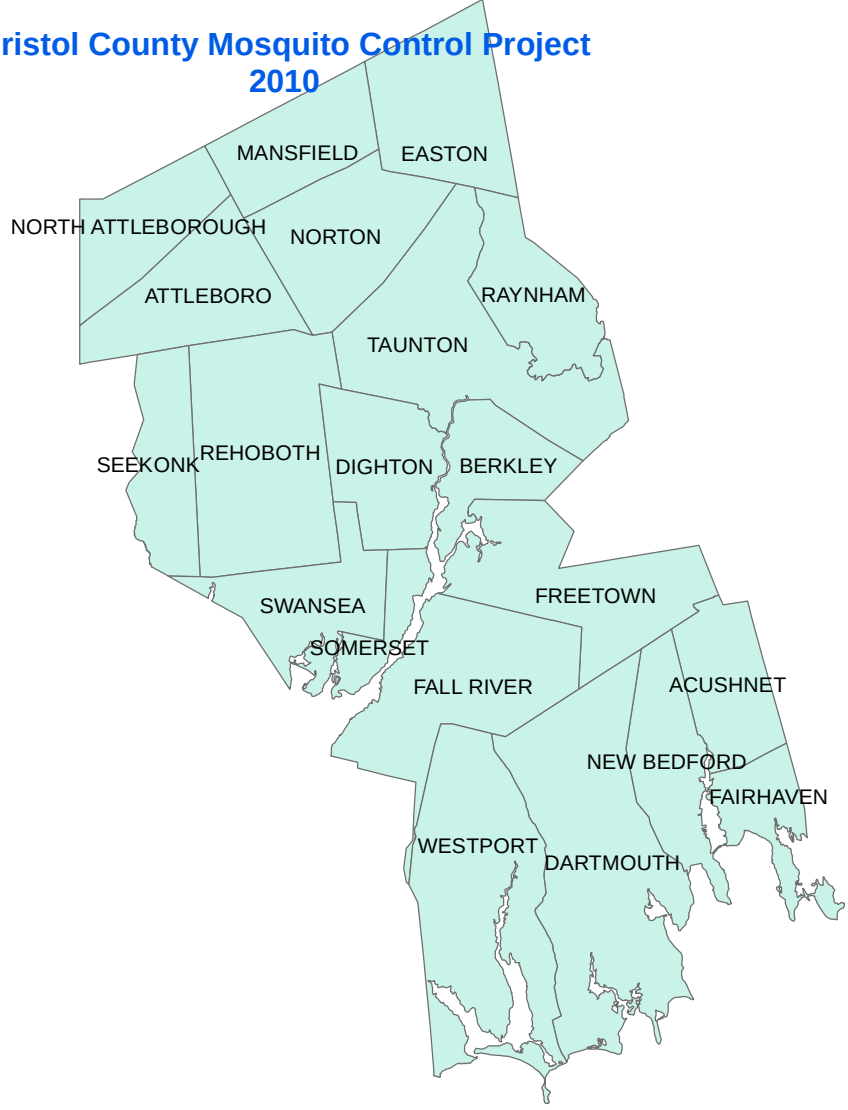
If you had difficulties with implementation of your program due to this law, please elaborate here: Avoiding this many locations at night makes adulticiding applications very difficult. With the addition of computers in the trucks, applicators are better able to locate these areas.

Comments: Map included at end of document with schools and no-sprays. The amendments to the Children and Families Protection Act on notification has grealty reduced the paper work required by the schools. This has allowed for applications in areas of high viral activity, to be made on school property in a more timely and cost efficient manner.

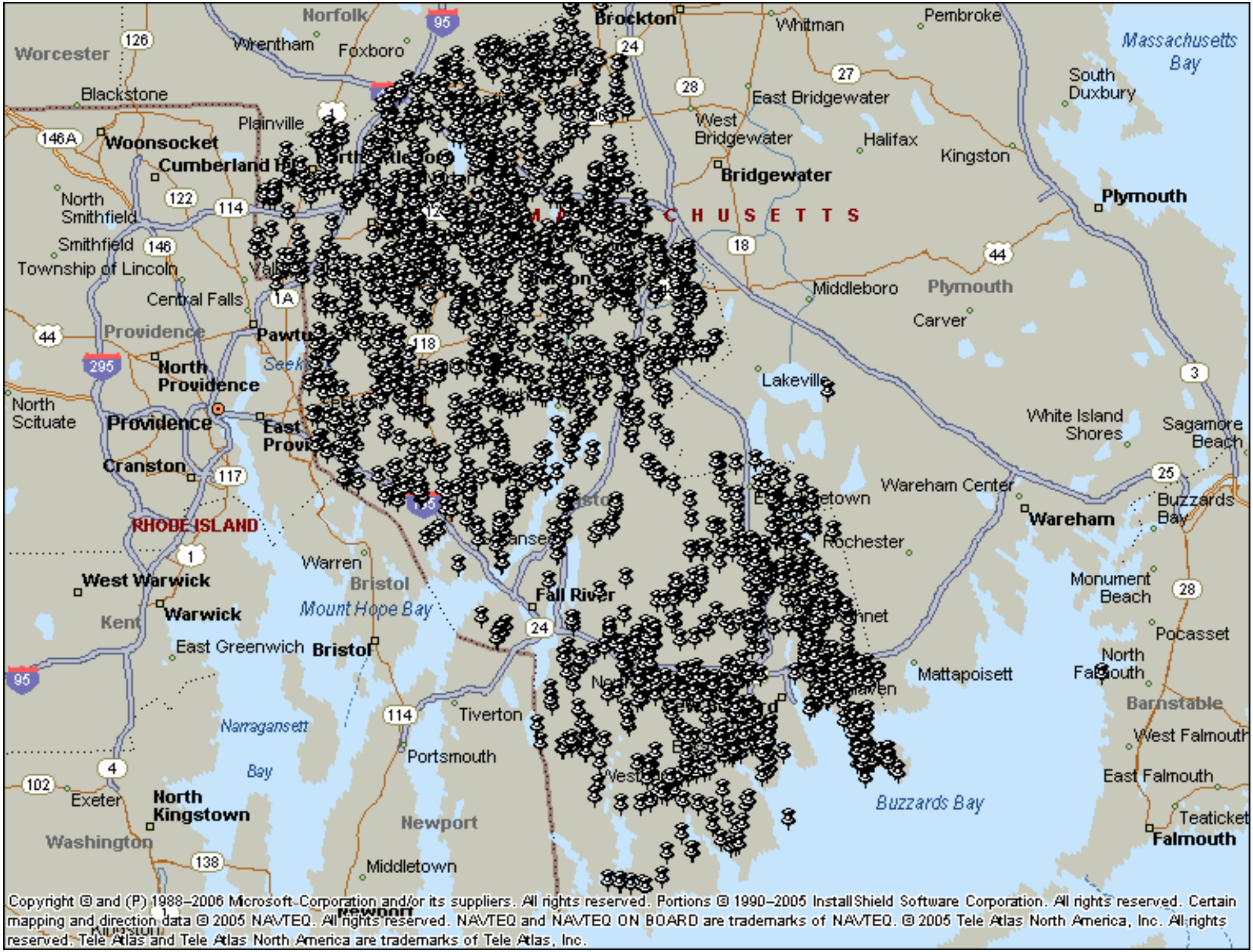
GENERAL COMMENTS

Please list any comments not covered in this report: Bristol County has 691 sq miles. It has 556 sq miles of land and 135 sq miles of water. It also has 74,000 acres of DEP wetlands plus an additional 25,000 acres of re-flood that supports Aedes vexans. In 2010, 477 sq miles were in a High/ Moderate risk for WNV and EEE. This is 69% of our service area. Please see the 193 page appendix attached to this document.

Bristol County Mosquito Control Project
2010



BCMCP's Computerized GPS Larval Sites



Bristol County Mosquito Control Project
140 North Walker Street
Taunton, MA 02780
508-823-5253

	CY2007		CY2008		CY2009	
	Pounds	Acres	Pounds	Acres	Pounds	Acres
Larvicide -Hand Applied Over/In Water [a]	2,311	420.2	2,770	503.6	2,903	527.8
Larvicide – Aerial [b]	0	0	0	0	0	0
	Gallons	Acres	Gallons	Acres	Gallons	Acres
Adulticide Truck (GIS/GPS) [c]	312.8	95,329.5	296.0	90,209.5	392.8	119,710.5
Adulticide Surface Water [d]	0	0	0	0	0	0
	Pounds	Total Catch Basins	Pounds	Total Catch Basins	Pounds	Total Catch Basins
Catch Basin [e]	5.94	23,188	5.30	20,680	491.72	22,301
		Total Acres		Total Acres		Total Acres
Catch Basin Acres [f]		53.2		47.5		51.2
Total Pesticide Applications Acres Over/In Water Treated [g]		473.4		551.1		579.0

Total Bristol County Size: 695 sq miles = 444,800 acres.

[a] VectoBac G®, EPA Reg #1021-1688-8329. This material is applied by hand at rate of 5.5 lbs/acre. The number of pounds and acres in the table above are for Calendar Years 2007, 2008, 2009.

[b] No aerial applications for larvae are performed in Bristol County.

[c] Anvil 10+10®, EPA Reg# 1021-1688-8329. Trucks applying this material have GPS/GIS capabilities since 2005 to avoid NHESP Priority Habitat, Residential No Sprays, wetlands, waters, fish farms, organic farms and other environmentally sensitive areas. Gallons used and acres sprayed are in the table above for Calendar Years 2007-09.

[d] There are no truck based ULV adulticide over waters in Bristol County.

[e] We have determined that each catch basin/storm water drain area is 100 square feet. There are 43,560 square feet to an acre. There are 435.6 catch basins per acre based on treatment area under ground. In 2007 and 2008 VectoLex WDG®, EPA Reg# 73049-57 was used. In 2009 VectoLex WSP®, EPA Reg#73049-20 was used.

[f] Totals for catch basin treatment acres are in the table above.

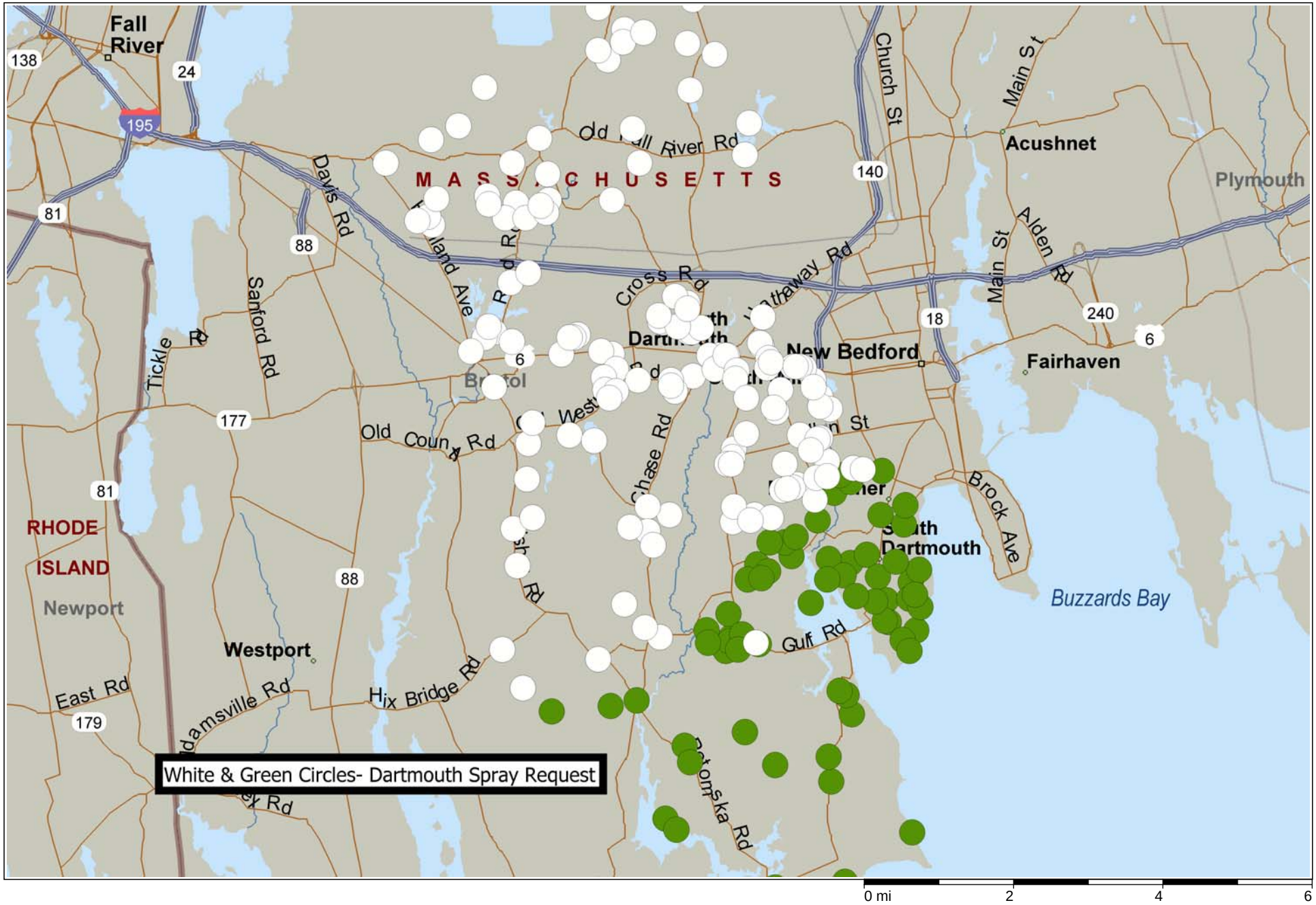
[g] Total pesticide applications to water.

Prepared by:

Wayne N. Andrews 9/30/2010

Wayne N. Andrews, M.Sc. Date
Superintendent Bristol County Mosquito Control

Spray Request 2010



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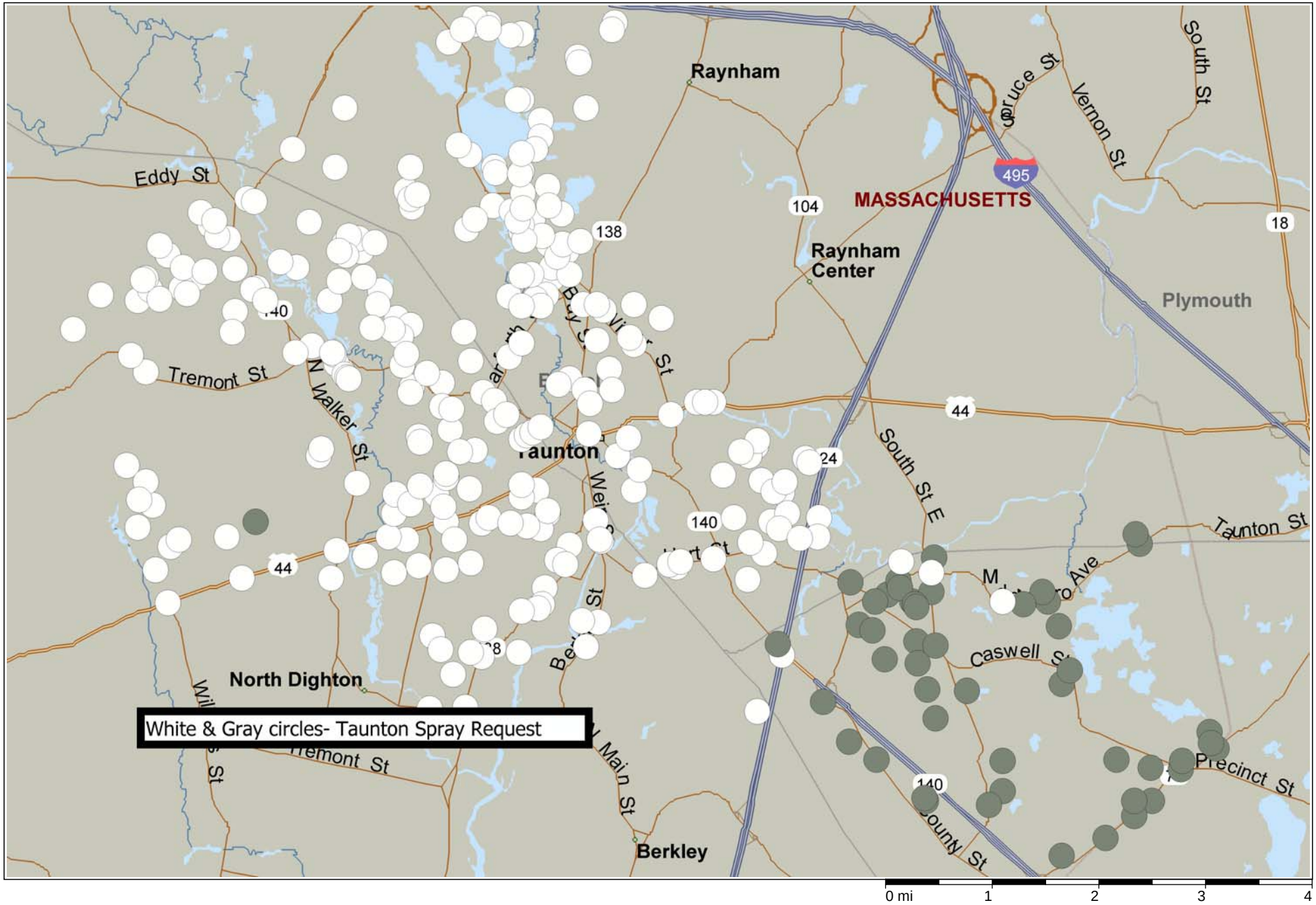
half towns



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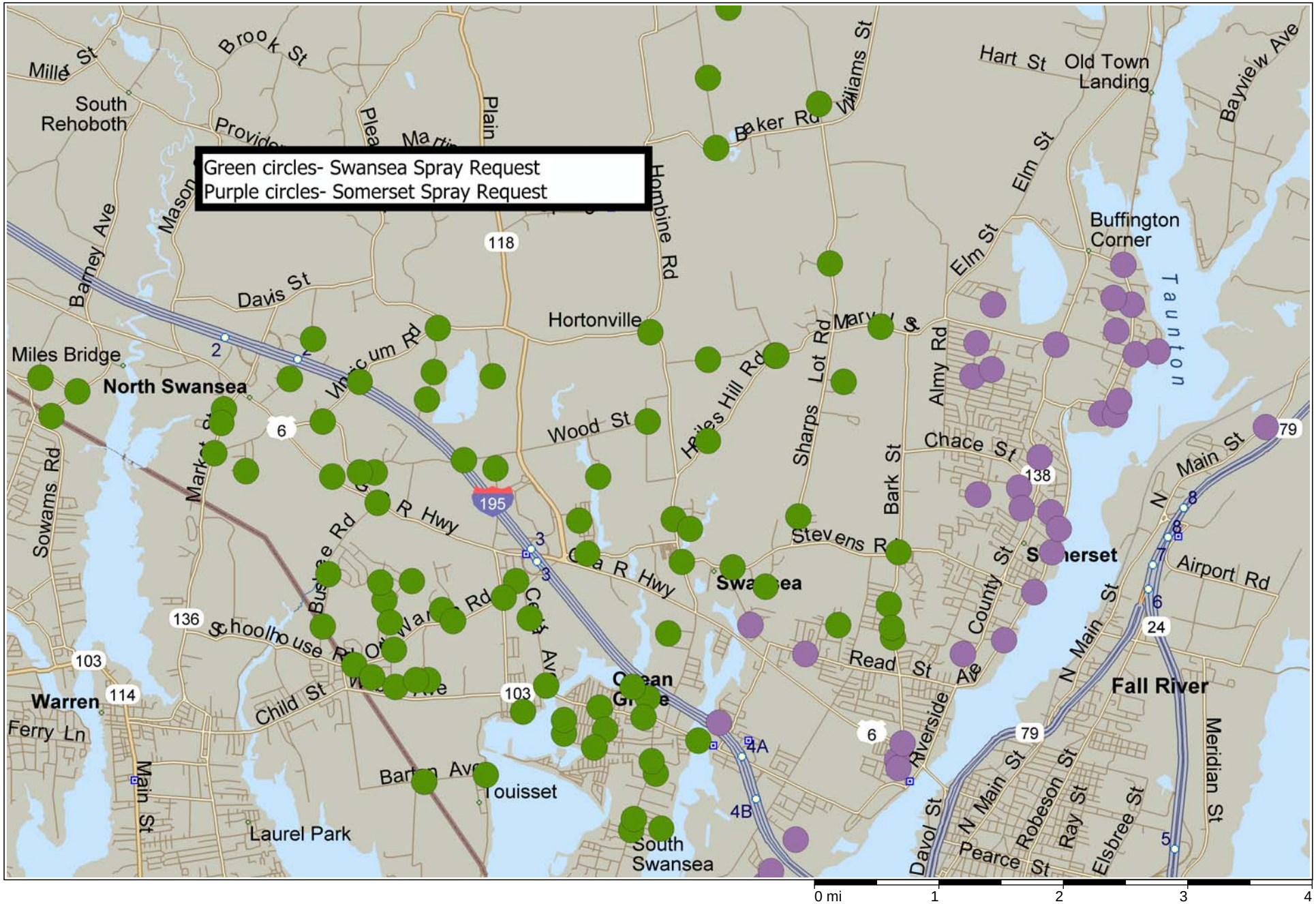

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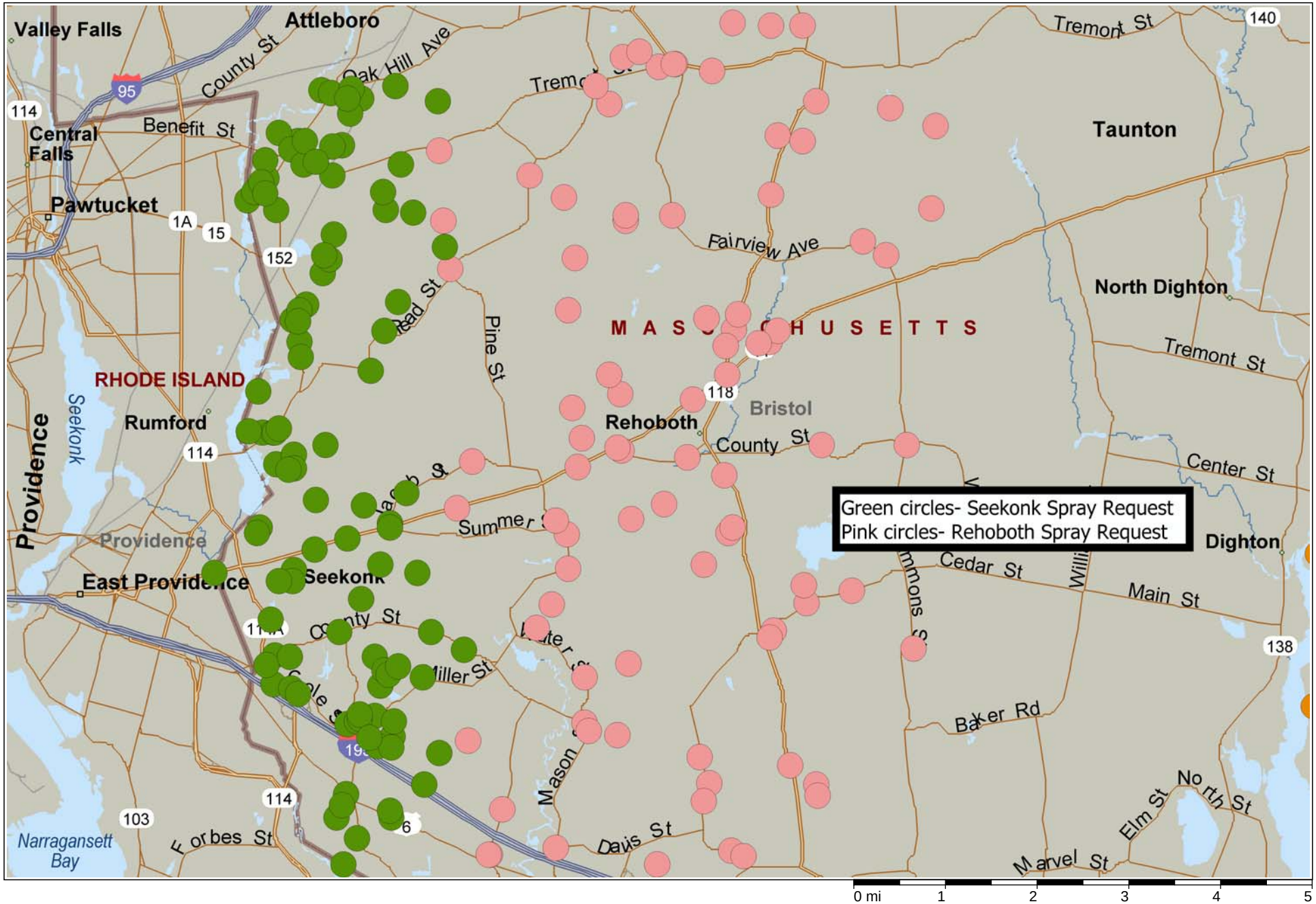

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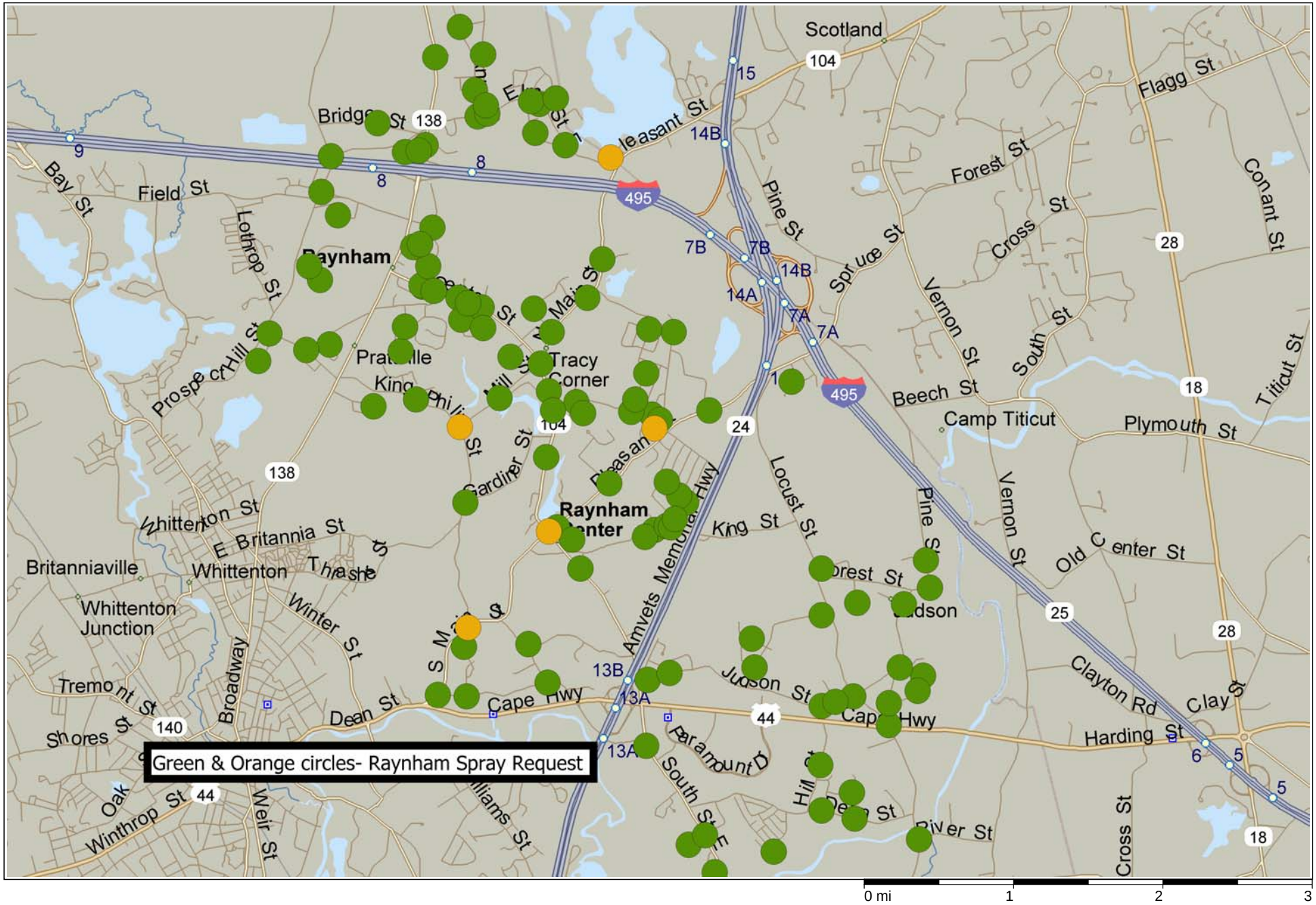

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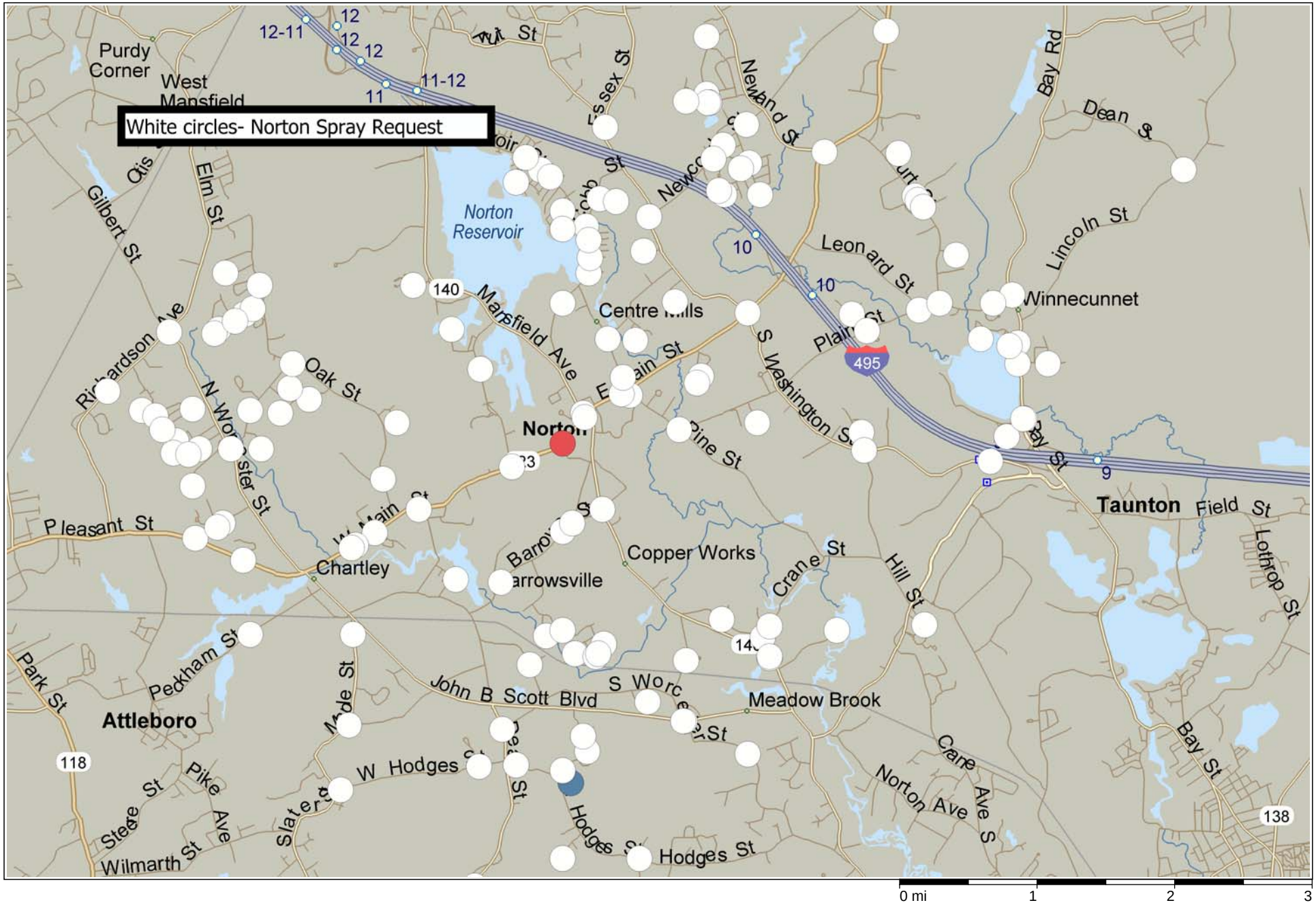

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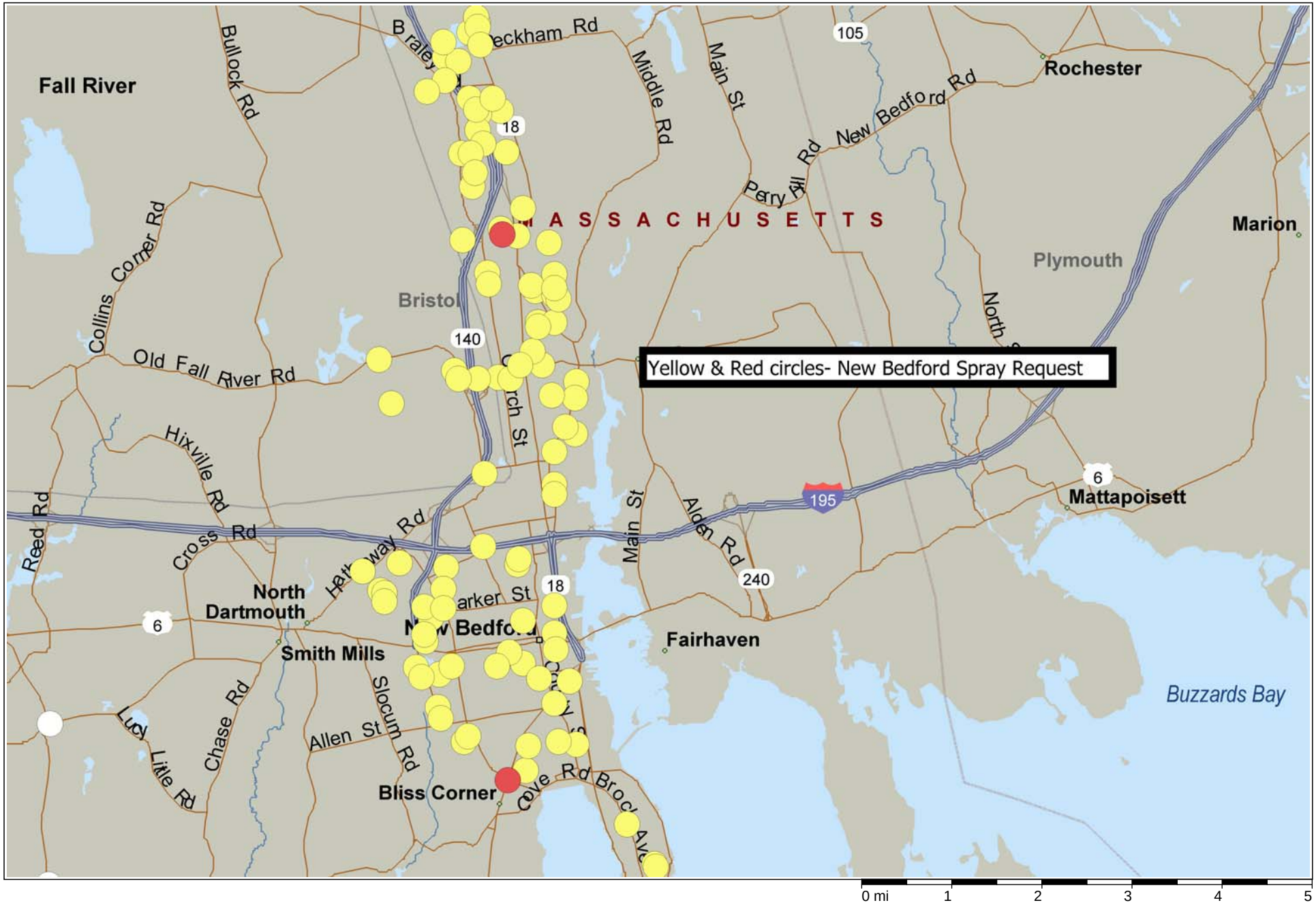

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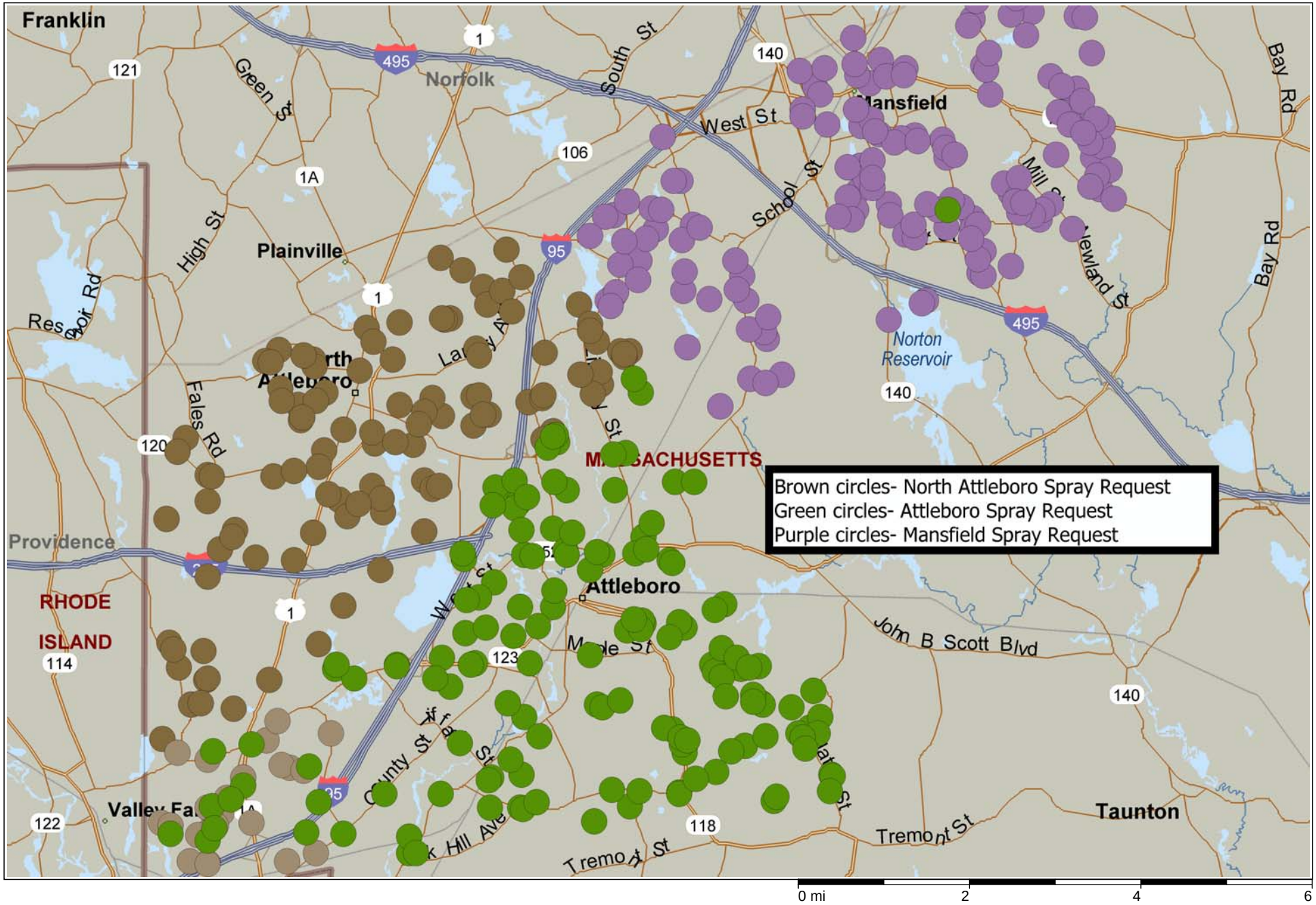

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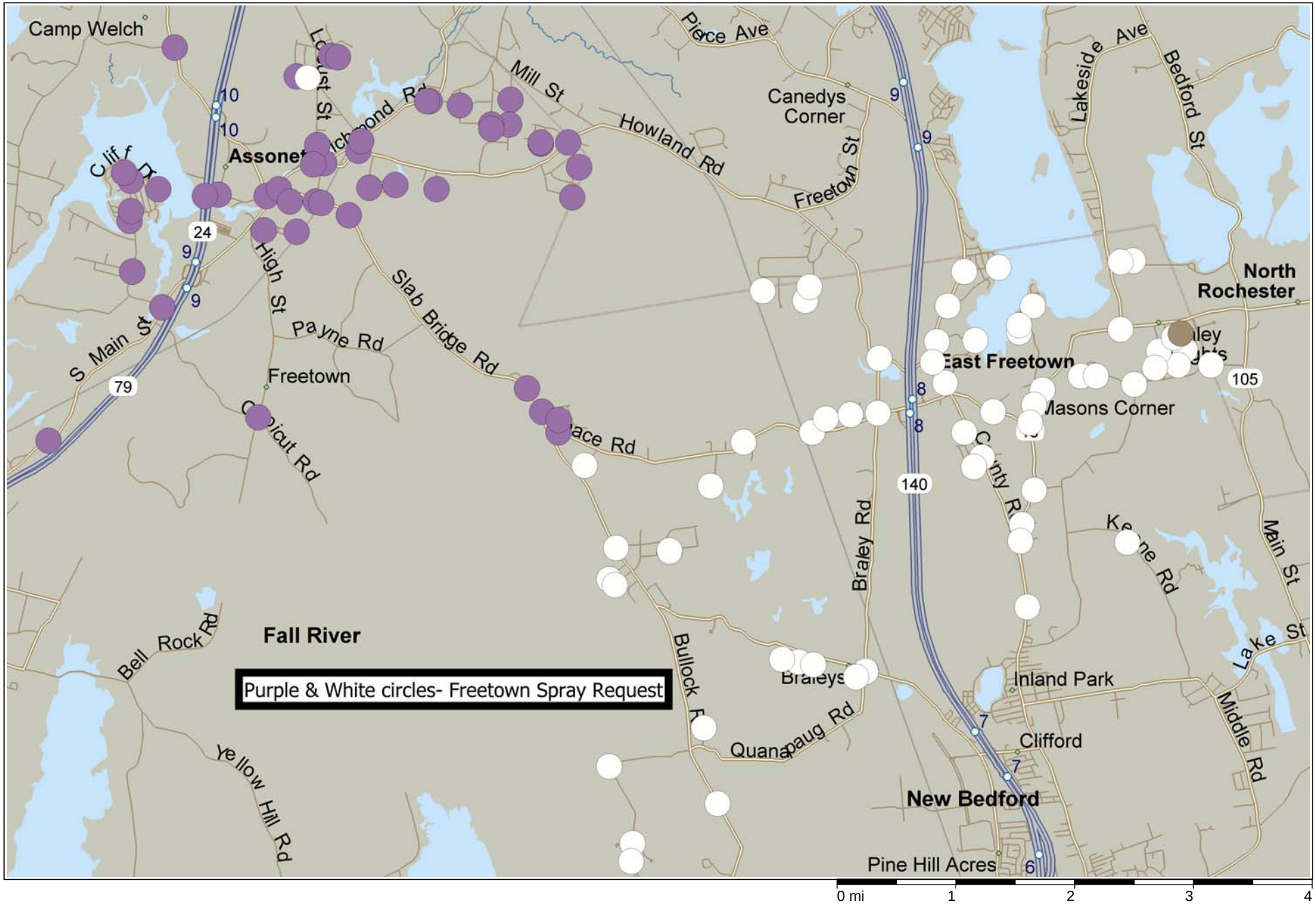

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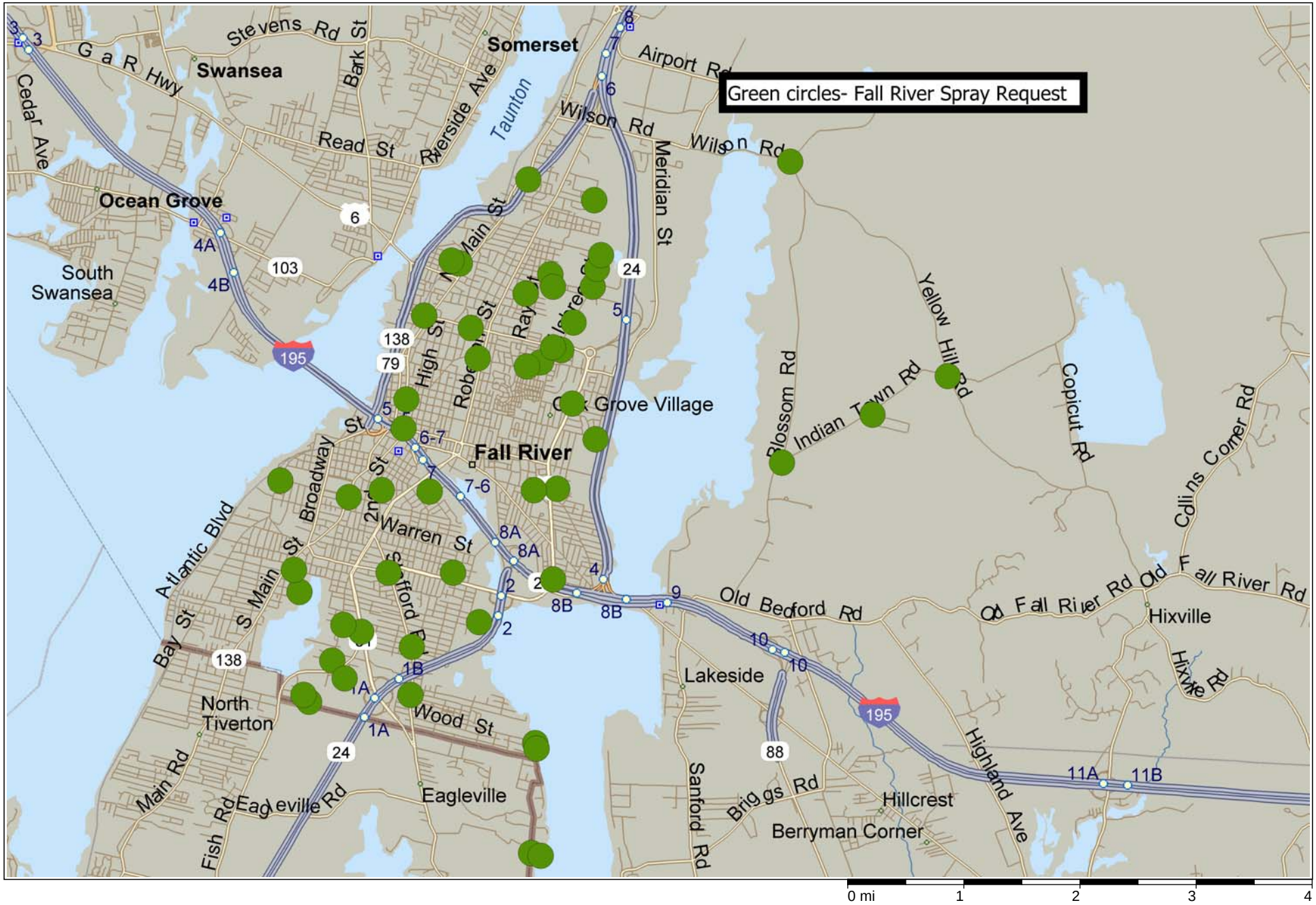

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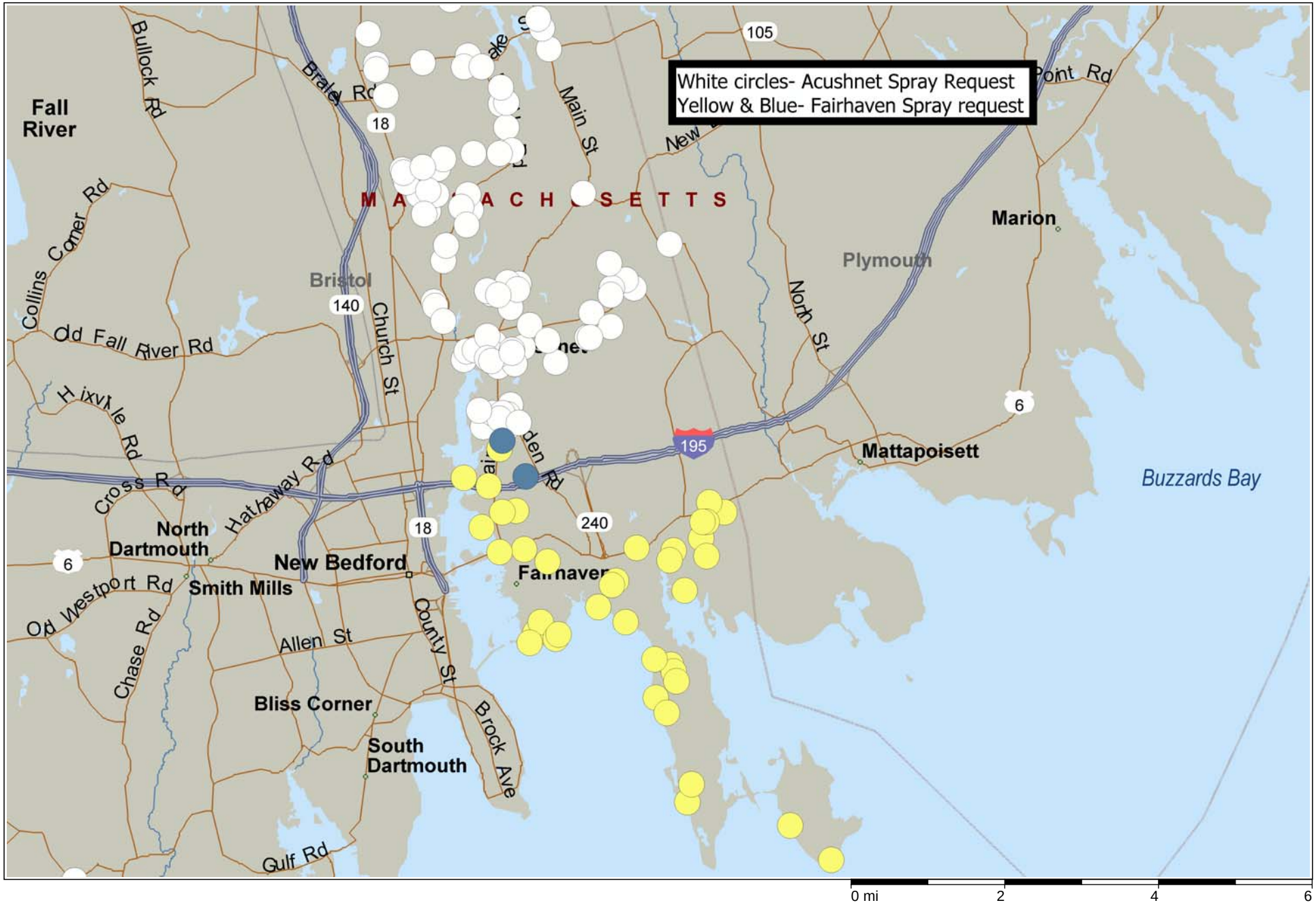

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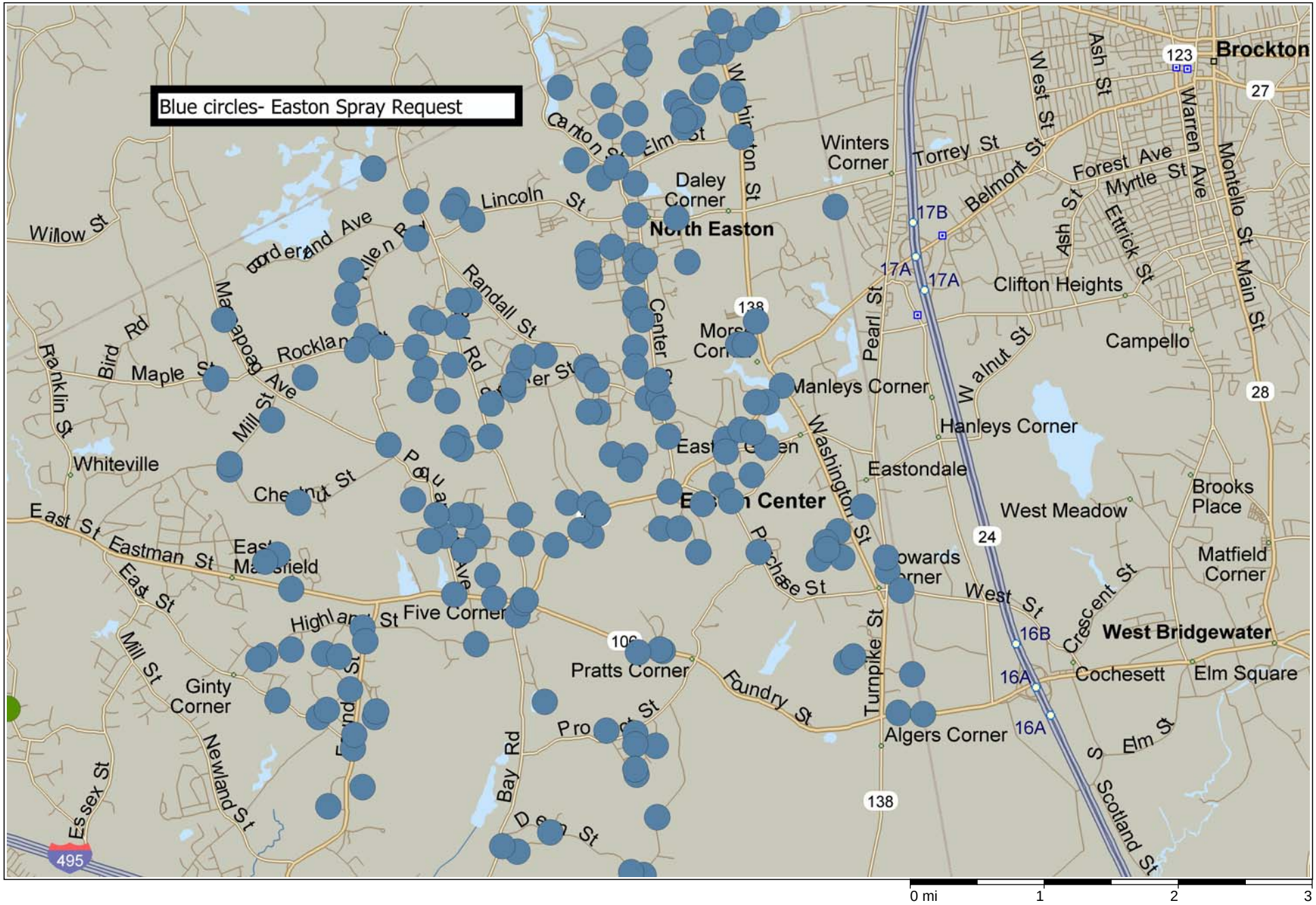

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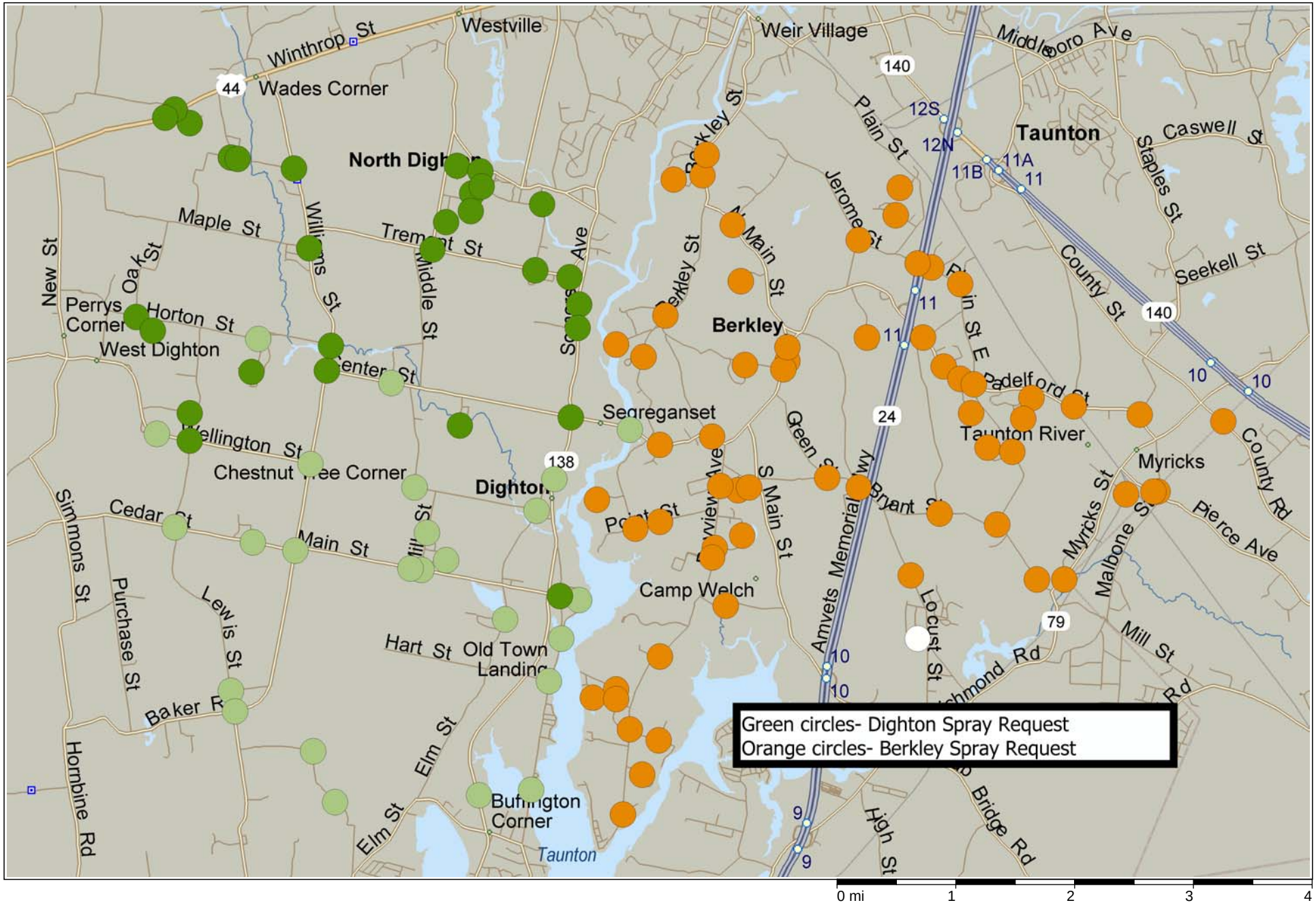

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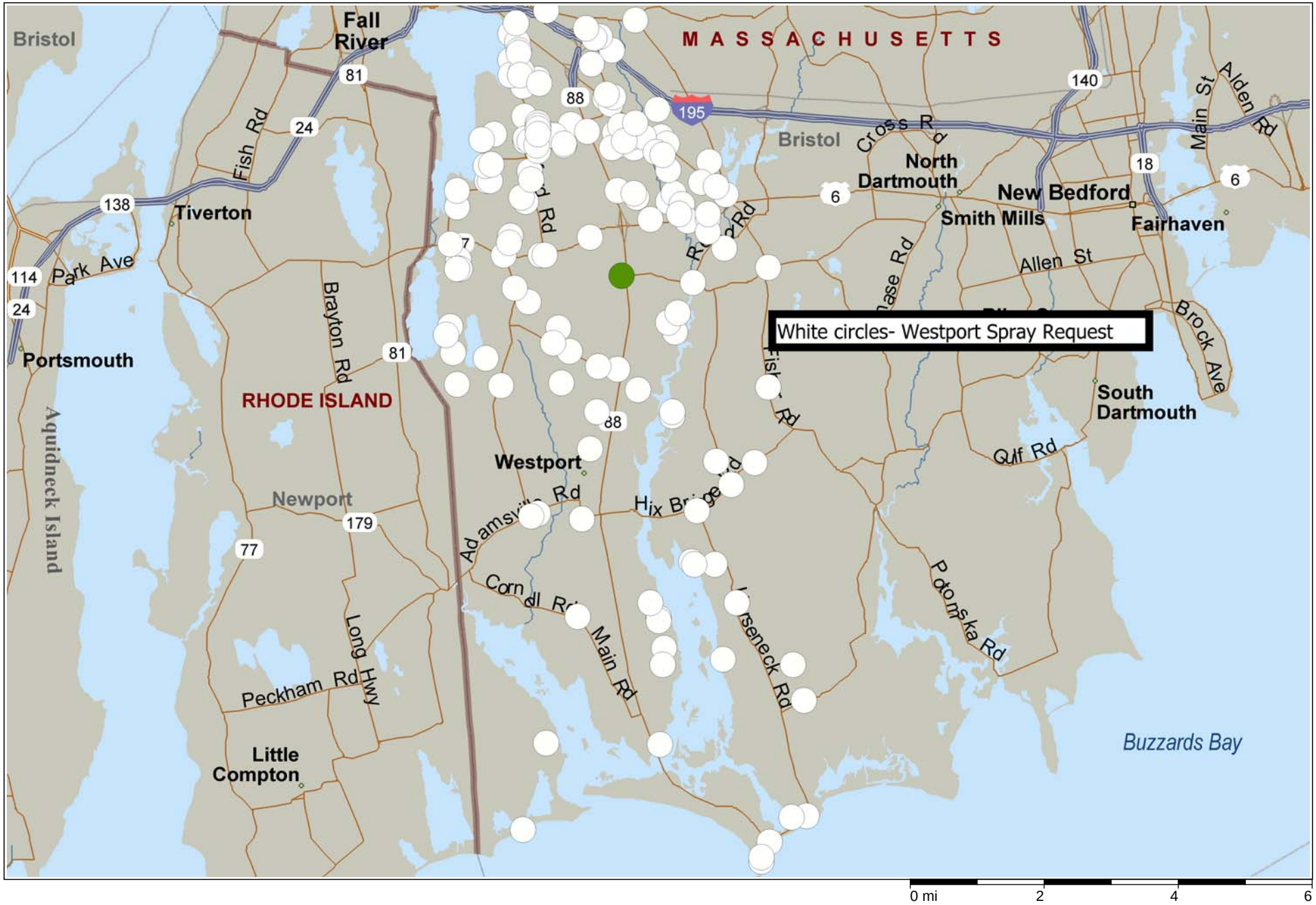

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Massachusetts Best Management Practices and Guidance for Freshwater Mosquito Control

October 24, 2008

Compiled and edited by:

University of Massachusetts - Amherst
Department of Natural Resources Conservation

Massachusetts Department of Agricultural Resources
State Reclamation and Mosquito Control Board

Massachusetts Department of Environmental Protection
Bureau of Resource Protection

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Appendices

1. Mosquito Control Complaint and Documentation Form
2. Site Plan
3. Notification Form

The design of this manual draws extensively from the *Massachusetts Forestry Best Management Manual* developed by Kittredge and Parker (1995). We wish to thank these authors for their permission to use materials from this manual. Additionally, this manual draws extensively from the ditch maintenance procedures and policies developed by the Northeast and Norfolk Mosquito Control Districts.

Design Credits:

This project has been financed partially with Federal Funds from the Environmental Protection Agency (EPA) to the Massachusetts Department of Environmental Protection (MassDEP) under a Section 104(b) (3) Water Quality and Wetland Grant. The mention of trade names or commercial products does not constitute endorsement.

1. WHY BMPs (BEST MANAGEMENT PRACTICES)?

Mosquito control in Massachusetts is overseen by the State Reclamation and Mosquito Control Board (SRMCB) (http://www.mass.gov/agr/mosquito/). Mosquito control is conducted in communities that are members of a regional mosquito control district. Mosquito Control Districts (MCDs),[1] acting under the authority of the SRCMB and MGL Chapter 252, work directly with local communities to control mosquito infestations and thereby alleviate a nuisance, protect public health and promote quality of life for those communities. Recognizing the various public benefits of mosquito control programs, there is also the need to understand and minimize unnecessary impacts to wetland resources that may result from these activities. Integrated Pest Management (IPM) techniques for mosquito control may involve wetlands management, including, but not limited to, physical alterations to resource areas. Wetlands management, as an IPM technique, is designed to minimize wetland impacts. Mechanical and hand clearing techniques are implemented on a site-specific basis and while some techniques may eliminate areas of temporary standing water, others may simply improve drainage and ebb flows through the surrounding floodplain. These activities may sometimes disturb stream banks and/or the surrounding resource areas.

The purpose of this guidance is two-fold. First, it is designed to provide recommended practices for proper planning of freshwater mosquito control activities, consistent with applicable regulations. Second, it provides MCD personnel with a set of *Best Management Practices* (BMPs) for freshwater mosquito control activities involving wetlands management that will help minimize disturbance to stream banks and surrounding resource areas and control sediment discharges that may cause unnecessary impacts to:

- Wetland resources and adjacent areas,
- Drinking water supplies, and
- Fish and wildlife habitats**.**

The need for this manual was identified, in part, from recommendations made in the 1998 Generic Environmental Impact Report (GEIR) developed for mosquito control by the State Reclamation and Mosquito Control Board within the Department of Agricultural Resources, (DAR). The Final GEIR was required of the SRMCB by the Massachusetts Environmental Policy Act (MGL Ch.30A § 61). The Secretary's certificate on the GEIR required that the SRMCB provide periodic updates on issues involving source reduction methods, including the results of working with the water quality certification program and Natural Heritage and Endangered Species Program to improve notice and record keeping practices and minimize potential negative impacts from source reduction activities in wetlands and other resource areas. This guidance serves as an update on the dialogue between these programs.

[1] The term Mosquito Control District (MCD) includes those entities established as Mosquito Control Projects by their enabling legislation e.g. Norfolk County Mosquito Control Project.

It also outlines agreed upon steps that can be taken to allow these programs to achieve their respective goals and legislative mandates. In addition to providing better protection for wetland resources, BMPs for freshwater mosquito control activities by MCDs involving wetland management may also reduce the need for other kinds of mosquito management activities such as larviciding and adulticiding.

This document is designed for use by mosquito control personnel to guide them in planning and implementing freshwater mosquito control activities. The attached appendices provide standardized documents for site plans, notification, and documenting complaints and/or evidence of mosquitoes.

The success and effectiveness of these BMPs depends on mutual cooperation between MCD's, the SRMCB, local governments, and the regulatory community. Timely and responsive communication among these groups is important to the success of these efforts.

2. PLANNING

Comprehensive mosquito control planning is the **most important BMP, and the first to consider**: For any freshwater mosquito control activity that involves mechanical wetlands management, the following five steps are recommended to MCDs:

A. Complete the Mosquito Control *Complaint and Documentation Form* (Appendix 1) to document the presence or conditions likely to support mosquito breeding;

B. Review legal requirements for the proposed work site;

C. Prepare a *Site Plan* as described on page 10 (see sample *Site Plan* in Appendix 2);

D. Notify affected property owners and local, state, and federal agencies of the planned activity. (See sample Appendix 3); and

E. Monitor the effectiveness of the activity and environmental impacts of mosquito control work.

Following these five steps will help to ensure that all applicable regulatory requirements are met and that the activity implements the appropriate BMPs to minimize impacts to wetland resource areas. Proper notification will promote better communication among MCDs and environmental agency staff, as well as the general public interested in the benefits of the MCD activity. Monitoring provides a means to evaluate the success of the activity and information for how to improve future activities.

A. Identifying the Need for the Mosquito Control Activity in Freshwater Wetlands

Documentation of the need for mosquito control at a particular activity site should include:

- Description of the causes and effects of the mosquito breeding habitat on site (i.e., sediments, blocked culverts);
- Evidence as recorded in Mosquito Control *Complaint and Documentation Form* (Appendix 1) of mosquito breeding or infestation from one or more of the following sources:
  - Previous larviciding site records;
  - Larvae / adult data from field sampling and dip counts;
  - Aspirations of adult mosquitoes or landing counts (at the discretion of the field technician);
  - Complaints from residents or public officials; and
  - Observations from mosquito control personnel as recorded including site conditions that are conducive to mosquito breeding.

B. Review of Legal Requirements for Proposed Activities in Freshwater Wetlands

Once the need for the activity has been established, the legal requirements for mosquito control activities in wetland resource areas should be evaluated.

The State Reclamation and Mosquito Control Board (SRMCB) was established by MGL Ch.252 (Improvement of Lowlands and Swamps statute) and incorporated provisions of Ch. 199 and 699 of the Acts of 1960. This state board is housed within the MA Department of Agricultural Resources (DAR) and has authority under this law to:

1. To drain or flow a meadow, swamp, marsh, beach or other low land held by two or more proprietors,

2. To remove obstructions in rivers or streams leading thereto or there from, and

3. To eradicate mosquitoes in **any** area infested thereby, including, in respect to each such purpose, purposes incidental thereto, such improvements may be made as provided in this chapter.

Many state environmental statutes specifically exempt mosquito control work authorized under the provisions of M.G.L. c. 252, including, most notably, M.G.L. c. 131, § 40 (Wetlands Protection Act) and M.G.L. c. 40, § 8C, (Conservation Commission Authority).

MDCs should also review the applicability of legal and regulatory requirements of other programs, such, but not limited to, the following:

1. Federal Law:

The U.S. Army Corps of Engineers (USACE) regulates and requires a permit for all work in navigable (tidal) waters under Section 10 of the Rivers and Harbors Act, with almost all work requiring written authorization. Activities subject to Section 10 (33 U.S.C. 403) include construction, excavation, or deposition of materials in, over, or under such waters, or any work, which would affect the course, location, condition, or capacity of those waters. In addition, the Corps regulates and requires a permit for the discharge of fill in waters of the U.S. under Section 404 of the Clean Water Act, which includes fill associated with mosquito ditches in tidal and non-tidal wetlands under Corps jurisdiction. Waters of the U.S. include jurisdictional wetlands as defined in 33 CFR 328.3(b). (See: http://www.usace.army.mil/cw/cecwo/reg/33cfr328.htm) Fill material is defined in 33 CFR 323.2 (e) (1). (See:http://www.usace.army.mil/cw/cecwo/reg/laws/Def_of_Fill_Rule.pdf)

In Massachusetts, the mosquito control activities under jurisdiction of the Corps are subject to the terms and conditions outlined in the Massachusetts Programmatic General Permit (PGP). (See: http://www.nae.usace.army.mil/reg/mapgp.pdf)

A Corps July 2004 mosquito-ditching letter (See: http://www.nae.usace.army.mil/reg/MosquitoDitchingGuidanceLetter.pdf) provides guidance on regulated vs. non-regulated activities commonly employed by the mosquito control districts.

For a complete review of specific 404 requirements and additional guidance, contact the New England District of the United States Army Corps of Engineers at: http://www.nae.usace.army.mil/reg/index.htm

2. State Law:

a. 401 Water Quality Certificate

Section 401 of the Clean Water Act requires States to confirm that federally permitted projects comply with state water quality standards. Such confirmations are issued in the form of "401" Water Quality Certificates.
Work in freshwater wetlands is exempt from the requirements of a Section 401 Water Quality Certificate IF:

- The activity does not involve fill (e.g. side-casting) ***OR***
- The activity involves fill in "waters of the US" but the activity qualifies as a Category 1 (i.e. < 5,000 square feet of fill) activity under the Corps'

Massachusetts Programmatic General Permit (the "PGP"). See the PGP requirements at: (http://www.nae.usace.army.mil/reg/mapgp.pdf)

Work in freshwater wetlands is subject to the requirements of Section 401 Water Quality Certificate IF:

- The activities alter or temporarily impact wetland areas that do not qualify for Category I (e.g. > 5,000 square feet of fill or in stream activities conducted between October 1 and June 30) under the Massachusetts Programmatic General permit (Note: some areas < 5,000 square feet may be regulated by the USACOE if the wetlands are considered to be historically significant or constitute federal special aquatic sites)
- Any activity resulting in any discharge of dredged or fill material to any Outstanding Resource Water, isolated vegetated wetland identified as habitat for rare and endangered species per 314 CMR 9.04 (see: http://www.massgov/dep/water/laws/regulati.htm#wqual)

Outstanding Resource Waters (ORWs)

Water Quality Certificates are also required for activities involving the discharge of dredged or fill materials in water resources classified as *Outstanding Resource Waters* (ORWs) by the MA Department of Environmental Protection (MassDEP) at 314 CMR 4.04. ORWs include those waters deemed to comprise outstanding socio-economic, recreational, ecological and/or aesthetic values. Any new or increased discharge into an ORW is prohibited unless a 401 *Water Quality Certification* is obtained from MassDEP. Specific restrictions to work in ORWs include:

- No discharge of dredge or fill material into wetlands or waters are allowed within 400 ft of the high water mark of a Class A surface water that is used as a source of public drinking water.

- No discharge of dredge or fill material is allowed to a *Certified* vernal pool.

- Wetlands bordering Class A, B, SB or SA *Outstanding Resource Waters* are designated as ORWs to the boundary of the defined area.

The locations of designated ORWs (http://www.state.ma.us/mgis/orw.htm) should be reviewed by MCD personnel to determine if the site falls within an area designated as an ORW. When required, a 401 *Water Quality Certification* is issued by the appropriate regional MassDEP office. The MCD and the appropriate MassDEP Regional Office should work cooperatively to effectuate project objectives and compliance with permit conditions. For regional office addresses, see: http://www.mass.gov/dep/about/region/findyour.htm)

b. Rare and Endangered Species

The Massachusetts Endangered Species Act (M.G.L. c.131A) and its implementing regulations (MESA, 321 CMR 10.00) establish procedures for the listing and protection of state-listed plants and animals. The MESA regulations include project review filing requirements for projects or activities that are located within a Priority Habitat of State-listed Rare Species ("Priority Habitat"). The MESA is administered by the Natural Heritage and Endangered Species Program (NHESP) of the MA Division of Fisheries & Wildlife, and prohibits the "take" of state-listed species. The "take" of state-listed species is defined as "in reference to animals, means to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity or attempt to engage in any such conduct, or to assist such conduct, and in reference to plants, means to collect, pick, kill, transplant, cut or process or attempt to engage or to assist in any such conduct. Disruption of nesting, breeding, feeding or migratory activity may result from, but is not limited to, the modification, degradation or destruction of Habitat" (321 CMR 10.02).

MDCs should consult the most recent edition of the *MA Rare & Endangered Species Habitat Atlas* to determine if a proposed project will occur within *Priority Habitat* and the relevant NHESP guidance information to determine if direct filing with pursuant to the MESA is required.

If a filing with the NHESP is required, filing should consider access, egress, spoil/soil deposition or spreads or other activities related to the project occur within *Priority Habitat*, and then the MCD should send the required information to the NHESP review pursuant to the MESA. In general, the Site Plan should include sufficient detail and mapping to clarify the location of all work areas and the form of work (e.g., mechanical work or hand work).

- Within 30 days of receiving a filing, the NHESP will provide a response letter indicating whether or not the submission is complete. If the submission is complete, the NHESP will provide a letter determining if the project will result in a "take" within 60 days of the date of posting of the first letter. (321 CMR 10.18)**.**

- In this letter, the NHESP will determine whether or not a project, as currently proposed, will (a)avoid a "take" as proposed, or with conditions and may proceed without further review, or (b) will result in a "take" of State-listed Rare Species and cannot proceed as proposed (321 CMR 10.23).

- If a project is determined to result in a "take" then it may be possible to redesign the project to avoid a "take". If such revisions are not possible, then projects resulting in a "take" may only be permitted if they qualify for a MESA Conservation & Management Permit (321 CMR 10.23).

- The *MA Rare &Endangered Species Habitat Atlas* is currently available as a bound book, a compact disk with electronic viewer technology, as downloadable data for Arc View from MassGIS, and online using the MassGIS viewer. Details are available at: http://www/mass/gov/dfwele/dfw/nhesp/publications/nhesp_pubs.htm

- The NHESP's mailing address for MESA reviews can be found at: http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/reg_review_contats.htm

c. Certified Vernal Pools

A vernal pool is a confined basin depression which, at least in most years, holds water for at least two continuous months during the spring and/or summer, and which is free of adult fish populations. These areas often provide essential breeding habitat for amphibians such as wood frogs and spotted salamanders as well as for certain kinds of invertebrates. Certified vernal pools are classified as *Outstanding Resource Waters*, and, as such, require a *Water Quality Certification* from Mass DEP when work resulting in a discharge of dredged or fill material is proposed in them. Certified vernal pools are those that have been verified through fieldwork and certified by NHESP. For certified vernal pool locations, MCDs should review the most recent edition of the "*Massachusetts Natural Heritage Atlas*" http://www.mass.gov/dfwele/dfw/nhesp/nhesp.htm.

- Typical permit conditions will require that MCDs avoid all work in certified vernal pools and establish a 50-foot filter strip around vernal pools in which no disturbance to the ground vegetation is allowed. Creation of ruts deeper than 6 inches within 200 feet of a vernal pool should also be avoided as they represent barriers to amphibian migration.

d. Water Supplies

For work within the watersheds of the Quabbin, Ware River, or Wachusett Reservoir water supplies, a permit may be required from the Department of Conservation and Recreation (DCR) Division of Water Supply Protection (see: http://www.mass.gov/dcr/aboutDCR.htm). For watershed locations, see: http://www.mass.gov/dcr/waterSupply/watershed/water.htm.

e. Areas of Critical Environmental Concern

An *Area of Critical Environmental Concern* (ACEC) is an area containing concentrations of highly significant environmental resources that has been formally designated by the Secretary of Energy and Environmental Affairs. Environmental features that these critical areas may include range from wetlands and water supply areas to rare species habitats and agricultural areas. The designation directs state

environmental agencies to take actions to preserve, restore and enhance the resources of an ACEC, and is intended to encourage and facilitate stewardship.

As required by the ACEC regulations, state environmental agencies are directed to administer programs, revise regulations, and review Project Sites subject to their jurisdiction in order to preserve, restore, and enhance the resources of an ACEC. The *Massachusetts Environmental Policy Act* (MEPA) and the associated regulations (301 CMR 11.00) require review of activities within ACECs that need certain state permits, use state funding, or involve state agency actions. The purpose of a MEPA review within an ACEC is to ensure that the proposed projects will avoid or minimize adverse impacts to the resources of the ACEC. As of October 2007, 28 ACECs covering approximately 241,000 acres in 73 municipalities have been designated. Special care should be taken to protect these sensitive areas. http://www.mass.gov/dcr/stewardship/acec/acecs.htm.[2]

f. Massachusetts Environmental Policy Act

An Environmental Notification Form (ENF) must be obtained from the MA Executive Office of Environmental Affairs, in accordance with the Massachusetts Environmental Policy Act (MEPA), 301 CMR 11.00, if:

- The activity is within an *Area of Critical Environmental Concern* (See: http://www.mass.gov/dcr/waterSupply/watershed/water.htm) and a state permit or funding is required for the activity.
- If a state permit or funding as described above is required and a MEPA threshold, found at 301 CMR 11.03, is exceeded, (see MEPA regulatory thresholds at: http://www.mass.gov/envir/mepa/thirdlevelpages/meparegulations/meparegulations.htm) For example, new ditch construction exceeding 5,000 square feet of BVW would likely require submittal of an ENF. Maintenance of existing ditches is likely exempt from this requirement as Corps jurisdiction for ditch maintenance projects is determined on a site by site basis, using best professional judgment, and taking into account the wetland functions and values.

g. Chapter 91: Waterways Regulations

As provided in the waterway regulations at 310 CMR 9.04(1)(e), projects require review if they occur below the high water mark of any non-tidal river or stream on which public funds have been expended for stream clearance, channel improvement, or any form of flood control or prevention work, either upstream or downstream within the river basin, except for any portion of any such river or stream which is not normally navigable during any season, by any vessel including canoe, kayak, raft, or rowboat. If mosquito control activities are subject to these provisions, see:

[2] The original ACEC designations or subsequent ACEC Resource Management Plans and wetland restoration plans for these areas should be reviewed. Those covering large marsh or wetland area may specifically include mosquito control activities as part of their respective management plans.

http://www.mass.gov/dep/water/approvals/ch91wo.doc for instructions and http://www.mass.gov/dep/water/approvals/ch91apwo.doc for a copy of the applicable waterway license application form.

C. Completing the Site Plan

The next step in the planning process is for MCD personnel to complete the *Site Plan* (Appendix 2) for each site where mechanized wetlands management activities are proposed. The purpose of the *Site Plan* is to guide mosquito control personnel in planning and implementing work in freshwater wetlands whose objective is to control mosquitoes. The *Site Plan* also should provide sufficient information to determine whether the activity meets regulatory requirements. The *Site Plan* can include site-specific information on the following: project purpose, sensitive areas, current and proposed site conditions, proposed alteration, BMPs, and plan map.

1. Site Information and History

This section of the *Site Plan* provides information on the MCD proposing the management activity in freshwater wetlands and general background information on the site including:

- Location;
- MCD preparing the *Site Plan*;
- Present and Past (if known or different) land use in the area of activity (i.e., suburban, industrial, agricultural, open space).

If known, the history of prior work (i.e., ditch maintenance or previous freshwater wetlands management activities) at the site location is helpful to determine U.S. Army Corps of Engineer jurisdiction over ditch maintenance activities. Evidence of previous ditch maintenance may be demonstrated to be "reasonably evident" from one or more of the following sources:

- Physical evidence, such as spoil deposits, soil profiles, tree stumps, structures, etc.
- Historical evidence such as municipal, state, or mosquito control records, aerial photographs, or maps; evidence of historic stream channel.
- Documented recollection of residents, abutters, or public officials, etc.

2. Purpose of Freshwater Wetland Work

- Identify the type of work proposed;
- Mosquito breeding documentation

3. Identification of Sensitive Area

- Identify the presence of sensitive areas that may trigger regulatory review.

4. Documentation of Site Conditions

A variety of pre-existing site conditions should be documented on the *Site Plan*, including:

- Natural stream **channel** or constructed **ditch**
- Channel/Ditch type (main, lateral, sub-lateral);
- Hydrology of channel/ditch flow (intermittent or perennial, if known)
- Wetland vegetation present (i.e., forested, shrub, emergent, wet meadow or open water);
- Cross section dimensions of current channel/ditch profile at no greater than 100 foot intervals, but in all cases a minimum of two profiles, including:
  a. Top and bottom channel/ditch widths;
  b. Depth of channel/ditch from top of bank;
  c. Side slope ratios;
  d. Locations of existing spoil deposits.

- Soil profile within the channel to depths sufficient to document the depth of organic and, if applicable, mineral layers. Core samples to be taken at 100 ft intervals with hand auger.
- Indicate staging areas, access points, and locations where removed material will be disposed if deposited within wetland resource areas.
- Representative, dated photographs of the site taken from established, fully recoverable set points depicted on accompanying maps.

5. Proposed Alteration and BMPs

This section of the *Site Plan* provides a description of the proposed work at the site, detailing the following:

- Tentative proposed start assumed to be 30 days from the written notice date or the stated specific date or date range;
- Estimated length/area and type of each ditch/wetland resource area being altered (length expressed in feet and area in square feet);
- An estimate of the amount of spoil to be removed from each ditch, expressed in cubic feet;
- Location of spoil deposition if left in wetland resource areas;
- Estimated cross section dimensions of finished ditch profile, including:
  a. Top and bottom channel widths;
  b. Depth of channel from top of bank;
  c. Side slope ratios if altered from original profile;

Identify all BMPs to be used for vegetation removal, sediment disposal, erosion and sedimentation control. Indicate location of BMPs on the site map.

6. Site Plan Maps

Two maps are needed as part of the *Site Plan*. The first map is a section of the USGS quadrangle map of the area showing the location of the proposed site. Additionally, a plan, aerial photo from MassGIS, or computer-generated map of the site should be included (See Appendix 2). This map should include:

- Named cross streets, gravel or paved roads (annotated);
- Known feeder streams or water conveyances into the site;
- All set-points (i.e. location and orientation) used for photographs;
- Known natural and human-made hydrologic connections (i.e., pond outflows, streams, culverts);
- Location of certified vernal pools, if present;
- Aerial and/or ground-based photographs or digital images depicting features requiring mediation. Location and direction or bearing (north, south, east, or west – upstream or downstream) of photographs should be marked on the accompanying maps.

D. Notification

Notification of the appropriate parties regarding the proposed activity serves to:

- Enhance communications between property owners and abutters, and local, state and federal agencies;
- Save time by avoiding misunderstandings;
- Build public support for mosquito control work in the community.

Notification of mechanical wetlands management activities should consist of:

- Sending a *Standard Notification* by mail and / or e-mail thirty (30) calendar days prior to initiating work. The Notification should include a narrative, an aerial photograph or other site plan map, and the section of the USGS topographic map depicting the site location (See: Appendix 3) and any supporting documentation to:

  a. Conservation Commission: Voluntary notification to the applicable Conservation Commissions is recommended even though MCD work is exempt as authorized by Chapter 252 MGL;
  b. Public Water Supply Authority, if necessary;
  c. Appropriate Regional MassDEP office to the attention of the Wetlands & Waterways Program http://www.mass.gov/dep/about/regional.htm;
  d. District Office of the U.S. Army Corps of Engineers;
  e. Natural Heritage and Endangered Species Program, if applicable.

- Relevant notification information is also recommended to be sent to the following:

a. All property owners or persons legally in control of property where work is to be conducted;
b. Dig Safe and any non-member utility companies (e.g. Municipal Water/Sewer Departments and State Highway Departments) prior to excavation.

- Posting of a sign at the site, visible from the nearest public way, will include the MCD name, pertinent contact information and a reference that work is being conducted pursuant to MGL Chapter 252

3. BEST MANAGEMENT PRACTICES

A. Vegetation Disturbance

An important BMP goal of any wetlands management activity is to minimize unnecessary disturbance to vegetation. This will reduce the potential for erosion and sedimentation into the water body and help to maintain water quality and wildlife and fisheries habitats.

- Locate access and travel pathways where feasible to avoid steep slopes, wetland resource areas, and certified vernal pools, while minimizing loss of vegetation.
- All reasonable efforts should be made to minimize soil erosion and loss of bank stability.

It may be more cost effective and efficient to maneuver along a longer access path to minimize erosion. The pathway with the least impact may involve having the machinery work from opposite banks along different segments. To the extent possible and practical:

- Use environmentally sensitive low-ground pressure equipment and hand clearing when and where feasible for the purpose of equipment and work access.
- Minimize tree cutting and, if possible, focus access areas in grass and shrub areas.
- If at all possible, avoid the operation of heavy equipment directly within the channel.
- Work should proceed with appropriate sediment control structures in place. See the section relating to sediment containment in channels for more information. Excavation of the channel is limited to the historic grade, dimensions and channel course as described in *Site Plan.*

.

- All disturbed banks and access pathways should be graded and stabilized by reseeding and / or planting with native species and /or mulching to resist erosion after the activity is completed. See the section on *Erosion and Sedimentation Control* below for more information.

As part of any MCD's effort to control mosquitoes by the improvement of stream flow and restoration of stream channel characteristics, and to the extent practicable, consideration should be given to preserving natural conditions and promoting fish habitat. Naturally deposited wood in streams is very important to stream ecology and can provide fish habitat to promote natural predation. If MCD activities involve placement of a new culvert, construction standards are required to conform to the stream crossing standards contained in Appendix E: Massachusetts River and Stream Crossing Standards of the Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands –, March 2006. See link: http://www.mass.gov/dep/water/laws/wldhab.pdf. While not required, consideration should also be given to these standards for activities involving culvert replacement, maintenance and repair.

B. Cut Vegetation

- Trees and brush (slash) should only be cut as necessary to allow safe transport and work space for mechanized equipment and personnel during mosquito control activities. If feasible, cut vegetation should be removed from the wetland. Slash that cannot be removed from the site should be placed on upland areas rather than wetland areas, unless removal will result in significant additional wetland impacts as defined by the ACOE, or cause significant additional slash. Because piles of slash represent a fire danger, slash should be spread out or chipped instead of piled. In proximity to stream channels, slash should be chipped or deposited in a manner or location where movement towards the waterway is unlikely. Consideration should also be given to slash disposal that avoids the spread of invasive species. To reduce negative aesthetic impacts, slash should not be left in close proximity to the outer edge of a highway.

C. Sediment Disposal

- Sediments excavated from the channel or bank should be deposited in such a manner to prevent reentry into the water body.
- If possible, excavated sediments should be deposited on an adjacent upland and the deposition of excavated sediments in wetlands should be avoided. Sediment deposition on adjacent wetlands may trigger federal 404 jurisdiction and possible state 401 reviews. The following practices are recommended for soil management beyond wetland jurisdiction:
  - Mineral soils should not be removed from channels unless they impede the water flow and cause the channel to deviate from the original configuration. If excavated, these mineral soils should be deposited off site. Alternatively, they may be placed on *upland* areas, spread thinly and graded for proper runoff.
  - Road sand removed from channels should be deposited off site. On-site sand disposal may be placed on upland areas outside wetland

resource areas (e.g. 200 feet beyond stream banks if possible), spread thinly, and graded for proper runoff.

- On-site upland stockpiling of sediments is not recommended, however, provided appropriate erosion control structures are used when necessary - stockpiles for the purpose of dewatering for removal or stockpiling of material while waiting for the availability of equipment for relocation is acceptable. See the next section on *Erosion Control* for more information.

D. Erosion & Sedimentation Control

Wetland management activities for mosquito control may result in impacts to adjacent and downstream wetland resources. Increased turbidity and loss of vegetative cover could affect water quality as well as the habitat for a variety of organisms. Erosion control measures are recommended when necessary, to reduce the potential for sediments entering the water body during the work phase, inactive periods (e.g., overnight, on weekends or during down times), and the post-work phase. Numerous erosion control techniques are available, some of which are described in the *Western Massachusetts Streambank Protection Guide: Handbook for Controlling Erosion in Western Massachusetts Streams.* Franklin, Hampden, & Hampshire Conservation District, Northampton, MA 1998. The *Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban* Areas may also be consulted. See: http://www.mass.gov/dep/water/esfull.pdf. The appropriate erosion control measure should be selected to prevent the potential for erosion and increased turbidity into nearby water bodies.

The use of checkdams is recommended when necessary, for in-channel sediment control. A variety of materials may be used for checkdams depending upon site-specific conditions. These materials include stone, coir, rice, straw or other fiber rolls, burlap and straw or hay bales. The proper selection of the checkdam composition should be based upon the water velocity in the channel. For example, the use of stone checkdams is recommended for higher velocity channels. For lower velocity channels, it may be feasible to block a downstream culvert with a permeable barrier. Filter material such as burlap fencing or piled burlap will decrease the velocity enough to cause sediments to be deposited upstream of the barrier while allowing the water to pass. If straw or hay bales are used, they should be placed in trenches about 4 inches deep, staked to the ground in two places, and placed with there ends (just not corners) abutting each other. If silt fencing is used, the lower edge should be placed in a 4-inch trench, which is then backfilled with soil. Straw or hay bales and silt fence may be used down slope of a disturbed area to keep water-carrying sediments from entering the water body.

- ❑ If sediment builds up behind the sediment control structures during construction, it must be removed periodically to maintain necessary effectiveness.

- Inspection of the site should occur during or immediately after a rainstorm to determine the effectiveness of sediment control measures and to correct or repair the controls if they are ineffective or have need of repair.
- After the disturbed site is stabilized, clean out collected sediments before removing all sediment control structures.

E. Monitoring Project Effectiveness

Although disturbed areas typically re-vegetate naturally, reseeding or mulching may accelerate site restoration and stabilization. The following erosion control and soil stabilization measures are encouraged and may be employed based upon specific site conditions such as steepness of slopes, soil types, vegetation, thickness of soil deposits, and proximity of deposits to the channel. Stabilization methods may include:

- Mulching limits surface erosion, suppresses weeds, retains soil moisture and can add some organic material to soil. As a major source of invasive exotic species, the use of hay should be discouraged unless it is certain that it was obtained from a local site free of invasive species. A thin layer of wood chips or straw (if available)-may be used. Straw is effective for erosion control and can be spread by hand or broadcast from machine. However, straw can be blown by the wind so in exposed areas should be anchored. It can be punched or crimpled into the soil by hand with a rake or mechanically.

- When possible a small-vegetated buffer strip (approximately 3-4 feet wide) should be left between the channel bank and the spoil deposits.

- Silt fencing or straw bales may be used site specifically (see previous recommendations). Do not leave the bales or fence in place as a permanent erosion control structure as these may serve as a barrier to wildlife movements.

- Disturbed soils may be reseeded. Grasses and other herbaceous cover can stabilize bare soil and minimize erosion. Native seed source is preferable for re-seeding. A compromise alternative is to use plants that germinate quickly to stabilize soils, but are not highly aggressive and will not persist or spread. In the meantime, the soil is immediately stabilized, and the regrowth of native vegetation is allowed to progress. Several options are commercially available:

Seed mixture[a]	Lbs/acre	Lbs/1,000ft^2	Soil pH range
Domestic ryegrass	20	0.45	4.5-7.5
Creeping red fescue, Redtop, Tall fescue	20 2 20	0.45 0.05 0.45	4.5-7.5

Recommended seeding times are from April 15 to June 15 or August 1 to September 15. However, winter rye may be used as a temporary cover and seeds between August 15 and October 15.

- MCD staff should conduct periodic inspections during the first two months after completion of the activity to document any deficiencies in erosion control and to recommend maintenance requirements.

- As part of each periodic inspection, MCD staff shall correct all deficiencies promptly.

In addition to monitoring the stability of the BMPs, the MCDs will survey the project site during their standard site inspections to insure the BMP practice is effective in the short and long term. The MCDs and other state agencies will continue to work towards augmenting the post-project monitoring data they currently collect to addresses environmental concerns.

E. Stormwater Best Management Practices and Mosquito Breeding

Thorough review of proposed designs, proper implementation during the construction phase, routine inspections of operation, and regular maintenance will not only provide better stormwater protection but also discourage the use of these areas by vector species. In addition, scheduled maintenance intervals provide an opportunity to control mosquitoes at the site by the use of effective larvicides by credentialed professionals. For a list of specific stormwater design, operation, and maintenance practices to reduce the likelihood of mosquitoes breeding in Stormwater treatment BMPs, see: *Stormwater Management: Volume Two Stormwater Technical Handbook* (2008). http://www.mass.gov/dep/water/laws/policies.htm#storm

As discussed in MassDEP's 2008 Stormwater Management handbooks and in the Wetlands Protection regulations (310 CMR 10.05(6)(k)9), the owners of the property that develop the stormwater BMPs, or municipalities that "accept" them through local subdivision approval, are responsible for their operation and maintenance to insure that the stormwater BMPs are operating effectively. Although the SRMCB and its mosquito control districts and projects are not responsible for the operation and maintenance of stormwater BMPs, these structures can be included in the MCDs larvicide treatment plans. MCDs will alert local Municipalities when they encounter poorly maintained BMPs.

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Priscilla Matton – Bristol County Mosquito Control Project
Walter Montgomery – Northeast Massachusetts Mosquito Control & Wetlands Management District
Gabrielle Sakolsky - Cape Cod Mosquito Control Project
Emily DW Sullivan – Northeast Massachusetts Mosquito Control & Wetlands Management District

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Appendix 1
Mosquito Control Complaint and Documentation Form

Larviciding Records ☐ Mapped Larviciding Site ☐

Field Personnel's Observation Notes☐

_____

_____

_____

_____

_____

Residents/Public Officials Complaints☐

Name Date

_____

_____

_____

Subject of Complaint (Comments)

_____

Larvae or Adult Mosquitoes Observed at Site ☐
Dipper Data (see attached sheets) ☐

Comments / Date(s)

_____

_____

Appendix 2

Site Plan for Mechanized Wetlands Management Activities

Date: / /

Site Information:

Location _____ Preparer of Plan _____

Town(s) _____ District/Project name _____

Road(s) _____ Mailing address _____

_____

Contact _____

Approx. start date: ____/____/____ Phone: _____

Work Purpose *(check all that apply)*

❑ Mosquito Control ❑ Sediment removal ❑ Culvert replacement

❑ Drainage or flood control ❑ Stream bank Restoration ❑ Obstruction removal

Mosquito Observation Data **(check all that apply)**

❑ Previous Larviciding ❑ Dip counts ❑ Landing counts ❑ Complaints

❑ Observations of field personnel

Additional comments:

_____

Sensitive Areas

Site work area checked for occurrence of:

- ❑ Rare & endangered species - *MA Natural Heritage Atlas*
- ❑ Certified vernal pools - *MA Natural Heritage Atlas*
- ❑ Outstanding Resource Waters – MassGIS *Map of Outstanding Resource Waters* (http://www.state.ma.us/mgis/orw.htm)
- ❑ Areas of Critical Environmental Concern – Appendix 7

If any of these sensitive areas occur at the work site, refer to regulatory requirements section of the *MA Mosquito Control BMP and Guidance for Freshwater Mosquito Controll* and indicate location on site work map.

Erosion Control, Soil Stabilization & Sediment Containment (ESS)

Indicate location on map →	**ESS-1**	**ESS-2**	**ESS-3**	**ESS-4**
Straw bales				
Silt fences				
Reseeding				
Mulching				
Straw/Hay bales in water channel				
Water quality swales				
Sediment traps				
Planting				
Other:				

Additional Comments:

_____

_____

_____

_____

Proposed Alteration

Total length (ft) _____ Total spoil removed _____ (approx. cubic yards)
Mineral: _____ (c.y.) Organic: _____ (c.y.)

Location of proposed spoil deposits: (indicate on site plan map)

_____

Approximate Area (sq. ft) of spoil displaced to wetland

_____

Site Conditions

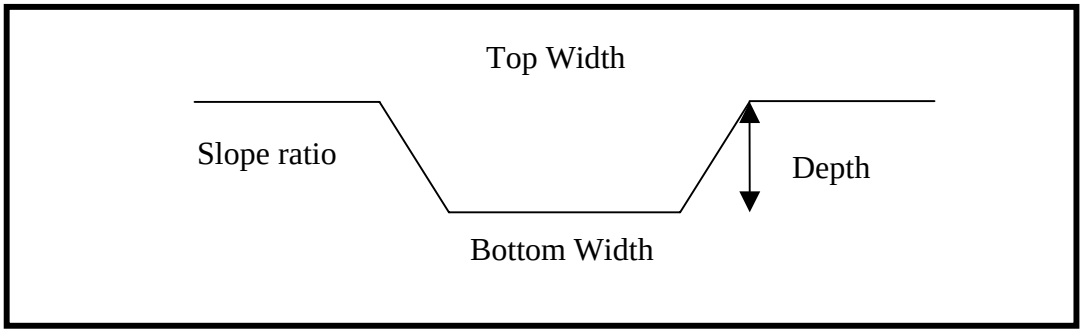
Ditch type _____Linear ft _____ Flow _____Wetland type(s) _____

Codes: **Ditch type:** **Flow:** **Wetland type:**

MA Main IT Intermittent FO Forested EM Emergent OW Open water

LA Lateral PE Perennial SH Shrub WM Wet meadow

SL Sub lateral



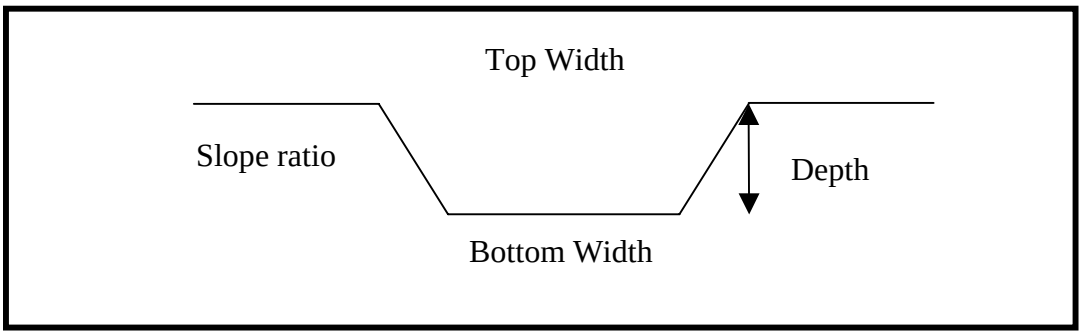
Dimensions	Existing	Proposed
Top width		
Slope ratio		
Depth		
Bottom width		

Comments:

Site Conditions

Ditch type _____ Linear ft _____ Flow _____ Wetland type(s) _____

Codes:	**Ditch type:**	**Flow:**	**Wetland type:**		
	MA Main	IT Intermittent	FO Forested	EM Emergent	OW Open water
	LA Lateral	PE Perennial	SH Shrub	WM Wet meadow	SL Sub lateral



Dimensions	Existing	Proposed
Top width		
Slope ratio		
Depth		
Bottom width		

Comments:

_____

_____

_____

_____

Proposed Alteration Summary (Include if more than 1 ditch)

Ditch Type	Number	Total Cubic Yards Displaced	
		On Wetland	On Upland

Total Cubic Yards Displaced _____ On Wetland
Total Cubic Yards Displaced _____ On Upland

Comments:
_____
_____
_____
_____
_____
_____
_____

Soil Profile (representative)

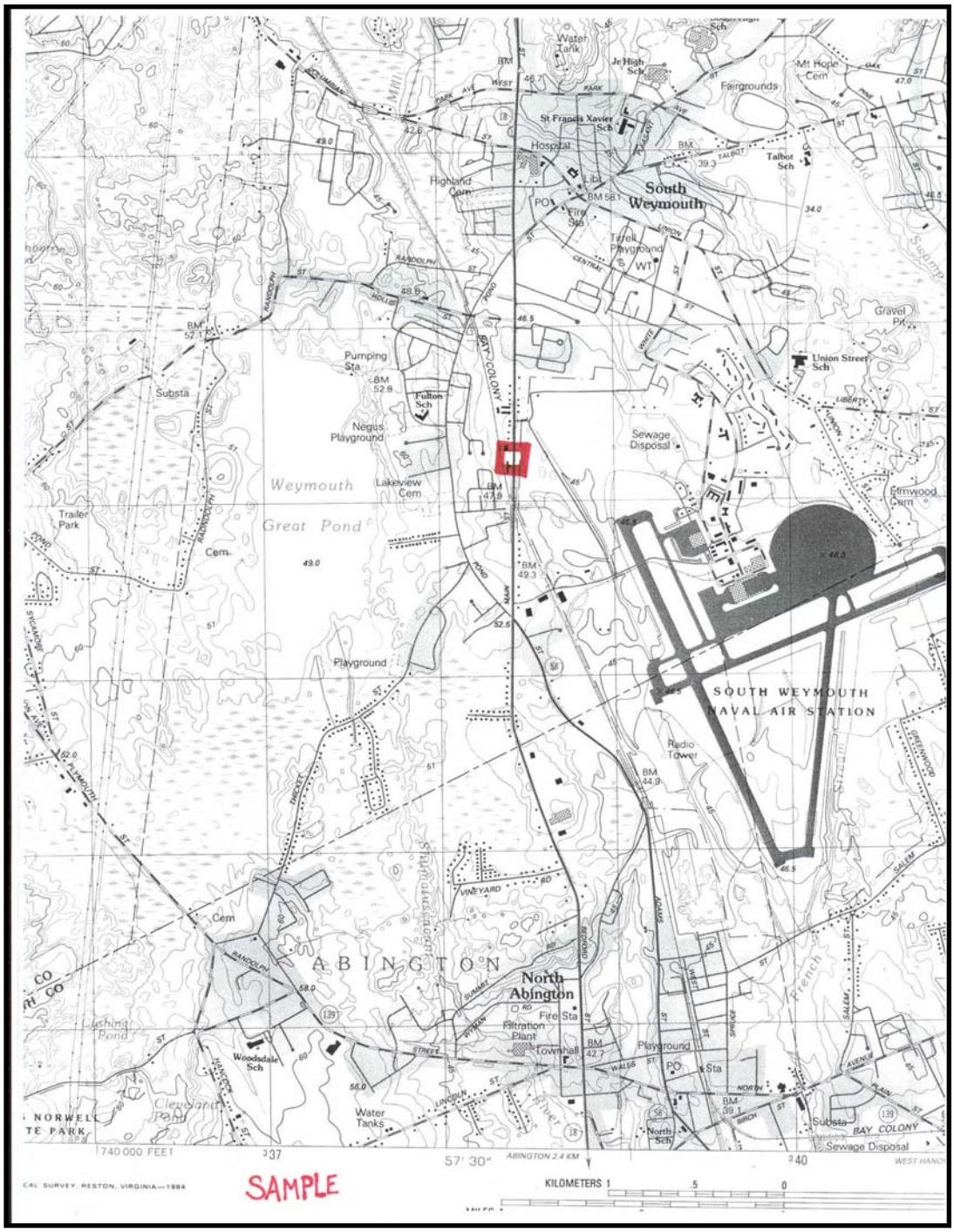
Organic Depth: _____ (inches) Mineral (if applicable): _____ (inches)

Notes: (Types, Colors, Hydrology, etc)

_____
_____
_____
_____

Site Plan Map

Submit both a copy of the USGS Topographic map with site circled and attach a copy of the Site Plan Map (i.e. aerial photograph or MassGIS if available) depicting the site location and proposed work with the Standard Notification Form to the appropriate Department. The photo should include the following information marked on it at a minimum: equipment access points (name nearby streets), approximate locations of all work areas, locations of erosion control (ESS) measures implemented (from previous section above), and locations of dredge spoil deposits.



Appendix 3

MCD Letterhead

Date

Municipal Conservation Commission
Street
City/Town, MA Zip

Re: Site # Mechanized Ditch Maintenance Project

Dear _____,

The (Specific MC District/Project) is proposing wetlands management activities as described below in compliance and accordance with Chapter 252 of the General Laws of the Commonwealth of Massachusetts on the site indicated on the attached topographic map in City/Town, Massachusetts.

Site number i.e. (NW0801 or 524A Methuen) involves a brief, but detailed description of the freshwater activity including: the reason for site selection (i.e. Public Official/Municipal Department or Commission, Resident, MCD Personnel) location (Town, street names, direction of ditch or stream in relation to street) estimated length of ditch to be maintained, and any additional information each district/project deems necessary.

The Notification may include a unique statement [i.e. although exempt from the Commission's jurisdiction, we invite inspection and comments, welcoming the opportunity to address any concerns that the Commission may have in regards to the proposed activity on this site. Please feel free to call me at the number listed above.]

If we do not hear from the Department / Commission within 30 days after the date of this notice, we will assume that there are no concerns regarding the proposed activity on this site and work will tentatively commence thereafter / specific date / date range.

Respectfully,

Name
Title (ex. Wetlands Project Coordinator)

Enclosed Location Map and Site Plan Map

Additional Notification furnished to:
US Army Corps of Engineers
MA Department of Environmental Protection (proper) Regional Office

Mechanized Wetland Management Activity Post-Monitoring Guidelines

Introduction

This document is to be used as a supplement to the Massachusetts Best Management Practices and Guidance for Freshwater Mosquito Control. These guidelines are operational in scope, representing accepted and consistent procedures within the limitations of a clear statutory mandate and finite funding for the purpose of controlling mosquitoes. It highlights a recommended approach for work in mosquito habitats or in habitats that may be prone to mosquito development.

Wetland management activities are conducted for a number of reasons though typically MCDs select sites, which have a history of, or habitat characteristics consistent with, supporting immature mosquito development. It is important to recognize that these activities occur under specific statutory authority, that being Chapter 252 of the Massachusetts General Laws.

> CHAPTER 252. IMPROVEMENT OF LOW LAND AND SWAMPS
>
> IMPROVEMENT OF LOW LAND
>
> Chapter 252: Section 1. General provisions

If it is necessary or useful (1) to drain or flow a meadow, swamp, marsh, beach or other low land held by two or more proprietors, **or** (2) to remove obstructions in rivers or streams leading thereto or therefrom, **or** (3) to eradicate mosquitoes in any area infested thereby, including, in respect to each such purpose, purposes incidental thereto, such improvements may be made as provided in this chapter.

Upon the completion of a mechanical wetlands management project, personnel may conduct a series of site visits for a period of approximately two years in order to monitor and evaluate the efficacy of the activity (if applicable) and extent of site recovery and stabilization. If potential problems associated with the implementation of physical alterations to the site are observed by MCDs, action will be taken to remedy the problem.

Post-Monitoring Review Procedure:

- **Cause and Effect –** If personnel observe deterioration of site conditions which can be directly associated with outside influences (previously or newly noted) e.g. sedimentation or erosion being caused by off-site stormwater structures or construction sites, culverts of inadequate size, culverts blocking flow or fish passage, inappropriate dumping, it should be noted.

- **Erosion Control Structures**- Erosion control structures should be inspected to evaluate effectiveness of treatment in accordance with the BMP site inspection schedule as follows or until the site has stabilized whichever comes first:

- Inspection Schedule

0-2 weeks	within two weeks of project completion
Up to 6 months	Following rains or weather events of significant proportion to re-flood the habitat (not to exceed once / month)
1 Year	at the peak of first growing season
2 Year	at the peak of second growing season

- Remediation measures if necessary should take place as soon as can be scheduled (no later than a month) to prevent potential negative impacts to the environment and to ensure the success of the project. This may include but is not limited to additional alterations, and adding or enhancing existing erosion control measures.

- Personnel should record additional erosion control strategies utilized and evaluate these as needed for the effectiveness of their treatment.

- **Immature Mosquito Sampling**- A set number of fully recoverable dip stations (RDS) may be marked and mapped; other locations may be sampled at any time. Personnel use best professional judgment to determine predicted site impact area and then select the number of dip locations to represent the size of this impact accordingly. Samples may be taken several times per season, preferably after heavy precipitation (rain). The date of the rain event should be recorded when possible. The actual number and location of stations should vary with the size and complexity of the project, and pre-and post- management monitoring should be at the same locations as much as practicable.

  - Inspection Schedule
    For purposes of monitoring standards, sites may be sampled in accordance with seasonal flooding or precipitation adequate to support flooding or recharge of the proposed activity area whenever possible.

1 Year	May – August: Following rains or weather events of significant proportion to re-flood the habitat (not to exceed once / month)
2 Year	May – August: Following rains or weather events of significant proportion to re-flood the habitat (not to exceed once / month)

  - Number of Recoverable Dip Stations (RDS)

Minimum # RDS	Impact-Acreage	Impact - Linear Feet
5	1 Acre	1-500
10	> 1 Acre	> 500

  - Dipping
    The first three dips per dip station are recorded regardless of sample success. Dips are taken from within a 10 foot radius of the mark. A standard to the profession, personnel are issued a white 350 ml “dipper”. If there is no available water to sample from within a 10 foot radius of the

dip location it will be considered dry and recorded by writing "dry" or using a slash mark on the corresponding data sheet. Personnel should not sample any given point more than once. Differentiation is made between larvae and pupae ("L" or "P" or in the case when both are present "L/P") – and in most cases reference to a particular type of instar should be documented (1st, 2nd, 3rd, or 4th).

Additional Post-Monitoring Review Procedure:

- **Channel/Ditch**- Observe and record the condition of ditch: including but not limited to blockages, erosion or slumping of banks, stability of substrate etc. Observe and record the condition of free flow through the channel / ditch utilizing the following terminology: obstructed, restricted, free flowing or appropriate combination of the above.

- **Vegetation / Regeneration** - Personnel should photograph area of spoil deposition and access / egress routes to evaluate site stabilization, i.e, vegetation recovery. Noticeable changes in vegetation types, new plant species, and reduction or increase of invasive species may be photographed if feasible. MCDs may find use of the invasive species list found in the Massachusetts Inland Wetlands Replication Guidelines helpful: http://www.mass.gov/dep/water/laws/replicat.pdf

- **Photography**- If practical, photographs should be taken from a variety of fully recoverable and mapped stations during the peak of growing season, (typically August).

The "additional" post monitoring site features above may be evaluated in accordance with the BMP site inspection schedule as follows:

- Inspection Schedule

Within 1 Year	preferably at the peak of first growing season
Within 2 Year	preferably at the peak of second growing season

Measures of Project Effectiveness:

The 9 regional MCDs use the following qualitative and quantitative parameters to monitor, evaluate, and measure the success of the mechanized wetlands management activity to reduce mosquitoes or prevent their future development for a particular project:

- Removal of causes and remedy of conditions contributing to habitat prone to mosquito development (i.e., sediments, blocked culverts, debris in the channel, etc);
- Evidence as recorded in the initial Mosquito Control *Complaint and Documentation Form* (Appendix 1) for comparison from one or more of the following criteria:
  - Reduction of mosquito larvae and/ or pupae abundance from field sampling and dip counts within site impact area;

- Reduction of frequency of mosquito larvae and/ or pupae present within site impact area;
- Reduction of larviciding activity within site impact area;
- Reduction or lack of adult mosquitoes in traps or as may be assessed by landing rate counts at the site;
- Reduction of complaints from adjacent residents or public officials; and
- Recorded mosquito control personnel observations including site conditions:
    - Non-conducive to mosquito larval habitat;
    - Conducive to enhancement of predatory fish habitat.

March 24, 2009

MASSACHUSETTS MOSQUITO CONTROL

OPEN MARSH WATER MANAGEMENT STANDARDS

MAY 2010

Compiled and edited by the Massachusetts Open Marsh Water Management Workgroup

Massachusetts Mosquito Control Districts

Bristol County Mosquito Control Project

Cape Cod Mosquito Control Project

Plymouth County Mosquito Control Project

Norfolk County Mosquito Control Project

Northeast MA Mosquito Control and Wetlands Management District

Massachusetts Department of Agricultural Resources

State Reclamation and Mosquito Control Board

Massachusetts Fish and Wildlife Service

Natural Heritage and Endangered Species Program

Massachusetts Office of Coastal Zone Management

Massachusetts Department of Environmental Protection

Massachusetts Audubon

The design of this Standard draws extensively from the original Essex County Mosquito Control Project's Standards for Open Marsh Water Management developed by Montgomery et al (1983), and the Northeast Massachusetts Mosquito Control and Wetlands Management District's OMWM Standards, Sullivan et al (2008). We wish to thank these authors for their permission to use materials from these manuals.

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MASSACHUSETTS MOSQUITO CONTROL

OPEN MARSH WATER MANAGEMENT STANDARDS

May 2010

1. INTRODUCTION

The purpose of the Open Marsh Water Management (OMWM) Standards is to function as the operational guidelines for mosquito control professionals for determining where and when it is appropriate to implement OMWM on salt marshes in Massachusetts. The Standards will assist mosquito control professionals in determining the effectiveness of the OMWM mosquito abatement modification. The Standards should help to define and standardize criteria, techniques, terminology, procedure and record keeping for Mosquito Control District (MCD) activities not regulated by the US Army Corps of Engineers.

2. SITE SELECTION

Sites will be identified from one or more of the following sources: MCD records, (adulticiding, larviciding, inspection or investigation) municipal, State or Federal official and/or affected private landowner.

3. SITE CRITERIA

Mosquito Control Districts consider a pre-monitored site appropriate for proposed OMWM modifications if the following apply:

> Sampling of the site documents the development of 2 mosquito broods / season. A mosquito brood is defined as "*All the individuals that hatch at about one time, from eggs laid by one series of parents and which normally mature at about the same time*." (from the Torre-Bueno Glossary of Entomology 1937, revised 1989).
>
> Mosquito broods can be caused by tidal event, fresh water influence or precipitation typically of an inch or more but dependent on previous marsh saturation.
>
> Species composition consists of nuisance mosquito population or a mosquito population of public health concern[1].

The MCD may re-monitor a site at any time.

4. SITE PARAMETERS

Mosquito Control District personnel use their experience and field expertise (best professional judgment) to define a site's limit (bounds) at time of site set-up. To determine the limit of the site, the MCD will first define the approximate extent of anticipated OMWM modification (direct impact). The area of likely indirect impact resulting from OMWM modifications is then estimated. Other considerations to weigh for determination of a site's limits include the following: potential mosquito habitat, existing topography, physical features (grid ditches,

[1] See Appendices: "Current Mosquito Species of Concern for Coastal Massachusetts". This list is not meant to preclude any mosquito species that fit either of the above categories but not currently listed.

creeks etc.), property ownership, crossings, restrictions, major water features and adjacent OMWM site limits.

5. SITE SET-UP

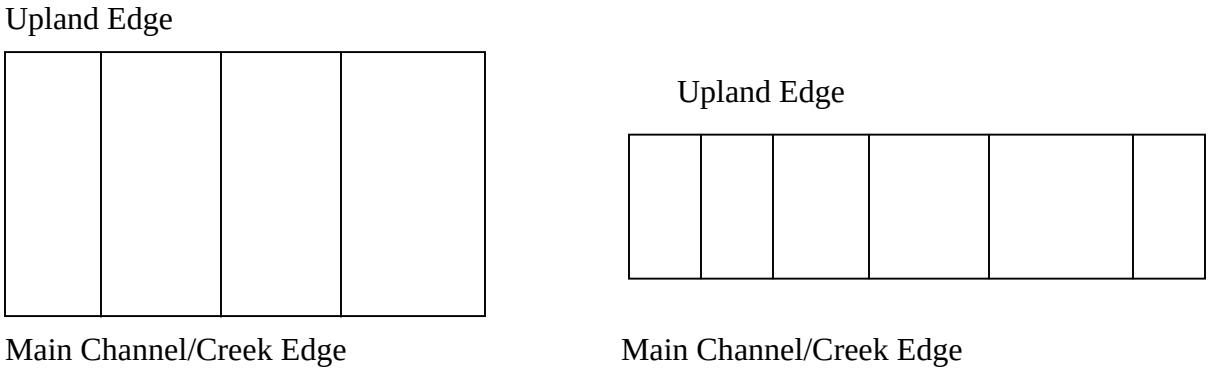
Locating Transects

Once the limit of a site has been estimated, the MCD will establish appropriate monitoring locations to measure changes to the marsh that may occur as a result of OMWM modifications. Random sampling along transects will be performed to document hydrology and vegetation data. Mosquito sampling will occur at randomly selected and fully recoverable dip stations (RDS). See Section 8. below.

Transects will be oriented perpendicular to the topographic gradient (e.g. generally from creek/ditch edge to upland edge) according to a consistent compass bearing (Figure One). If there is no clear topographic gradient and/or there is no main creek, ditch or channel, then transects will be set by the MCD's best professional judgment by creating an arbitrary line parallel to the edge from which randomly generated transect lines will run through the area of proposed OMWM modifications.

Ordinarily three transects will be sufficient for each site. However, for narrower or linear sites, more than three and shorter transects may be used (see below). Transect locations along the baseline will be determined using a calculator (with a function for generating random numbers) or another random number generation method. The random number selected represents the distance in feet from the beginning of each section and marks the starting location for each transect. To improve distribution of transects, the randomly generated number can be used to represent the percentage of the site width and transects located accordingly. If the randomly generated location of a transect places it in a ditch or within three meters of another transect, another random number will be generated to determine that transect location.

Figure 1: Transect Orientation



6. DATA COLLECTION EFFORT

While monitoring, technicians should to the extent practicable, record occurrences of interest such as wildlife (i.e., birds, mammals, plants, insects, etc.). All technicians are instructed in basic field identification and are equipped with field guides, binoculars and hand lenses to assist them with the task. MCDs will collect data from each site relevant to general observation, fish, mosquito, hydrology, soils and vegetation.

Raw Data Records

Raw data collection sheets, both pre and post modification, will incorporate general site information pertinent to the data collection visit. Each site is identified according to individual MCD format i.e., "# - municipality". The site identification is recorded along with the date of data collection, the time and duration on site, the technician's name (mosquito control professional tasked with collecting and recording data), the most recent high and low tide events (those of greatest potential influence to the site for that monitoring period), basic weather conditions (such as sunny, cloudy, wind speed and direction, precipitation totals etc.) and any human activity noted on or in the immediate vicinity of the site during the specified monitoring period. Air temperature is measured with a "red liquid" thermometer (or similar) for approximately 5 minutes.

Timing for Pre Modification Surveys

The MCDs conduct pre modification field surveys of all monitoring parameters to collect baseline data and assess a site for potential OMWM modification. Much of the information collected from the site is recorded on OMWM Pre Data Sheets and Summary Records (see appendices). A site should be visited monthly following a flooding event to capture data over a 5-month period (typically between May and September).

Timing for Post Modification Surveys

The MCDs conduct post modification field surveys of all monitoring parameters to measure efficacy of the modifications on mosquito populations and potential impacts to vegetation and hydrology. Much of the information collected from a site is recorded on OMWM Post Data Sheets and Summary Records. (See appendices). A site is monitored for all parameters at one year; two years and five years post site implementation. Post modification data collection is conducted monthly over a 5-month period (typically between May and September). Post modification mosquito population sampling should occur simultaneously with known larval presence on the marsh as evidenced by other field surveys, larviciding records etc. If the technician notes any conditions on site related to increased mosquito activity, poor vegetation recovery, erosion, sedimentation or break down of infrastructure it will be noted and remedied as soon as feasible and/or as necessary.

Fish Sampling

Technicians will record relative abundance of fish at each recoverable mosquito dip station, RDS. The technician notes and records the presence of live fish within a 3-meter radius of each recoverable dip station. Presence of fish is inferred when fish are seen in the water, vegetation or muck or if a fish-like disturbance/movement is noted in the water, vegetation or

muck. Data sheet entry for fish occurring at RDS is as follows: dry (no water) = -1, no fish = 0, 1-3 fish = 1, 4-10 fish = 2 and 10+ fish = 3.

Mosquito Sampling

Immature Mosquito Sampling Stations

The marking of potential larval habitats is based upon the MCD professional's experience and field expertise or best professional judgment. The goal when marking potential larval sites on a marsh is to document mosquito production efficacy of OMWM modifications. Potential larval habitats should be re-identified post OMWM modification. Sampling points are generally considered to be the whole panne or the area of potential mosquito developmental habitat associated with a distinct marsh feature such as a panne. The exception to this rule occurs when dealing with very large or very small areas.

In cases where mosquito production is occurring in a small pocket (< 3ft ^{2} surface area) the area should be evaluated in relation to other adjacent small pockets. For example, if there are numerous small pockets within 500ft^2 of marsh area, one sampling point can be used to represent all the depressions.

In cases where mosquito production is occurring in large contiguous areas, the area can be marked approximately every 5,000 ft^2. However, the MCD professional needs to consider that in some circumstances sheet water will dry back and concentrate into depressions. These depressions should be marked individually as potential mosquito habitat. The goal is to mark all areas that are likely to produce mosquito larvae, consistently.

It is suggested that in the spring prior to mosquito developmental habitat marking, the site should be inspected within a few days after an event that would create sheet water. This helps reveal areas that may hold sheet water and depressions that have the potential to produce mosquitoes. An examination of the plant communities and hydrological characteristics will help identify the depressions.

Once all potential larval habitats are identified, fifteen (15) stations will be randomly selected, flagged and labeled for full recoverability.[2] The location and corresponding flag number should be noted on the Site Map and entered with GPS description data (to within 5 meters of accuracy) on a recoverable dip station record. The observer may choose to randomly relocate any given station within the first month of monitoring if it becomes apparent that it will not support emergence of larvae through the adult phase. Miscellaneous mosquito sampling beyond this is frequently conducted for greater success of OMWM site implementation.

Immature Mosquito Sampling

A standard issue white "dipper" (350 ml) is used to dip for immature mosquitoes. The volume of any given dip will not exceed 350ml / dip but is often less. A dip is typically one smooth motion into the water / submerged vegetation and out keeping the dipper level upon exiting so that the sample does not spill. The technician deliberately targets areas of visible mosquito

[2] After two seasons, the number of dip stations required will be revisited based upon results of a power analysis to determine the optimum number of stations.

activity at each RDS but within a three meter radius of the station flag. If there is no available water to sample at the RDS it is considered dry. The technician specifically notes dip samples that contain mosquito pupae. The technician may indicate developmental stages of the larvae (instar – 1st, 2nd, 3rd, or 4th) or indicate "pupae". The technician may indicate condition of the sample i.e., live, moribund or dead as applicable.

Counting Methods

The technician counts live mosquito larvae and pupae and records the number per dip on the data sheet. Counts are most accurately achieved by "pouring off" larvae and / or pupae one at a time thereby avoiding the potential for counting a part of the sample more than once. Though dip numbers in excess of 200 larvae per dip or greater can be common on the salt marsh, it is difficult to precisely measure these numbers in the field. For this reason, numbers above 30 should be estimated based on technician best professional judgment and recorded within ranges of 31-100, 101-200, and 201 to 500. The midpoints of these ranges (65.5, 250.5, and 350.5 respectively) can then be used for data calculations.

Sampling Timing

Additionally, timing of the pre and post mosquito sampling effort can be determined by: marsh indicators (larval or flooding activity), local tide charts[3] (to predict flooding events) and / or precipitation of 1" or more. Experience demonstrates that it is best to wait 1-2 days after initial flooding of the marsh before collecting mosquito data. This provides more opportunity for complete tidal inundation of a site and greater saturation of the substrate thereby increasing the likelihood of mosquito egg hatching. This delay allows for advanced development of larvae and decreased chance that the technician will miscount due to poor visibility of 1st instar stages. Delayed sampling also allows for predation of larvae by larviferous fish; an important factor in the overall OMWM plan.

Adult Sampling

Adult mosquitoes may be sampled from a recoverable location such as a dip station using the standard "landing rate count". The technician records the number of mosquitoes that are seen landing on their body within a specified time frame, i.e. 1 minute, 5 minutes, etc. Handheld aspirators are an effective means of collecting adults in the field. Identification can be performed in the field by trained technicians. An emergence trap developed to confirm emergence and identification of adult mosquitoes may also be utilized to verify larval field identification.

Species Identification

Samples for identification should be collected that represent each brood whenever possible. Field identification of larvae in later stages (3rd or 4th instar) is acceptable by trained technicians. Mosquito larvae and pupae can be brought to the MCD's facility for rearing and / or detailed examination beneath a microscope. Vials are labeled with the name of the technician, date and location of collection, (site number and sample dip location). Once identified, the species is recorded on the appropriate data sheet / summary and discarded if not

[3] Though local tide charts can be used to set a general time table for post monitoring, salt marsh habitats can be flooded sufficiently to produce a brood of mosquitoes without indicated tidal activity and on very little rainfall.

being pooled for virus or disease testing. When more than one species is identified the dominant species (species of greater abundance) is recorded as such and other species noted as well.

Hydrology Sampling

Flooding Events

Tidal influence is measured with a rudimentary black stake tide gauge (1" x 1" x 48" - or other) and white chalk method.[4] The stake is placed at an RDS and a measurement of the elevation from the marsh surface to a mark on the stake is used as a predetermined standard. Each time the site is monitored the technician measures the elevation between the remaining chalk (line) and the reference mark and then re-chalks the stake to either water level or marsh surface as applicable for the next reading. "Marsh to mark" and "re-chalk" measurements are recorded. The difference between the previously re-chalked measurement and the current marsh to mark measurement is calculated to indicate previous flooding over the marsh surface.

Pore Water

Pore water wells will be located on the above described transect lines with one at the end of each transect (highest and lowest topographic points) and one located about halfway along each transect. Seventy (70) cm "pvc" pipe will be perforated along 60 cm of the length. The bottom of the pipe will be capped, and the pipe will be driven to a depth of 60 cm, with 10 cm extending above the marsh surface. The wells will be capped loosely to prevent rainwater from entering the well. The cap will have a small hole in the center for venting. Pore water measurements will be taken by recording the distance from the top of the well to the water surface within the well, minus the height of the well above the marsh surface. The height above the marsh surface should preferably be measured each time but at least once prior to monitoring season to adjust for movement of the well due to ice flow, freezing/thawing, etc. If the well is dry, that will be recorded on the data sheet. Pore water will be checked monthly throughout the monitoring period, within 5 days after a monthly spring tide. Sampling timing should occur 3 hours before or after a low tide. Pore water salinity is measured utilizing a standard refractometer that is calibrated with distilled water prior to each reading.

Precipitation

A wedge shaped rain gauge is typically fastened to a stake. Rainfall is measured in inches or millimeters but standardized throughout any given monitoring interval. Whenever possible the technician collects rainfall data shortly after a rain event. A rain gauge, which is located on an adjacent site, may be used as a measure provided it is relatively close in proximity – within 500 meters. Rainfall collection dates and amounts are noted on the data sheet, tallied between site visits and totaled on the summary sheets. Though not ideal, alternate methods may be used for documenting weekly precipitation amounts such as a trusted web site or other reliable resource.

Salinity

Surface water salinity will be measured at each mosquito sampling station utilizing a standard refractometer calibrated with distilled water prior to each reading. The technician carries an

[4] Though this method is not precise, more accurate and costly methods of measurement are unnecessary to the mosquito control professional for designing effiective modifications for an OMWM site.

eye-dropper for collecting a water sample from approximately 1" – 3" below the surface of the water. Three samples are taken and discarded to clear the eye-dropper and the 4th sample is measured. The technician cleans the instrument with distilled water and dries the instrument with a "Kim wipe" if available.

Soils Sampling
Rudimentary soil core profiles by hand auger may be taken to determine the feasibility and or extent (mainly depth dimension) of a proposed alteration relative to subsurface soil condition. Locations where sampling may occur: reservoirs, ponds, and selective ditches.

Vegetation Sampling
Technicians collect vegetation data using a point-intercept method along transects. Vegetation sampling is conducted once annually in late summer to early fall (July to October). The interval for point data collection along each transect will be every meter if the transect is 30 meters long or less, or every 2 meters if the transect is longer than 30 meters. At each interval, all species of plants intercepting the line are recorded. Observers only work transects from one side to avoid vegetation trampling.

Data Analysis
Vegetation data are recorded on a Vegetation Record. Data will be analyzed to determine percent frequency (indicative of the overall vegetative cover) and absolute frequency (the number of one-meter intervals at which a plant species is present). To determine percent frequency for each transect, the absolute frequency is divided by the total number of intervals in each transect. These observations are designed to examine changes in vegetation after OMWM modification.

7. SITE DOCUMENTATION

Permanent Site Records
The Mosquito Control District will keep a permanent record of each OMWM site. Maps, field maps measurements, site imagery, preliminary and post monitoring data, sample locations (recoverable dip stations, groundwater sampling stations, vegetation transects, and recoverable photo stations will be archived. Each implemented site (post) should also have notification records i.e., agency, advisory committee, and property owner. All relevant correspondence (conversation, meeting and written record) and any field notes or calculations pertinent to the site should be archived as well. All pre and/or post raw data (mosquito, hydrologic, soils, and vegetation) will be made available upon request.

Site Mapping
Massachusetts GIS mapping data and occasionally aerial photography are used throughout project development. Available GPS information (within 5 meter accuracy) will be incorporated within layers as deemed pertinent to site design development. Layers that might be included are not limited to the following: ortho-photography, topography, property ownership, wetland types and boundaries, ACEC Designation, Outstanding Resource Waters,

and Natural Heritage Designations - Priority Habitats of Rare Species, Estimated Habitats of Rare Wildlife and Certified Vernal Pools[5].

The site map identifies: site limits (perimeter), transect locations, groundwater well locations, and recoverable dip stations, and recoverable photo stations within 5-meter accuracy. These features are overlaid as layers or digitally drawn using GIS tools.

Site Design
MCD professionals create a specific design for each site based on data collected, preexisting conditions, site influences and general observations. Available GIS data (orthophotography or similar) are used as a base map. Proposed modifications are numbered and labeled accordingly. A "Legend" is included that specifies a color code for digitally drawn modifications. The site design includes: estimated high tide line and proposed alterations i.e., staging area, access and egress routes, site preparation requirements, erosion and sediment control device locations, temporary designated stockpile areas, and on site spoil disposal areas if applicable.

Site Summaries
At the end of each monitoring period, the site is evaluated utilizing Site Summary Codes (see appendices). Information recorded should include an approximate assessment of site characteristics relative to ownership, adjacent upland types and land use, ground conditions, general hydrology and invasive species composition.

The preliminary data is summarized for Advisory Committee review. Data summarized include but are not limited to dates of sampling, mosquitoes - corresponding mean immature mosquito range per # of dips taken / collection date, mosquito range per station and mosquito species identified, groundwater measurements, vegetation – percent frequency and absolute frequency and for fish - relative abundance range.

Proposed modification features are measured and approximate dimensions for each recorded on a Proposed Feature Dimensions Summary Record. An estimate for volume of spoil displaced (expressed in cubic yards) is calculated for each feature. The total volume (expressed in cubic yards) for all proposed on site features is also recorded.

The post data are summarized for Advisory Committee review. Data summarized include but are not limited to dates of observation, mosquitoes - corresponding mean immature mosquito range per # of dips taken / collection date, mosquito range per station and mosquito species identified, groundwater measurements, vegetation – percent frequency and absolute frequency and for fish - relative abundance range.

Site Photography
A fully recoverable photo station (RPS) is marked by GPS coordinates (+ or – 5 meter accuracy) and a marker (i.e. wood stake) inserted in its place and replaced for the duration of

[5] Additional information on the Massachusetts Endangered Species Act, MESA and OMWM activities within designated habitat can be found in the Appendices.

the monitoring period. This location is selected on its ability to provide optimal coverage of site characteristics. A digital panoramic record or aerial photograph consisting of 1 year preliminary and 1 and 2-year post alteration imagery of the site is recorded at time of peak vegetation – usually August.

Site Notification

A site map and proposed site design will be circulated to all members of the MCD OMWM Advisory Committee for review and comment prior to construction. Advisory Committee members should review, supply comments and make suggestions relative to their particular agency's expertise to the MCD within 30 days of receipt of the information. If the MCD receives no comment within 30 days it will be assumed that there is no comment and implementation of site design will proceed.

Acknowledgements in alphabetical order:

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Priscilla Matton	Bristol County Mosquito Control Project
Walter Montgomery	Northeast MA Mosquito Control & Wetlands Management District
David Paulson	Natural Heritage and Endangered Species Program
Richard Pollack	Harvard School of Public Health
Mike Stroman	Massachusetts Department of Environmental Protection
Emily DW Sullivan	Northeast MA Mosquito Control & Wetlands Management District

APPENDIX A

HISTORY OF SALT MARSH MANAGEMENT FOR MOSQUITO CONTROL IN COASTAL MASSACHUSETTS

Ditching

There are some historic references to Native American tribes, who inhabited coastal areas of New England, conducting ditching on the salt marsh. However, extensive ditching of the marsh wasn't practiced until after the arrival of the first settlers. Ditching was largely conducted on salt marshes to improve conditions there for pasture and grazing of livestock but also to promote larger yields and allow easier access to harvest hay. Salt marsh vegetation provided for other uses such as thatch for roofing, salt grasses for insulation, but largely for livestock bedding and feed.

Ditching on a much larger scale was done to provide access by gondolas to outlying salt marshes for harvesting salt hay and to accommodate commerce between settlements. Natural creeks were widened, extended or rerouted to neighboring settlements. Ditching became a profession and apprentices were paid 16 cents per rod. In some cases, tolls were charged to navigate some creeks and channels.

Grid Ditching

The grid ditch system still evident on our salt marshes today, were dug by hand between 1928 and 1934. The primary purpose of this era of ditching was to put as many people to work as possible, as this was the time of the great depression. No entomological studies were conducted in conjunction with this ditching effort; mosquito control was a secondary consideration at best. However mosquito control was achieved by default as practically every square inch of marsh was drained by the extensive project. Some engineering studies were done to determine where and at what intervals ditches were dug. Ditches were dug in straight rows by hand with sod saws and two man shovels. In 1934, at the peak of this ditching effort, over 11,000 men were employed digging ditches and when completed nearly 3,000 linear miles of salt marsh ditch were dug in Essex County alone. Virtually all salt marsh in New England was ditched with the exception of one marsh in Rhode Island.

Later in the late 1940s and early 1950s soldiers returned home from World War II. Housing shortages were a big problem in the more populated areas particularly in and around Boston. A generation of young families, eager to get their lives back on track migrated to the north shore of Massachusetts to start new lives. This migration coincided with the degradation of the grid ditch system created in the 30s. These ditches had not been maintained and now produced far more mosquitoes then they had initially eliminated. By many accounts it was so bad some considered the area to be almost uninhabitable. A few local programs were established to try to reopen the ditches but it was impossible to duplicate the labor force that had originally created the ditches.

In 1958, a grass roots effort, fueled by public demand for relief resulted in legislation establishing the Essex County Mosquito Control Project. For reasons unknown the projected

was not formally funded until 1965. Equipment was purchased and a major effort was launched to reclaim salt marsh ditches.

Salt Marsh Ditch Maintenance in Northeast Massachusetts

In the late 1970s, Walter Montgomery was an equipment operator for what was then, the Essex County Mosquito Control Project, ECMCP. Montgomery's primary duty was to maintain the extensive salt marsh grid ditch system, excavated for the most part, between 1928 and 1934. Montgomery recalls using an implement known as a scavel plow; this was a large wedge shaped device mounted under a wing plow and could be attached to the front of a tractor or sometimes towed behind. A scavel plow wedge was basically constructed to the original ditch dimension. The wedge would be dropped into the ditch and the tractor either pushed or pulled it along. As the wedge peeled spoil out of the ditch the wing plow would roll the spoil into furrows approximately six feet wide on both sides of the ditch. These furrows of spoil were then either run over to flatten them or plowed off the marsh.

On a good day Montgomery recalls completing two or more miles of ditch maintenance but even at that rate maintaining 3,000 linear miles of ditches was an endless endeavor. It was Montgomery's experience that freshly maintained ditches were really only effective for about two years before requiring additional maintenance. Typically ditches would become blocked on the high marsh and previously drained salt pannes would often reestablish. Montgomery observed that the open water areas of these pannes or ponds didn't have mosquito larvae but the grassy sheltered areas around the edges or isolated depressions adjacent to the ponds, supported mosquito larvae. Montgomery's observations further supported his belief that continued maintenance of the grid ditch system was not productive and furthermore there had to be a better way to manage salt marsh mosquito populations.

In the early 1980s Montgomery was promoted to Field Foreman. This provided him with the opportunity to investigate possible alternatives to ditching. Montgomery became aware of work that was being done in the mid Atlantic states, Open Marsh Water Management, OMWM and wondered if it could be duplicated in the northeast. The Essex County Mosquito Control Project began experimenting with basic OMWM techniques but soon realized that more technical expertise was needed.

Open Marsh Water Management

The origins of Open Marsh Water Management, OMWM, can be traced back to New Jersey in the late 1960s and is directly attributed to mosquito control greats such as Dr. J.M. Jobbins, J.K. Shisler and Frederick Ferrigno. From its inception, OMWM was a collaborative of environmental advocates and mosquito control professionals. Delaware began evaluating OMWM in 1980 (William H. Meredith, Department of Fish and Wildlife, Division Of Natural Resources and Environmental Control / NMCA 1980) and soon the mosquito control technique was instituted as standard practice there. Maryland also began an OMWM Program under the direction of Dr. Cyrus Lesser.

OMWM in Essex County, MA

In March of 1982 the Town of Rowley received a Coastal Zone Management, CZM grant for $19,800 to study mosquito control practices and the effect of ditching on migrating shore birds,

mosquitoes and invertebrates on Rowley salt marshes. Sixteen thousand five hundred dollars were contracted to the Manomet Bird Observatory. The remaining $3,300.00 was used to pay for in kind service to various groups. The Essex County Mosquito Control Project approached the Rowley Conservation Commission and asked to be involved in the study, hoping to promote interest in OMWM and gain technical expertise, which was lacking. This was the beginning of a long and beneficial relationship between mosquito control and several environmental agencies and groups. The premise of this relationship was simple and unspoken; agreeing to disagree on subjects of controversy and focusing on OMWM which could be mutually beneficial to the environment and simultaneously provide for mosquito control. The results of the study were presented to both the Rowley Conservation Commission and CZM in a report entitled *The effect of ditching for mosquito control on salt marsh usage by birds in Rowley, Massachusetts* (published as Clarke, 1984).

In 1983 a $10,000.00 grant was secured from the U.S. Fish and Wildlife Service to continue the study. The Essex County Mosquito Control Project enlisted the help of many other mosquito control professionals from New Jersey, Delaware and Maryland as well as Dr. Thomas Hruby of the Resource for the North Shore and Office of the Massachusetts Audubon. Together two pilot projects were designed which used the New Jersey Standards for OMWM as guidance (Dr. Kenneth Bruder, 1980). An experimental permit was secured from the U.S Army Corp of Engineers. Findings of the study were published in the Journal of Field Ornithology, in the spring of 1984.

Fairly quickly Montgomery and others realized that they needed to develop an OMWM Standard, which would reflect the regional characteristics of Essex County salt marshes; particularly differences in tidal range in comparison to that of New Jersey. The Standards would function as an operational manual and be designed to help mosquito control professionals and other interested agencies to understand the process of implementing OMWM. These Standards became the original *Essex County Mosquito Control Standards for Open Marsh Water Management* (Montgomery, 1982). It also became evident that the public would need to be educated as to the potential benefits of OMWM as compared to traditional maintenance of the grid ditch system. From the public's perspective, mosquito control professionals had been draining salt marshes for years and now here they were proposing to deliberately hold water on the marsh. A media blitz focusing on newspapers and regional magazines was initiated. Montgomery co-authored a brochure with Dr. Hruby entitled *The Mosquito, the Salt Marsh, and You; Controlling mosquitoes on Essex County salt marshes* (No date).

In 1984, ECMCP applied for and received its first Army Corp of Engineers Permit which included the original Essex County's *Standards for OMWM*. The permit provided ground rules for the development of the OMWM Advisory Committee. The Advisory Committee's role was twofold: to act as a watch dog group to ensure that concerns of all the various agencies and environmental interests were considered as well as to provide technical assistance and expertise falling beyond the scope of mosquito control personnel.

Fresh Water Marsh vs. Salt Water Marsh

Open Marsh Water Management in Essex County has been scrutinized from many angles over the course of the years. The U.S. Fish and Wildlife Service had its own internal debate which posed numerous questions culminating in concern regarding the effects of OMWM on the productivity and value of bordering fresh water marshes. Some experts preferred salt marshes and were not concerned by encroachment into the fresh water interface. Some put more value in maintaining the fresh water marshes. After much discussion a compromise was reached and incorporated into the Standards. Thus began the origins of an alteration technique known as the "perimeter" ditch (sometimes called a gutter ditch), which could be excavated on the estuarine interface between salt and fresh vegetation. A perimeter ditch allowed for fresh water sheet flow to its boundaries, simultaneously providing for its drainage away from the salt marsh surface, thereby stopping further encroachment of fresh water vegetation on the marsh; native salt marsh vegetation flourished. From the mosquito controller's perspective these ditches provided much needed tidal circulation into the upper reaches of the salt marsh (typically more productive mosquito habitat) and encouraged movement of naturally occurring mosquito eating fish throughout a site.

As the debate over fresh marsh versus salt marsh evolved, concerns also rapidly grew regarding *Phragmites australis* and its invasion of the salt marsh. General consensus became that fresh water intrusion on salt marshes had a negative impact to the resource area. The perimeter ditch quickly became an effective means by which to redirect excess fresh water and thereby diminish Phragmites vigorous march across the marsh. This is perhaps the principle reason why OMWM was embraced so enthusiastically by a number of those in the environmental community. Open Marsh Water Management was seen as a means to restore salt marsh. *Sanctuary: Journal of the Massachusetts Audubon Society* (Buchsbaum, 1989). Massachusetts Audubon continued to conduct studies on these and other OMWM projects from 1985 through 1989 and results were presented at the New England Estuarine Research Society Conference in June of 1989.

Chapter 410 of the Acts of 1996

In October of 1996 Montgomery and the Essex County Mosquito Control Project received a Massachusetts Wetlands Restoration Award from The Executive Office of Environmental Affairs "in recognition of outstanding contributions to wetlands restoration in the Commonwealth of Massachusetts" and cited a total of 450 acres of restoration on 30 individual sites. It was not long after that Montgomery officially changed the name of the "Project" to reflect the agency's more permanent stature in the field but also to suggest the solid commitment of the agency to manage wetlands with a long term perspective. Chapter 410 of the Acts of 1996 made it official: ECMCP became the Northeast Massachusetts Mosquito Control and Wetlands Management District, NEMMCWMD or the District.

US Army Corps Individual Permit and the OMWM Standards

The Army Corps permit was subsequently renewed for 3 years each in 1987, 1989, 1992 and 1995. In 1998, at the suggestion of the U.S. Army Corp of Engineers, NEMMCWMD renewed its OMWM permit for 10 years. The District revised and updated the OMWM Standards each

time the permit required renewal in order to reflect the development of new strategies, technological advances in equipment, and lessons learned in the field.

OMWM in Coastal Massachusetts

The Plymouth County Mosquito Control Project (PCMCP) held a permit in the 1980's and conducted about a half dozen or so OMWM projects, but the permit was not renewed. In 2001 PCMCP received a 5 year permit and then renewed for 10 years. They have completed 3 projects under the latest permit which expires in 2015.

The Norfolk County Mosquito Control Project (NCMCP) was mentored by the NEMMCWMD in OMWM and received a 5 year permit in 1999. This permit was renewed for 10 years in 2006 after some administrative delays, and will expire in 2016. NCMCP has completed 12 projects. NCMCP and PCMCP collaborated on a joint standards revision in 2005 that applied to their renewed permits.

Bristol County Mosquito Control Project (BCMCP) received a permit in 2002, which expired in 2006. A renewed permit was granted and it will expire in 2011. BCMCP has proposed OMWM projects, but for various extenuating circumstances has not completed any projects.

In 2008, the NEMMCWMD applied for its permit renewal and received a Federal Consistency Objection. The District filed a federal appeal, which was later rescinded. A workgroup comprised of the Bristol, Cape Cod, Norfolk, Northeast MA and Plymouth County Mosquito Control Districts, the State Reclamation and Mosquito Control Board, CZM, MA Fish and Wildlife, and MA Audubon was formed to revise the Standards.

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APPENDIX B

CURRENT MOSQUITO SPECIES OF CONCERN
COASTAL MASSACHUSETTS

The following mosquito species are of concern because of their potential or demonstrated ability to transmit viruses. The remaining species listed are those which have a significant annoyance potential. **Bolded** species are those with larval development habitat found directly in the salt marsh.

Scientific Name	Common Name
Aedes canadensis	"woodland pool mosquito"
Aedes cantator[6]	"brown salt marsh mosquito"
Aedes japonicus	"Japanese rock pool mosquito"
Aedes sollicitans	"golden salt marsh mosquito"
Aedes taeniorhynchus	"Southern salt marsh mosquito"
Aedes triseriatus	"eastern tree-hole mosquito"
Aedes vexans	"re-flood mosquito"
Anopheles punctipennis	"mottle-winged mosquito"
Anopheles quadrimaculatus	"malaria-carrying mosquito"
Coquillettidia perturbans	"cattail marsh mosquito"
Culex pipiens	"northern house mosquito"
Culex restuans	"white-dotted mosquito"
Culex salinarius	"un-banded salt marsh mosquito"
Culiseta melanura	"cedar swamp mosquito"
Culiseta morsitans	
Uranotaenia sapphirina	"sapphire-lined mosquito"

[6] Reference to *Ochlerotatus* has been reverted back to *Aedes* as defined in original or pre 2000 nomenclature. Many professionals of mosquito abatement have made this same decision as it has caused confusion nation-wide.

APPENDIX C

COMMON SALT AND BRACKISH MARSH PLANT SPECIES
COASTAL MASSACHUSETTS

Agalinis maritime	Salt marsh False Foxglove
Agropyren pungens	Quackgrass
Aster tenuifolius	Aster
Atriplex patula	Marsh Orach
Carex paleacea	Salt Marsh Sedge
Distichlis spicata	Spike Grass
Glaux maritima	Sea Milkwort
Iva frutescens/annua	Marsh Elder
Juncus gerardii	Black Grass
Juncus effusus	Soft Rush
Juncus maritimus	Sea Rush
Lepidium latifolium	**Perennial Pepperweed***
Limonium nashii	Sea Lavender
Lythrum salicaria	**Purple Loosestrife***
Myrica gale	Sweet Gale
Panicum virgatum	Switchgrass
Phragmites australis	**Common Reed***
Plantago maritima	Seaside Plantain
Pluchea purpurascens	Camphor Weed
Potentilla anserina	Silverweed
Salicornia europaea	Common Glasswort
Scirpus pungens	Common 3-Square – Sedge Family
Scirpus robustus	Salt Marsh Bulrush – Sedge Family
Scirpus validus	Soft Stemmed Bulrush – Sedge Family
Spartina alterniflora	Smooth Cord Grass
Spartina cynosuroides	Big Cordgrass
Spartina patens	Salt Hay Grass
Solidago sempirvirens	Seaside Goldenrod
Suaeda linearis	Sea Blight
Typha angustifolia	Narrow-leaved Cattail

*** Bold text indicates invasive species. Follow protocols that prohibit spread.**

APPENDIX D

OMWM DATA RECORD BINDER

MASSACHUSETTS MOSQUITO CONTROL
OPEN MARSH WATER MANAGEMENT STANDARDS
May 2010

OMWM Pre Data Record

Site name or #: _____ Date: _____ Observer: _____
Weather: _____ Air: ____ °F Wind: _____ Time begin: _____ Time end: _____
High tide time: _____ Height: _____ Tide Gauge from: _____ Rise: _____
Low tide time: _____ Height: _____ Tide Gauge up to: _____ Rain Gauge: _____
Last Spring Tide: _____ Height: _____ Tide Gauge Rechalked: _____ Rain / Week: _____

Mosquito

RDS	1	2	3	4	5	6	7	8	9	10		
Dips											Mean of Dips / Site	Total per Site
Mean / Station												
Dominant Species												
Other Species												
Adults / __Minutes												

Fish*

RDS	1	2	3	4	5	6	7	8	9	10	Mean Value/Site	Total Value/Site
Value Code*												

* Dry = (-1) / None = (0) / 1-3 = (1) / 4-10 = (2) / 11+ = 3

General Observation*

Human activity on site: _____ Human activity in vicinity: _____
Birds on Site: _____ Birds in vicinity: _____
Other:

Comments

OMWM Pre Data Summary Record

Site # : _____ Municipality: _____ Ownership: _____
Upland Type: _____ Upland Land Use: _____ Fresh Marsh: _____
Marsh Type: _____ Ground Condition: _____
Hydrology: _____ Invasive Vegetation: _____

Mosquito Data

Date									
# of Dips / Site									
Mean Mosquito / Site									
Maximum Mosquito / Dip									
Minimum Mosquito / Dip									
Dominant Mosquito Species									
Other Mosquito Species									
Landing Rate Count									

Fish Data*

Date									
# of Wet Stations									
Mean Value / Site									
Total Value / Site									

* Dry = (-1) / None = (0) / 1-3 = (1) / 4-10 = (2) / 11+ = 3

General Observations*

Humans									
Birds									
Fish									
Other									

Vegetation Data

Dates: Observers: _____

Transect	Bearing	Length	Interval
1			
2			
3			

Species Present:

Comments:

OMWM Post Data Record

Site name or #: _____ Date: _____ Observer: _____
Weather: _____ Air: ____ °F Wind: _____ Time begin: _____ Time end: _____
High tide time: _____ Height: _____ Tide Gauge from: _____ Rise: _____
Low tide time: _____ Height: _____ Tide Gauge up to: _____ Rain Gauge: _____
Last Spring Tide: _____ Height: _____ Tide Gauge Rechalked: _____ Rain / Period: _____

Mosquito

RDS	1	2	3	4	5	6	7	8	9	10		
Dips											Mean of Dips / Site	Total per Site
Mean / Station												
Dominant												
Other Species												
Adults / __Minut												

Fish

RDS	1	2	3	4	5	6	7	8	9	10	Mean Value/Site	Total Value/Site
Value Code*												

* Dry = (-1) / None = (0) / 1-3 = (1) / 4-10 = (2) / 11+ = 3

General Observation*

Human activity on site: _____ Human activity in vicinity: _____
Birds on Site: _____ Birds in vicinity: _____
Other:

Comments

OMWM Post Data Summary Record

Site # : _____ Municipality: _____ Ownership: _____
Upland Type: _____ Upland Land Use: _____ Fresh Marsh: _____
Marsh Type: _____ Ground Condition: _____
Hydrology: _____ Invasive Vegetation: _____

Date									
# of Dips / Site									
Mean Mosquito / Site									
Maximum Mosquito / Dip									
Minimum Mosquito / Dip									
Dominant Mosquito Species									
Other Mosquito Species									
Landing Rate Count									

Fish Data*

Date									
# of Wet Stations									
Mean Value / Site									
Total Value / Site									

* Dry = (-1) / None = (0) / 1-3 = (1) / 4-10 = (2) / 11+ = 3

General Observations*

Humans									
Birds									
Fish									
Other									

Vegetation Data

Dates: Observers: _____

Transect	Bearing	Length	Interval
1			
2			
3			

Species Present:

Comments:

APPENDIX E
OMWM SITE SUMMARY CODES

Category	Type	Code	
OWNERSHIP			
	Private, unspecified	1	
	Private, agricultural	2	
	Private, conservation	3	
	Public, unspecified	4	
	Public, agricultural	5	
	Public, conservation	6	
	Public, wildlife refuge	7	
UPLAND TYPE			
	Hilly (Solid rock)	1	
	Hilly (Soil or glacial deposits)	2	
	River or coastal valley	3	
	Man-made (Causeway, railroad, buildings…)	4	
UPLAND LAND USE			
	Business / Industrial	1	
	Residential, developed	2	
	Residential, undeveloped	3	
	Agricultural	4	
	Transportation	5	
	Conservation	6	
FRESH MARSH			
	None	1	
	Less than ½ upland edge	2	
	More than ½ upland edge	3	
MARSH TYPE			
	High	1	
	Low	2	
GROUND CONDITION			
	Firm	1	
	Soft	2	
	Very Soft	3	
HYDROLOGY			
	Unditched, “natural”	1	
	Ditched, poorly drained	2	
	Ditched, well drained	3	
	Restricted, culvert / roadway etc.		R
INVASIVES			
	Phragmites australis	1	
	Lepidium latifolium	2	
	Lythrum salicaria	3	
	Other (List species)		

APPENDIX F
OMWM AND THE MASSACHUSETTS ENDANGERED SPECIES ACT (MESA)

The Massachusetts Endangered Species Act (M.G.L. c.131A) and its implementing regulations (MESA, 321 CMR 10.00) establish procedures for the listing and protection of state-listed plants and animals. The MESA regulations include project review filing requirements for projects or activities that are located within a Priority Habitat of State-listed Rare Species ("Priority Habitat"). The MESA is administered by the Natural Heritage and Endangered Species Program (NHESP) of the MA Division of Fisheries & Wildlife, and prohibits the "take" of state-listed species. The "take" of state-listed species is defined as "in reference to animals, means to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity or attempt to engage in any such conduct, or to assist such conduct, and in reference to plants, means to collect, pick, kill, transplant, cut or process or attempt to engage or to assist in any such conduct. Disruption of nesting, breeding, feeding or migratory activity may result from, but is not limited to, the modification, degradation or destruction of Habitat" (321 CMR 10.02).

MCDs should consult the most recent edition of the *MA Rare & Endangered Species Habitat Atlas* http://www.mass.gov/dfwele/dfw/nhesp/nhesp.htm to determine if a proposed project will occur within *Priority Habitat* and the relevant NHESP guidance information to determine if direct filing pursuant to the MESA is required.

If a filing with the NHESP is required, filing should consider access, egress, spoil/soil deposition or spreads or other activities related to the project occurring within *Priority Habitat*. In general, the Site Plan should include sufficient detail and mapping to clarify the location of all work areas and the form of work (e.g., mechanical work or hand work).

Within 30 days of receiving a filing, the NHESP will provide a response letter indicating whether or not the submission is complete. If the submission is complete, the NHESP will provide a letter determining if the project will result in a "take" within 60 days of the date of posting of the first letter (321 CMR 10.18). In this letter, the NHESP will determine whether or not a project, as currently proposed, will (a) avoid a "take" as proposed, or with conditions and may proceed without further review, or (b) will result in a "take" of State-listed Rare Species and cannot proceed as proposed (321 CMR 10.23).

If a project is determined to result in a "take" then it may be possible to redesign the project to avoid a "take". If such revisions are not possible, then projects resulting in a "take" may only be permitted if they qualify for a MESA Conservation & Management Permit (321 CMR 10.23).

APPENDIX G
OMWM REFERENCE LIBRARY

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Appendix 3: SRMCB Massachusetts Mosquito Control Surveillance Protocol for Evaluation of Efficacy of Aerial Adulticide Application(s) Regarding Mosquito-Borne Disease

INTRODUCTION

Eastern Equine Encephalitis (EEEv) and West Nile Virus (WNv) are the most significant mosquito-borne public health threats in Massachusetts. In Massachusetts and elsewhere in the United States, established regional mosquito surveillance and control programs operate utilizing principles of, and components comprising, Integrated Pest Management (IPM), or more specifically, Integrated Mosquito Management (IMM). A basic tenet of IPM and IMM is that action thresholds and intervention decisions are based on surveillance.

Mosquito-Borne disease surveillance demands proper pest recognition and quantification as it attempts to define the local epidemiology of the disease: the presence, distribution, and prevalence of the causal agents and vectors. Surveillance of these populations, along with careful scrutiny of environmental influences, seasonal variations, facilitates the process of assessing risk of mosquito-borne disease, and provides a basis for intervention decisions.

In Massachusetts, the State Reclamation and Mosquito Control Board (SRMCB) and the mosquito control districts/projects (MCPs) it oversees collaborate with the Massachusetts Department of Public Health (MDPH) Arbovirus program to monitor ecological and epidemiological parameters, and to dynamically assign risk levels pertaining to EEEv and WNv transmission throughout any mosquito season.

PURPOSE

This document establishes a standardized protocol for use by SRMCB, MCPs and MDPH personnel to assess the efficacy of an aerially applied adulticide for the goal of reducing risk of EEEv and/or WNv transmission to the public. In pursuing the goal previously stated, the overarching purpose of this protocol is to ensure the trapping of mosquito populations that have not been impacted by aerially applied adulticides in order to achieve a better interpretation and apply correctly conclusion(s) regarding the efficacy of the adulticide to reduce the threat of mosquito-borne disease. Finally, this particular document will address and place more emphasis on quantitatively measuring efficacy of interventions such as aerial adulticide application for purpose of suppressing EEEv.

Although the protocol places emphasis on EEEv, there is an established surveillance system for WNv using specific traps such as gravid traps to collect mosquitoes statewide for submission to the MDPH Arbovirus Laboratory in Jamaica Plain. The gravid trap is very effective in collecting live specimens of *Culex* adults for virus analysis and could be used to quantitatively measure the efficacy of interventions such as aerial adulticide application. The MDPH, in cooperation with the MCPs, Boards of Health and various state/local agencies have established a trapping protocol for deployment of traps (gravid traps) specific for the purpose of determining the presence of WNv in geographically specific mosquito populations. During the mosquito season, MCPs deploy traps at strategic locations for season long collection of primarily *Culex pipiens* and *Culex restuans*. The *Culex pipiens/restuans* complex of mosquitoes has been implicated in the transmission of the West Nile virus from bird-to-bird and bird-to-human during years of increased virus activity. Trapping protocols for deployment of these traps has evolved over time resulting in an elaborate network of traps covering many areas of the state. In concert with the long-term trapping sites, MDPH, in cooperation with the MCPs, has developed a rapid deployment trap protocol which is activated and geographically focused based on certain environmental parameters such as clusters of WNv positive mosquitoes and/or human cases.

LESSONS LEARNED IN 2006

One measure of efficacy relies upon documenting a change in the abundance of mosquitoes before a spray event and directly after to determine the extent to which the intervention was successful. Decreases in mosquito abundance can support a conclusion that the intervention was successful where the spray was actually deployed and support the contention that risk of arbovirus transmission was similarly reduced. The analysis of efficacy could also take into consideration the extent of any change in the abundance of mosquitoes (pre- and post- application) in non-treated areas. In some cases mosquito abundance may be observed to rise after a spray event. Such phenomena may be explicable on the basis of the emergence of new (young) adults within an area as well as by immigration of mosquitoes from beyond the treated area. Without trained personnel and resources to assess the age structure of mosquito populations, reliance on abundance data may lessen the certainty of any conclusions.

Another measure of efficacy takes account of changes to the minimum field infection rates (MFIR), indices based upon the number of mosquitoes within virus-positive pools (or samples). An effective intervention should be expected to reduce the MFIR post treatment, relative to the MFIR pre-treatment. A conclusion based solely upon the MFIR results (absent data pertaining to the corresponding abundance and population age structure) may compromise the level of assurance of any conclusion. An increase in the MFIR post treatment might be suggestive of an intervention failure, or be explicable to a decrease in the abundance of young mosquitoes that had less opportunity to have acquired infection.

For example, during the 2006 mosquito season, the most recent occasion when a large scale aerial adulticide operation was conducted, surveillance data overwhelmingly indicated that the use of aerial adulticiding to parts of Southeastern Massachusetts would be a prudent intervention to curtail a dramatic increase in the mosquito-borne threat of EEEv. In response to this emergency event, establishing suitable pre- and post- monitoring locations proved a significant challenge. The discrepancies and variability of the measured reductions observed in 2006 were likely attributable to differing methods of analysis as well as confounding factors such as weather changes between pre and post collections, terrain, locations and kinds of traps utilized, and mosquito species.

Another lesson learned was the need for an improved protocol incorporating as much standardization to the extent feasible that could address as many of the aforementioned variables and complexities inherent in the sampling of adult mosquitoes.
These inherent complexities include, but are not limited to, flight range of the target mosquitoes being sampled, selection of trap sites appropriate for assessing efficacy, and limitations in personnel and resources to document age structure. The current protocol may be strengthened by identifying sites where specific trapping devices might be set prior to any decision to embark upon an aerial intervention.

During 2006, additional or supplemental resources were not available to conduct efficacy measures for the aerial intervention. The same MCPs personnel responsible for several tasks including standard surveillance, data collection efforts and performing emergency intervention tasks were required to also set additional traps in efforts to measure efficacy of the emergency aerial adulticide intervention.

There was no established timeline between SRMCB, MCPs, and MDPH regarding the turnaround time pertaining to efficacy analysis, interpretation, and results reports. In this protocol, the SRMCB shall coordinate with its member MCP's and MDPH, the number of traps, acceptable trap type, and acceptable ranges for placement within and outside of spray zone perimeter. Once relevant data on these collections has been provided, the SRMCB shall determine the final efficacy measures for reporting purposes. Serious efforts to objectively measure efficacy must be supported by appropriate personnel and resources.

Due to the nature of the emergency conditions, changing weather conditions, and logistical uncertainties such as knowing in advance the number of aircraft that would be available as well as the size of the spray zone, communication challenges included less than desirable notification to all parties regarding fundamental changes to the proposed spray areas as the operation proceeded as well as delayed reports on the progress of the aerial spray. A standard sampling protocol will go a long way in improving the experience gained during the emergency spray operation in 2006 especially communication between SRMCB, MCPs, and MDPH and ultimately result in better interpretation and application of the data derived from sampling efforts to assess efficacy of an aerial application intervention. Decisions and actions by each agency require a transparent and expedient process to ensure that efforts are justified and swiftly performed.

SPECIFIC SPECIES OF MOSQUITOES

More than 150 species of mosquitoes have been identified in the U.S.; of these, 51 are known to occur in Massachusetts. Whereas all mosquitoes require water in which their immature stages develop, each species of mosquito exploits a characteristic kind of habitat (e.g. fresh water wetland, salt marsh, cedar swamp, tree hole, etc), produces as few as one or as many as several generations each year, is active during a defined season, and quests for blood during defined intervals (e.g. daytime, nighttime or during dawn/dusk periods). Furthermore, mosquitoes of certain species feed predominately on one kind of host (e.g. birds or mammals), whereas others are less discriminating and feed on a number of different ones. Because of these and yet other differences, certain kinds of mosquitoes are better able to acquire, maintain and transmit disease-causing viruses between their vertebrate hosts. Accordingly, just a few kinds of mosquitoes are of particular concern to public health authorities and the mosquito control practitioner in Massachusetts. For EEEv, these include the maintenance vector *(Culiseta melanura*), and the likely bridge vectors (mainly *Aedes vexans, Ochlerotatus canadensis, and Coquilletidia perturbans).* For WNv virus, these include the maintenance vector *(Culex pipiens)*, and a long list of potential bridge vectors.

QUANTITATIVE MEASUREMENT FOR EFFICACY OF AERIAL APPLICATION OF PESTICIDES

Traps used for assessing the efficacy of an adulticidal application generally should be selected and deployed to maximize the sampling of mosquitoes of the target species. The larger the sample size, and the greater the proportion of the sample being composed of the target species, the greater the return on investment of time and labor.

The efficacy of an adulticiding effort can be assessed by noting a change in the

Local abundance of the target mosquito (es),
Age structure of that/those population(s), and
Proportion of vectors harboring the virus.

Traditionally, measurements have been limited to recording changes in abundance and infection rates. Whereas the abundance of a vector is most readily assessed, this parameter is of only limited significance as a component contributing to the transmission risk posed by that vector. For many kinds of mosquitoes, adults may emerge daily during the season. In these cases, the vast majority of adults will be just one or a few days of age. Thus, if a significant proportion of the adult population is killed by application of an adulticide, and if that same fraction of the population is soon replaced, in whole or part, by newly emergent adults, then the reduction might not be apparent simply by measuring vector abundance. The abundance of the vector population should be measured, but data is most valuable if considered along with other parameters that together better relate to risk.

Mosquitoes of any age may acquire EEEv and WNv infection from viremic vertebrate hosts. The virus survives and reproduces within, and may be transmitted by only certain kinds of mosquitoes. With few exceptions, such virus-competent mosquitoes can transmit infection to new hosts only after incubating the virus for a period of days or weeks. Young mosquitoes, even if infected, pose relatively little immediate threat. It is the aging mosquito population, composed in part of adults that may have acquired and incubated EEEv and WNv that pose risk of virus transmission. Thus, interventions based upon use of adulticides may reduce the abundance of vectors that may yet acquire virus as well as those that may already be infected or infectious. In the former case, the intervention may reduce risk of transmission for days or weeks. In the latter case, the intervention may have immediate effects on reducing transmission risk.

TRAP TYPE

Diverse kinds of traps exist for the surveillance of adult mosquitoes. Each kind of trap has attributes that make it more or less useful than other kinds for sampling certain kinds of mosquitoes.

In Massachusetts, the traps used most often for surveillance of adult mosquitoes include the *CDC light trap, the gravid trap, the New Jersey Light trap and the resting box.*

The *CDC Trap* was first designed in the late 1950's by the Centers for Disease Control. The trap is compact and portable, is powered by a battery, and can maintain sampled mosquitoes alive for the purpose of species identification and viral assay. A small incandescent lamp disorients flying insects, and a fan draws these into a collection chamber. The light may be augmented or replaced by a carbon dioxide (CO_2) source. Several modifications to the basic design are available; each configuration changes the attractiveness of the trap to different kinds of mosquitoes. Modified versions in use in Massachusetts include the American BioPhysics (ABC) trap (used by the Plymouth County Mosquito Control Project), and the UV light trap (used by MDPH), which is fitted with a blue-black light rather than the standard incandescent lamp.

Carbon dioxide (CO_2) may be provided by a mass of sublimating dry ice, or as a metered flow from a pressurized cylinder. Standard use of a calibrated metered flow aids in comparing results between trap collections. This trap, baited with a CO_2 source, attracts the widest cross section of an existing, host seeking population. Generally, mosquitoes represent the largest fraction of insects collected within CDC traps. The primary enzootic vectors of EEEv (*Culiseta melanura)* and WNv (*Culex species*) are readily sampled with these devices. **Currently, the CDC Trap (even with the modified versions mentioned above augmented with CO2) is the most efficient or best standard surveillance device for assessing the efficacy of an aerial application because of its relatively low cost, portability, widespread use, and tendency to maintain captured insects alive and in good condition.**

The *Gravid Trap* is used almost exclusively to collect female *Culex pipiens and Cu. restuans* that have already taken a blood meal and are seeking a site to deposit eggs. These portable battery-operated traps are particularly useful for surveillance of virus-infected mosquitoes because they tend to collect the older (and thus infected) portion of the vector populations, and maintain the captured mosquitoes alive and in good condition for laboratory assay. **Gravid traps, therefore, are valuable for WNv monitoring efforts.**

The *New Jersey Light Trap* is a large, robust device powered by 120V AC. Consequently, these are best deployed as permanent installations. **Because they are not as portable as CDC traps, they are less suitable for rapid deployment in temporary sites.**

The *Resting Box* is used almost exclusively to sample adult *Culiseta melanura, particularly those that have already blood fed*. Because few other kinds of mosquitoes or insects visit such boxes, this surveillance device tends to be a selective and sensitive indicator of EEEv transmission in the immediate area. Resting Boxes, however, demand more time and labor for monitoring than do CDC traps. Arrays of resting boxes are operated in focal areas by some MCPs. Because resting boxes generally tend to sample relatively few mosquitoes, the sample sizes may not be sufficiently robust for statistical analyses. **Accordingly, they will not routinely be relied upon for evaluating efficacy of aerial applications of pesticides.**

Each kind (species) of mosquito exhibits its own specific host seeking preferences. These preferences relate to, amongst other characteristics, the kind of hosts attacked, the habitats where they are most abundant, their vertical distribution (for questing, resting and ovipositing), the seasonality of their population dynamics, and their photoperiodicity (for questing and ovipositing). For instance, females of *Ochlerotatus trivittatus* tend to feed under tree canopies, whereas those of many tidal wetland *Ochlerotatus* species seek hosts in open fields. Vertical stratification of host-seeking behavior has been demonstrated, with several species (*Culiseta melanura*, *Culex restuans*) most frequently feeding high in the tree canopies. **To assure standardization of trap placement in emergency efficacy evaluations, traps shall be suspended at a height of about 4 feet off the ground.**

MOSQUITO IDENTIFICATION AND AGE ASSESSMENT

Correct identification of mosquito vectors is paramount to disease risk assessment and for justifying intervention efforts.

Published ‘keys’ to assist in identifying mosquitoes include:

1.Connecticut Key: (Andreadis, T.G., Thomas, M. C., Shepard, J. J., Identification Guide to the Mosquitoes of Connecticut 2005, New Haven, CT: The Connecticut Agricultural Experiment Station. 173p.)

2. Midwestern Key: (Siverly, R. E. (1972). Mosquitoes of Indiana. Indianapolis, Ind, Indiana State Board of Health)

3. New York Key: (Means, R. G. (1979). Mosquitoes of New York: Part I. The genus Aedes Meigen, with identification keys to genera of Culicidae. Albany, NY, The University of the State of New York, State Education Dept. State Science Service, New York State Museum and Means, R. G. (1987). Mosquitoes of New York: Part II, Genera of Culicidae other than Aedes occurring in New York. Albany, NY, University of the State of New York, State Education Dept.)

4. Northeastern Key: (Stojanovich, C. J. (1961). Illustrated Key to Common Mosquitoes of Northeastern North America, Stojanovich, Chester J., 750 East McGlincey Lane, Campbell, California 95008).

5. North American Key: (Darsie, R. F., Ward, Ronald A., Chang, Chien C. (1981). Identification and Geographical Distribution of the Mosquitoes of North America, North of Mexico. Fresno, Calif, Fresno, Calif.: American Mosquito Control Association**:** 313p and Darsie, R. F., Ward, Ronald A. (2005). Identification and Geographical Distribution of the Mosquitoes of North America, North of Mexico. Gainesville, FL, University Press of Florida.)

In Massachusetts, regional MCPs and MDPH employ entomologists to sort and identify sampled mosquitoes.

SURVEILLANCE CRITERIA

Trap Type

CDC light trap baited with CO_2. The CO_2 will be delivered either via a calibrated metered flow of 250-500cc/min from a secured pressurized cylinder, or as a non-metered flow from sublimating dry ice (2 lbs / trap/night)
UV Traps can be deployed as a non-CO_2 option, if these traps are arrayed in a manner in which meaningful comparisons can be made using the same kind of trap. Thus, collection data derived from UV traps operating in treated areas should be compared to data from UV traps operated in non-treated areas. The use of the UV trap to analyze efficacy for the purpose of this protocol is not recommended since the numbers of mammal biting mosquitoes may be under represented by lack of CO2 bait.

II. Trap Activation and Sample Collection

Traps:
Should ideally be installed at the surveillance site no later than one hour before astronomical sunset, or set to activate automatically at the assigned time if the location is a secure. **Note: Traps should be set so that collection period is no less than one full trapping night.**
Should be removed the following calendar day, ideally no earlier than 30 minutes after astronomical sunrise, or set to automatically stop collecting (and retain the sample).
Must be removed (or completely covered) during adulticide applications so that insecticide does not contaminate the trap and collecting vessel.

III. Trap Deployment

Traps:
Should be installed away from competing light sources and obstructions such as buildings.
should be located along the intersection of differing habitats to maximize local diversity
will be sited at geocoded locations, and be further identified by the name of the community, street address (if relevant) or other physical or ecological indicator.
used to compare treated and non-treated areas will be placed in similar habitats to the extent possible as coordinated by pre-planning efforts prior to an aerial adulticide intervention.

IV. Trap Density

Each treatment and comparison block will be monitored by not be less than two, and not more than four traps
Traps should be deployed so that, to the extent possible, their samples are representative of the density of adults of target species in geographically distinct areas. **Important Note:** The number of traps described in the above passage should be adequate to meet the objective of evaluating treatment efficacy and exceeds the density typically required by FEMA, (24 hour windows pre and post trap within the spray block or area).

V. Mosquito Identification

Female mosquitoes from traps will be identified to species.
Female mosquitoes will be counted, including damaged individuals, and reported on standard collection forms.
Trap contents will be subjected to aliquot reduction when sample size exceeds 400 mosquitoes / trap / night.
Collections should be stored chilled, and sorted on a chill table or on ice. Samples of female mosquitoes of target species should be assayed for virus as soon as possible, and other samples should be ideally deep-frozen (-20 degrees C or –4 degrees F) for subsequent dissection to assess parity rates for the purpose of obtaining additional data on the physiological age of collected mosquitoes. ***Note:*** *Mosquitoes should be knocked down with CO2 into tight tubes, frozen quickly, held in a freezer for months to be processed at a later time or in the case of analysis for mosquitoes collected pre and post intervention, thawed minutes before dissection for aging.*

CONCLUSION

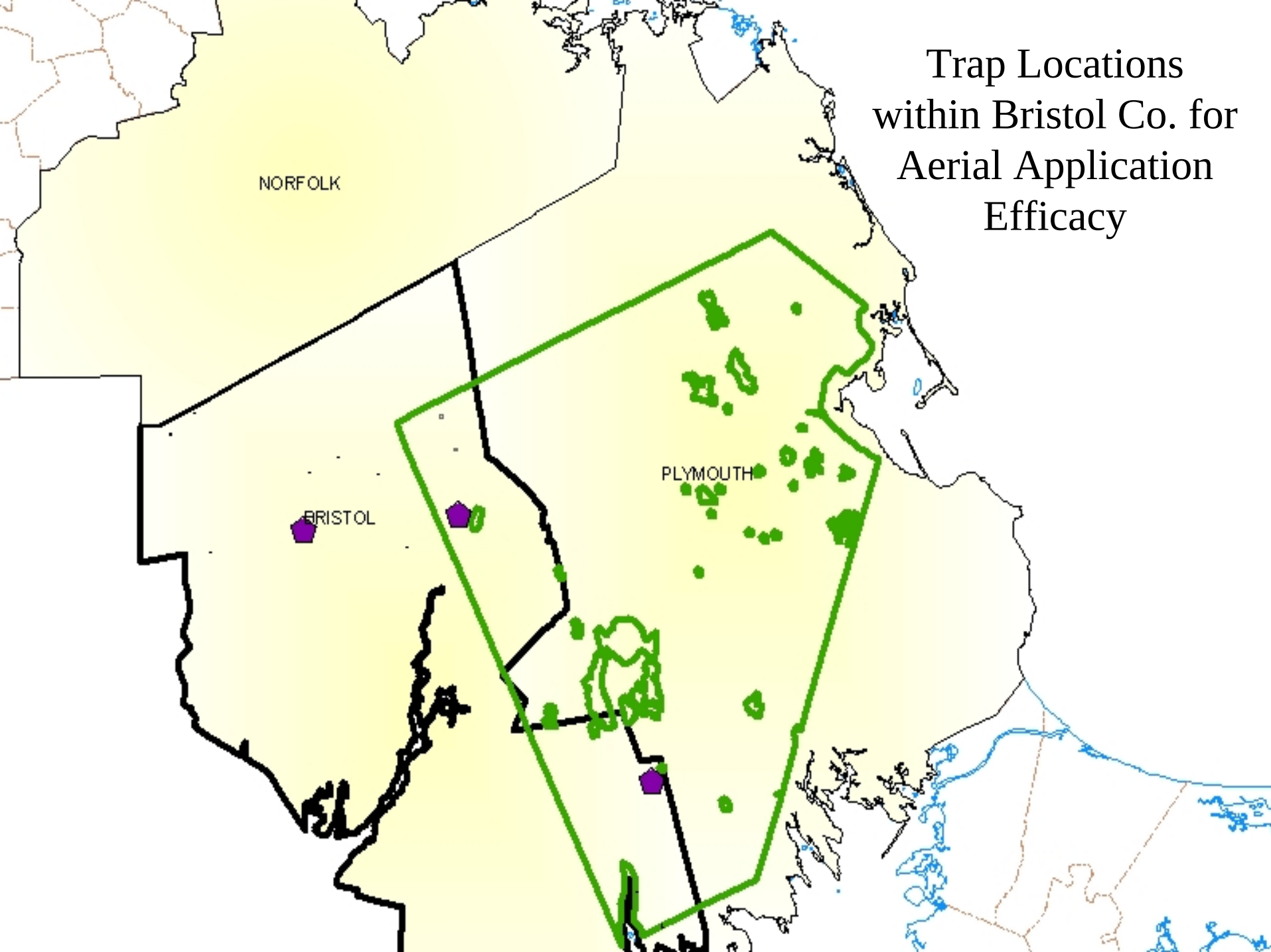
For the purpose of moving toward uniformity in establishing meaningful measures to determine efficacy of interventions such as aerial adulticide applications, the best protocol will contain challenges and limitations when measuring impacts to biological organisms such as mosquitoes. During any given aerial adulticiding application, adult mosquitoes can be resting, digesting blood meals, or seeking hosts at varied times and may escape control. As outlined, various trap types can bias toward specific mosquito behavior such as the resting box which sample *Culiseta melanura* mosquitoes that have already blood fed. Similarly, gravid traps sample or collect mosquitoes that are ready to oviposit (lay eggs). These conditions may allow these mosquitoes to escape the impact of any single aerial adulticide application (only reducing those mosquitoes on the wing). Those mosquitoes escaping treatment will continue to be collected by sampling devices and effect meaningful comparisons. As a result, trap placement is critical to this protocols objective. Therefore, the emphasis of this protocol aims to achieve the proper placement of the least bias sampling device such as the CDC light trap baited with CO2 well within the spray zone at least 24 hours prior to the intervention and 24 hours after the intervention to assess impact on the target population.

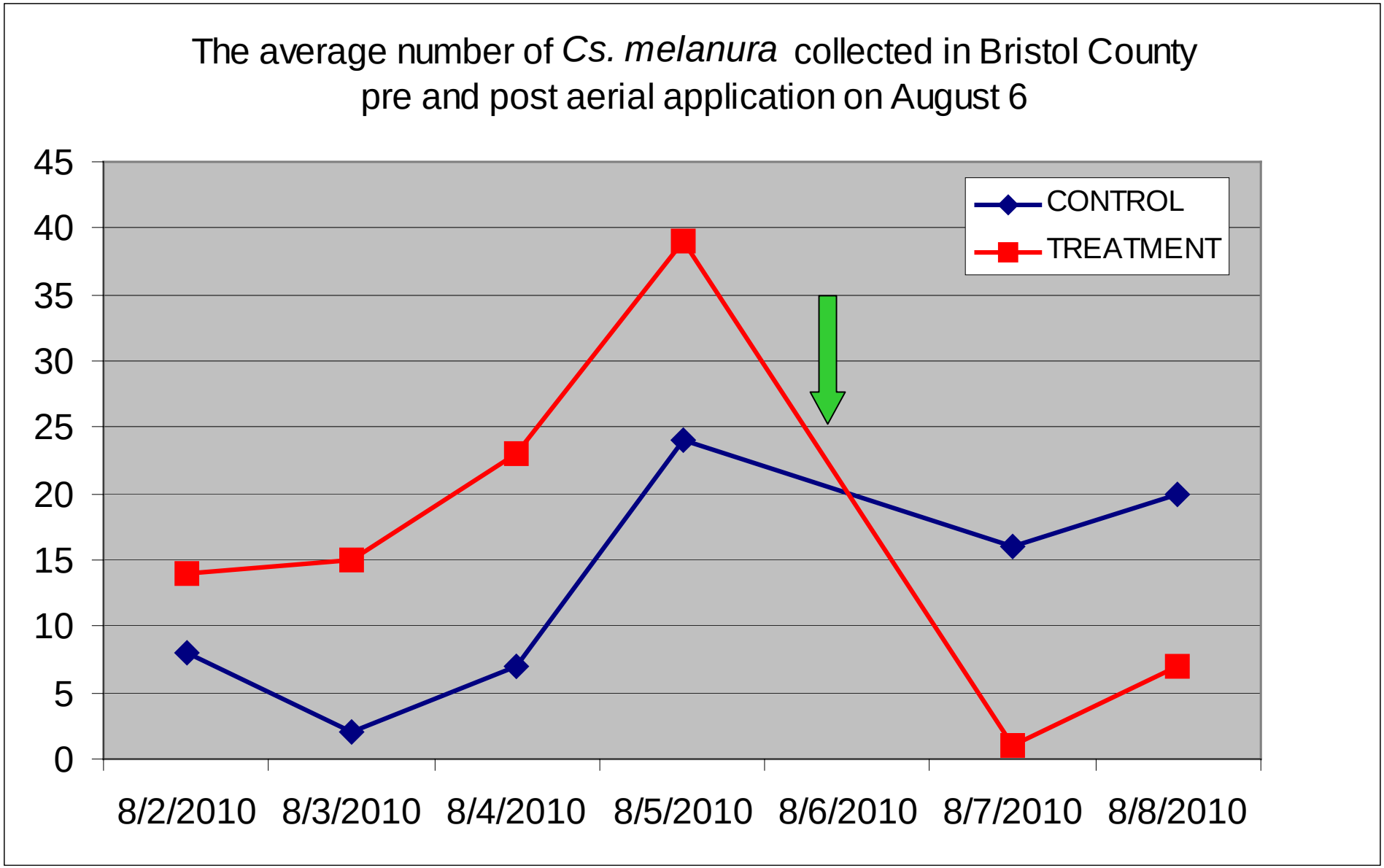
Bristol Co. Efficacy Results 2010

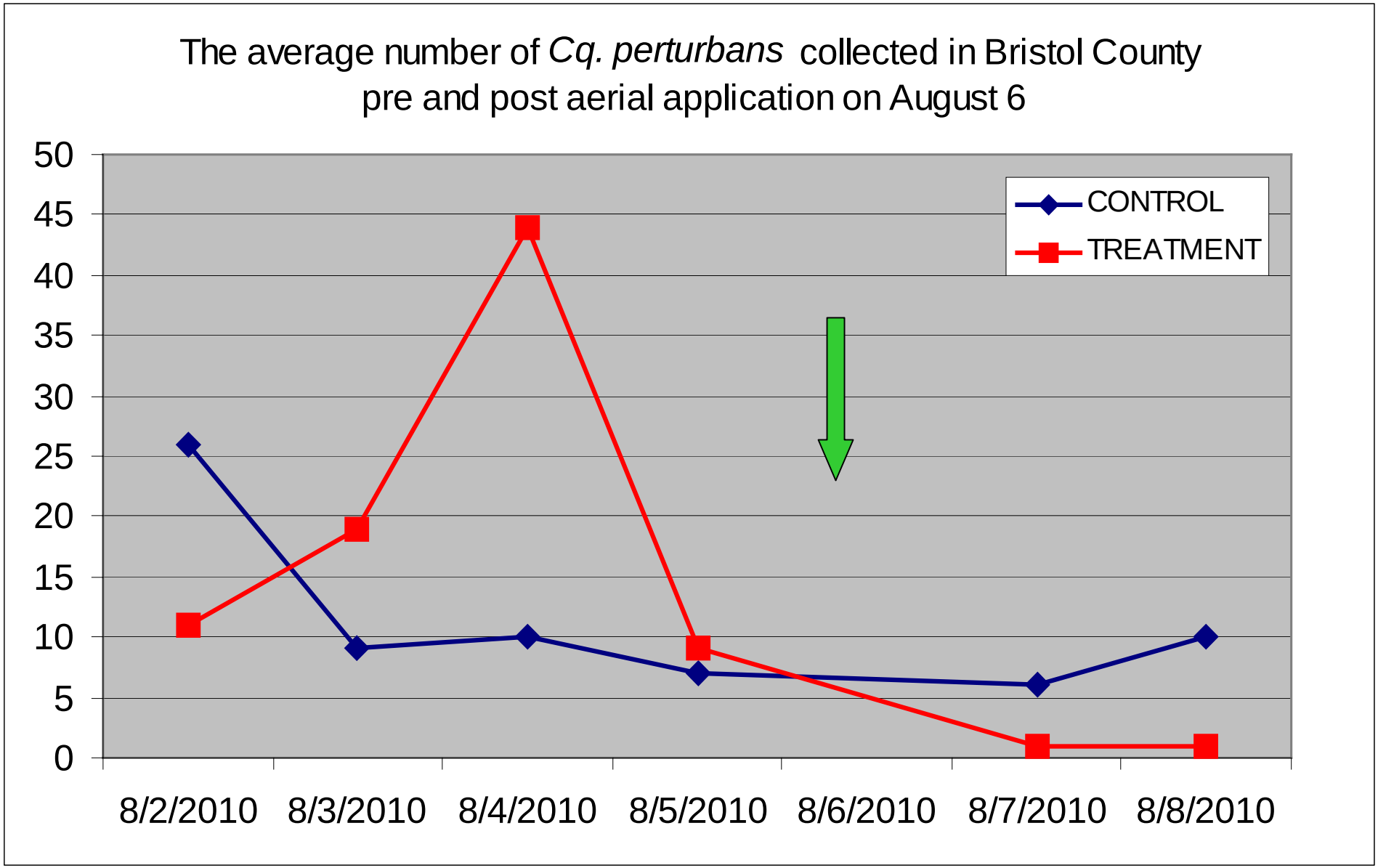
- Raynham- Attleboro
  (1 control : 1 treatment)
  – August 6-7
  Cs. melanura- 96%
  Cq. perturbans- 87%
  Ae. vexans- 100%
  Oc. canadensis- 100%
  OVERALL- 88%

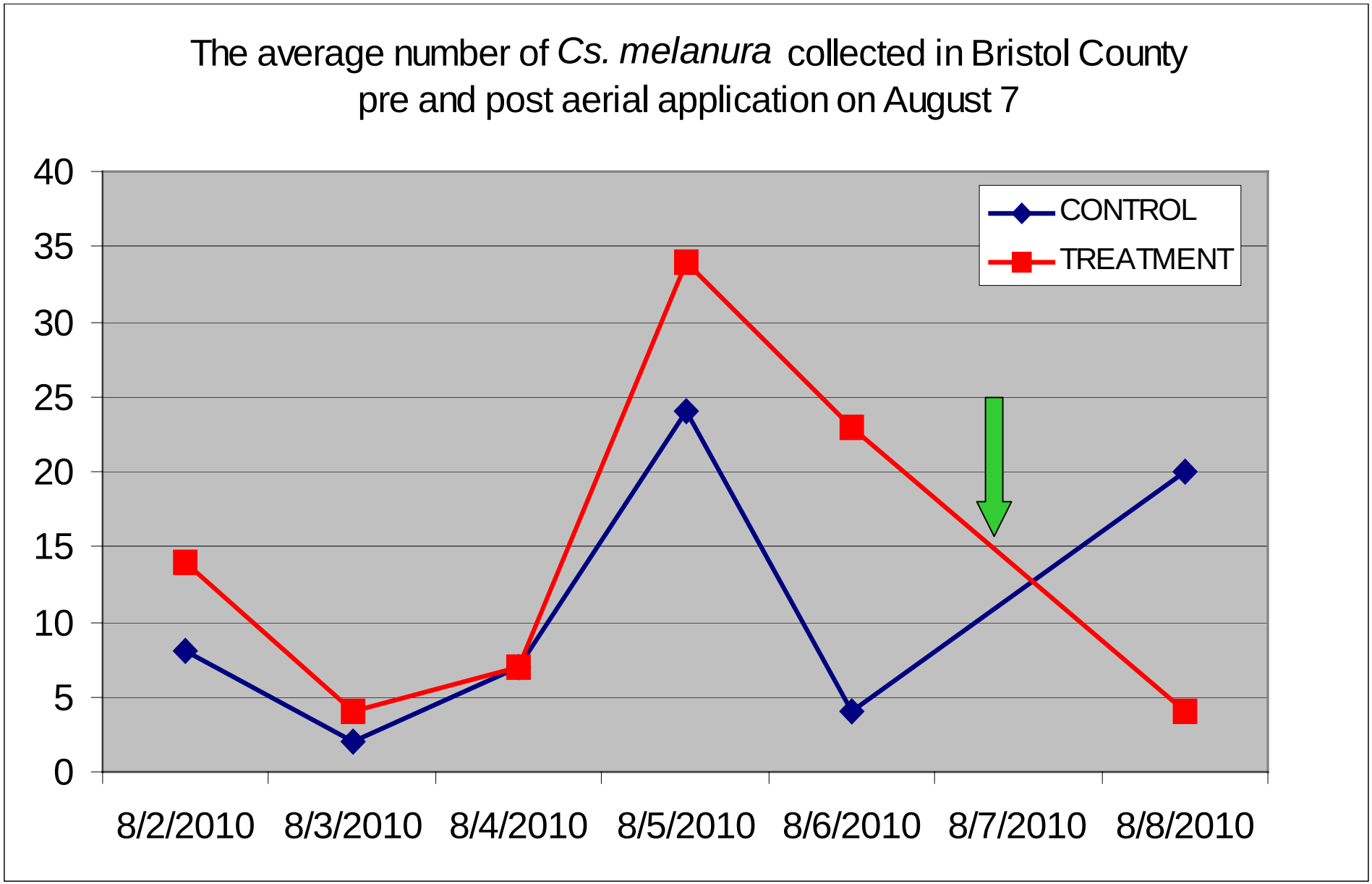
- Acushnet- Attleboro
  (1 control : 1 treatment)
  – August 7
  Cs. melanura- 97%
  Cq. perturbans- 80%
  Ae. vexans- 61%
  Oc. canadensis- 58%
  OVERALL- 91%

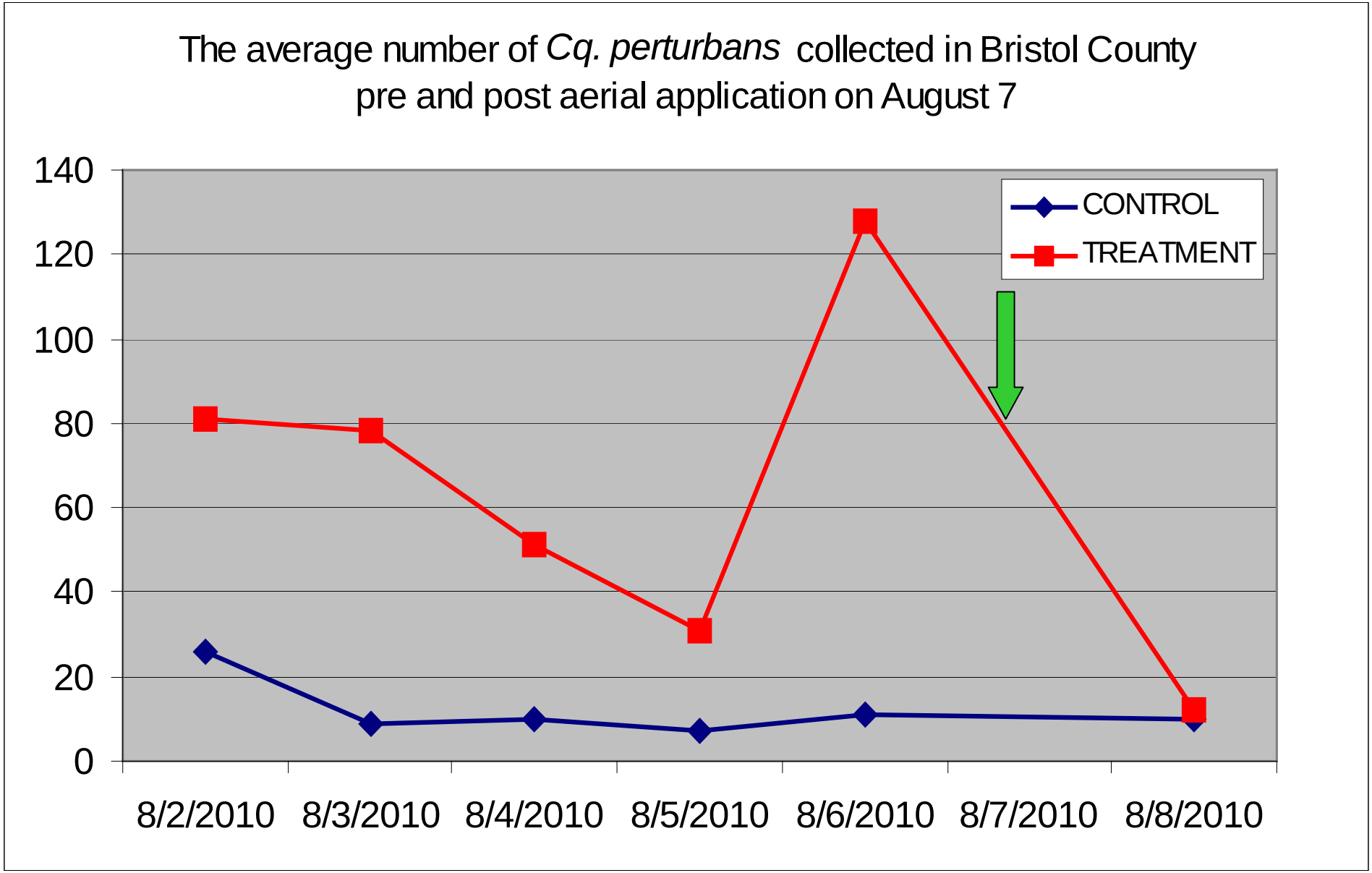
Trap Locations within Bristol Co. for Aerial Application Efficacy




The average number of *Cs. melanura* collected in Bristol County pre and post aerial application on August 6
45
40
35
30
25
20
15
10
5
0
CONTROL
TREATMENT
8/2/2010
8/3/2010
8/4/2010
8/5/2010
8/6/2010
8/7/2010
8/8/2010


The average number of *Cq. perturbans* collected in Bristol County pre and post aerial application on August 6
50
45
40
35
30
25
20
15
10
5
0
CONTROL
TREATMENT
8/2/2010
8/3/2010
8/4/2010
8/5/2010
8/6/2010
8/7/2010
8/8/2010


The average number of *Cs. melanura* collected in Bristol County pre and post aerial application on August 7
40
35
30
25
20
15
10
5
0
CONTROL
TREATMENT
8/2/2010
8/3/2010
8/4/2010
8/5/2010
8/6/2010
8/7/2010
8/8/2010


The average number of *Cq. perturbans* collected in Bristol County pre and post aerial application on August 7
140
120
100
80
60
40
20
0
8/2/2010
8/3/2010
8/4/2010
8/5/2010
8/6/2010
8/7/2010
8/8/2010
CONTROL
TREATMENT

Bristol County Mosquito Control Project (Bristol CMCP)
Week Ending July 3, 2010
<u>Epi-Week 26</u>

Current mosquito activity/trend, is it increasing, declining, holding steady?

Due to the warm and humid night temperatures, mosquito collections are average for some species. The weather trend points to an active year for mosquitoes. *Culex* populations are average at this point.

The earliest EEE isolate in the past 10 years was from MA DPH's trap in Raynham on July 4, 2007. BCMCP had the 1st EEE positive of the 2009 season from the resting boxes located in Freetown. One pool of 50 *Cs. melanura* was positive out of the 288 submitted on July 16, 2009.

The earliest WNV isolate was from a gravid trap set in Dighton on June 24, 2002.

Current predominant species that are developing or on the wing:

Ochlerotatus canadensis and *Cq. perturbans* are in abundance throughout the County, with increased collections in our CO_2-baited CDC light trap within our towns. In addition we collected *Cx. pipiens* and *Cx. restuans* from urban sites.

Comparison to previous season is it the same, better, or worse:

Compared to last season there is more activity because last year had unseasonable cold and rainy temperatures. The 2010 season is showing an increase in temperatures, and we predict an increase in mosquito populations and cycling of WNV and EEE.

The annual *Cs. melanura* hunt coordinated through the MA DPH on June 2nd-June 3rd, yielded more mosquitoes this year than last. From the New Bedford Bolton Cedar swamp 45 *Cs. melanura* were collected in 2010 compared to 0 in 2009. In Attleboro 8 were collected compared to 0 last year and in Norton 15 were collected compared to 2 in 2009. Though the numbers are not as high as the 2007 collections of 700, the 2010 numbers are above 2009's collections. Lower numbers of *Oc. abserratus* and *Oc. fitchi* / *excrucians* were collected at all sites.

Currently *Cx. pipiens* are exceeding *Cx. restuans* in our gravid traps from most of the trapping locations. We are conducting surveillance to look for WNV in *Culex* mosquitoes in those areas that had late season WNV isolations.

Resting boxes at the Freetown/ New Bedford site have collected large amounts of *Cs. melanura* especially at the end of May- early June, with over 200 females. This trend seems to be declining in Epi-Week 26. However *Cs. melanura* can be found throughout the County in many of our NJ light traps and CO_2-baited and un-baited CDC light traps.

Weather impacts e.g. precipitation/heat. Is it accelerating or slowing things down?

Bristol County received 0.17 inches of rain in New Bedford and 0.24 inches in Taunton. The average highs are 90ºF and lows of 70ºF. This is above average for this time of the year.

Number of requests for service, is up, down etc:

Year to date Bristol has received 8,684 calls for service as of 7/2/10, compared to 5,818 in 2009 and 6,163 in 2008. With the addition of email, we have taken more requests in a shorter period of time then in the past.

How is the MCP responding or what kind of intervention is taking place, Is it working?

In general our response will be ground ULV applications in areas of high public demand and mosquito populations. Requests to check stagnant water on private property will continue into the season. We will begin to larvicide catch basins throughout Bristol County in Epi Week 27. Public outreach is a very important component of our Project. We are participating in a variety of City and Town public events, including radio and newspaper interviews.

Bristol County Mosquito Control Project (Bristol CMCP)
Week Ending July 10, 2010
<u>Epi-Week 27</u>

Current mosquito activity/trend, is it increasing, declining, holding steady?

Due to the warm and humid night temperatures, mosquito collections are average for some species. The weather trend points to an active year for mosquitoes.

Appendix 1 from the MA DPH Surveillance and Response Plan: Mosquitoes Associated with Arboviral Activity in Massachusetts

Aedes vexans – low populations
Coquillettidia perturbans - low populations
Culex pipiens – increasing
Culex restuans – increasing
Culex salinarius – very few, rare
Culiseta melanura – declining, especially in resting boxes
Ochlerotatus canadensis – low populations
Ochlerotatus japonicus – holding steady at low numbers

Current predominant species that are developing or on the wing:

Ochlerotatus canadensis and *Cq. perturbans* are in low abundance throughout the County, with collections in our CO_2-baited CDC light trap within our towns. In addition we collected *Cx. pipiens* and *Cx. restuans* from urban sites in high numbers.

Comparison to previous season is it the same, better, or worse:

Compared to last season there is more activity because last year had unseasonable cold and rainy temperatures. The 2010 season is showing an increase in temperatures, and we predict an increase in mosquito populations and cycling of WNV and EEE.

Currently *Cx. pipiens* are exceeding *Cx. restuans* in our gravid traps from most of the trapping locations. Pools were submitted for testing from our urban sites with each averaging 50 per trap.

Resting boxes at the Freetown/ New Bedford site had collected large amounts of *Cs. melanura* especially at the end of May- early June, with over 200 females. This trend seemed to be declining in Epi-Week 26, and continued with no collections from Epi-Week 27. However low numbers of *Cs. melanura* can be found throughout the County in many of our NJ light traps and CO_2-baited and un-baited CDC light traps.

CO_2-baited CDC light trap collected a variety of species at low levels including; *Oc. canadensis, Cq. perturbans, Ae. cinereus, Ae. vexans, Oc. japonicus, Oc. excruicans, Cx. erraticus and An. punctipennis.*

Weather impacts e.g. precipitation/heat. Is it accelerating or slowing things down?

Bristol County received 0.12 inches of rain in New Bedford and 0.05 inches in Taunton. Localized rain events over the weekend were sporadic in Bristol County.

Number of requests for service, is up, down etc:

Year to date Bristol has received 9,603 calls for service as of 7/9/10, compared to 6,728 in 2009. With the addition of email, we have taken more requests in a shorter period of time then in the past.

How is the MCP responding or what kind of intervention is taking place, Is it working?

In general our response will be ground ULV applications in areas of high public demand and mosquito populations. Requests to check stagnant water on private property will continue into the season. We began larviciding catch basins throughout Bristol County. Public outreach is a very important component of our Project. We are participating in a variety of City and Town public events, including radio and newspaper interviews.

Bristol County Mosquito Control Project (Bristol CMCP)
Week Ending July 17, 2010
<u>Epi-Week 28</u>

Current mosquito activity/trend, is it increasing, declining, holding steady?
Appendix 1 from the MA DPH Surveillance and Response Plan: Mosquitoes Associated with Arboviral Activity in Massachusetts

Aedes vexans – low populations
Coquillettidia perturbans - low populations, increasing in the northern towns
Culex pipiens – increasing
Culex restuans – increasing
Culex salinarius – very few, rare
Culiseta melanura – increasing, especially in resting boxes with many blood fed specimens
Ochlerotatus canadensis – decreasing, lower populations
Ochlerotatus japonicus – holding steady at low numbers

Current predominant species that are developing or on the wing:

Ochlerotatus canadensis and *Cq. perturbans* are in low abundance throughout the County, with collections in our CO_2-baited CDC light trap within our towns. In addition we collected *Cx. pipiens* and *Cx. restuans* from urban sites in high numbers.

Comparison to previous season is it the same, better, or worse:

Compared to last season there is more activity because last year had unseasonable cold and rainy temperatures. The 2010 season is showing an increase in temperatures, and we predict an increase in mosquito populations and cycling of WNV and EEE.

BCMCP's primary focus in Epi-week 28 was on EEE. Selected gravid traps were set with average numbers of approximately 50 per trap.

Resting boxes at the Freetown/ New Bedford site showed a significant increase towards the end of the week. Collections at the beginning of the week yielded only 9 specimens but a collection on Thursday resulted in 44 *Cs. melanura.* On Friday we collected 95 specimens of which 46 were blood fed and on Saturday, 27 were collected with only 3 blood fed. This is a significant difference from Epi-Week 27 when none were collected. Low numbers of *Cs. melanura* can be found throughout the County in many of our NJ light traps and CO_2-baited and un-baited CDC light traps.

The resting box site in Raynham has been low this season to date. We are moving the boxes around to see if we can maximize our efforts in the area.

CO_2-baited CDC light trap collected a variety of species at low levels including; *Cq. perturbans, Ae. vexans, Oc. japonicus, Oc. excruicans, and An. punctipennis.*

Weather impacts e.g. precipitation/heat. Is it accelerating or slowing things down?

Bristol County received 1.21 inches of rain in New Bedford and 2.01 inches in Taunton.

Number of requests for service, is up, down etc:

Year to date Bristol has received 10,376 calls for service as of 7/16/10, compared to 7,845 in 2009. With the addition of email, we have taken more requests in a shorter period of time then in the past. We are now averaging approximately 1,000 requests a week, which is consistent with last year's average.

How is the MCP responding or what kind of intervention is taking place, Is it working?

In general our response will be ground ULV applications in areas of high public demand and mosquito populations. Requests to check stagnant water on private property will continue into the season. We began larviciding catch basins throughout Bristol County. Public outreach is a very important component of our Project. We are participating in a variety of City and Town public events, including radio and newspaper interviews.

Bristol County Mosquito Control Project (Bristol CMCP)
Week Ending July 24, 2010
<u>Epi-Week 29</u>

Current mosquito activity/trend, is it increasing, declining, holding steady?
Appendix 1 from the MA DPH Surveillance and Response Plan: Mosquitoes Associated with Arboviral Activity in Massachusetts

Aedes vexans – low populations with a possible increase from localized rainfall
Coquillettidia perturbans – populations are increasing with a mix of old and new
Culex pipiens – increasing
Culex restuans – increasing
Culex salinarius – very few, rare
Culiseta melanura – decreasing, especially in resting boxes
Ochlerotatus canadensis – low populations
Ochlerotatus japonicus – holding steady at low numbers

Current predominant species that are developing or on the wing:

Ochlerotatus canadensis is in low abundance throughout the County, with collections in our CO_2-baited CDC light trap within our towns. *Cq. perturbans* have increased in our traps with a mixture of old and new specimens. There are more than ample populations to serve as bridge vectors. In addition we collected *Cx. pipiens* and *Cx. restuans* from urban sites in high numbers.

Comparison to previous season is it the same, better, or worse:

Resting boxes at the Freetown/ New Bedford site showed a significant decrease in populations. Compared to the over 100 submitted from Epi-Week 28 this weeks submissions were more in line with Epi-Week 27. Low numbers of *Cs. melanura* can be found throughout the County in many of our NJ light traps and CO_2-baited and un-baited CDC light traps.

The resting box site in Raynham has been low this season to date. None have been submitted this season for testing.

CO_2-baited CDC light trap collected a variety of species at low levels including; *Cq. perturbans, Ae. vexans, Oc. japonicus, Oc. excruicans, and An. punctipennis.*

Two gravid traps at our two New Bedford sites collected 79 and 151 *Cx. pipiens* and *Cx. restuans* mixed samples up from Epi-Week 27. Our Dartmouth site collected 161 from two traps, which was significantly more then it caught historically. Seekonk, Swansea and Fall River had decreased populations in the gravid traps.

Weather impacts e.g. precipitation/heat. Is it accelerating or slowing things down?

Bristol County received 1.97 inches of rain in New Bedford and 1.80 inches in Taunton.

Number of requests for service, is up, down etc:

Year to date Bristol has received 11,100 calls for service as of 7/23/10, compared to 8,848 in 2009. They are done from last week but up for the year.

How is the MCP responding or what kind of intervention is taking place, Is it working?

In general our response will be ground ULV applications in areas of high public demand and mosquito populations. Requests to check stagnant water on private property will continue into the season. We began larviciding catch basins throughout Bristol County. Public outreach is a very important component of our Project. We are participating in a variety of City and Town public events, including radio and newspaper interviews.

Bristol County Mosquito Control Project (Bristol CMCP)
Week Ending July 31, 2010
<u>Epi-Week 30</u>

Current mosquito activity/trend, is it increasing, declining, holding steady?
Appendix 1 from the MA DPH Surveillance and Response Plan: Mosquitoes Associated with Arboviral Activity in Massachusetts

Aedes vexans – low populations with a slight increase
Coquillettidia perturbans – populations are increasing with a mix of old and new
Culex pipiens – increasing
Culex restuans – increasing
Culex salinarius – very few, rare
Culiseta melanura – low levels throughout the County
Ochlerotatus canadensis – low populations but increasing
Ochlerotatus japonicus – holding steady at low numbers

Current predominant species that are developing or on the wing:

Ochlerotatus canadensis is in low abundance but increasing throughout the County, with collections in our CO_2-baited CDC light traps. *Cq. perturbans* have increased in our traps with a mixture of old and new specimens. There are more than ample populations to serve as bridge vectors. In addition we collected *Cx. pipiens* and *Cx. restuans* from urban sites in high numbers.

Comparison to previous season is it the same, better, or worse:

Resting boxes at the Freetown/ New Bedford site showed a slight increase in populations. We collected 9 *Cs. melanura* over the whole week of collection. Low numbers of *Cs. melanura* can be found throughout the County in many of our NJ light traps and CO_2-baited and un-baited CDC light traps.

The resting box site in Raynham has been low this season to date. None have been submitted this season for testing.

CO_2-baited CDC light trap collected a variety of species at low levels including; *Cq. perturbans, Ae. vexans, Oc. triseriatus, Oc. canadensis, Oc. japonicus, Oc. excruicans, and An. punctipennis.*

Seekonk and Swansea had a slight increase of *Cx. pipiens* and *Cx. restuans* populations in the gravid traps. A new site in Swansea, closer to the coast collected 150 which is a very good collection, however they all tested negative for EEE and WNV.

Weather impacts e.g. precipitation/heat. Is it accelerating or slowing things down?

Bristol County received 0.08 inches of rain in New Bedford and 0.05 inches in Taunton.

Number of requests for service, is up, down etc:

Year to date Bristol has received 12,335 calls for service as of 7/30/10, compared to 9,858 in 2009.

How is the MCP responding or what kind of intervention is taking place, Is it working?

Public outreach is a very important component of our Project. We are participating in a variety of City and Town public events, including radio and newspaper interviews. With the pending aerial application, we are spending extra time talking with Boards of Health and residents interested or concerned about the application.

In general our response will be ground ULV applications in areas of high public demand and mosquito populations. Requests to check stagnant water on private property will continue into the season. We will continue to larvicide catch basins throughout Bristol County.

Bristol County Mosquito Control Project (Bristol CMCP)
Week Ending August 7, 2010
<u>Epi-Week 31</u>

Current mosquito activity/trend, is it increasing, declining, holding steady?

EEE isolations collected from Freetown on August 1st included *Cq. perturbans* and *Cs. melanura* pools. On August 2nd an EEE isolation from Raynham (Pine swamp within spray block) from *Cs. melanura*.

On August 6th and 7th, an aerial application took place over parts of Bristol County including Easton, Norton, Raynham, Taunton, Berkley, Freetown, Dartmouth, Acushnet, New Bedford and Fairhaven. BCMCP is currently working on the efficacy data and will provide it in a separate report.

Appendix 1 from the MA DPH Surveillance and Response Plan: Mosquitoes Associated with Arboviral Activity in Massachusetts

Aedes vexans – low populations, treading up
Coquillettidia perturbans – populations are declining slightly with a mix of old and new
Culex pipiens – increasing
Culex restuans – decreasing
Culex salinarius – increasing in CO_2-baited CDC light traps
Culiseta melanura – low levels throughout the County
Ochlerotatus canadensis – low populations but increasing
Ochlerotatus japonicus – holding steady at low numbers

Current predominant species that are developing or on the wing:

Cx. salinarius is in low abundance but increasing throughout the County, with collections in our CO_2-baited CDC light traps. *Oc. canadensis* and *Ae. vexans* are holding steady in our traps with a mixture of old and new specimens. In addition we collected *Cx. pipiens* and *Cx. restuans* from urban sites in high numbers.

Comparison to previous season is it the same, better, or worse:

We collected 12 *Cs. melanura* over a two-night collection from resting boxes at the Freetown/ New Bedford site. The population continues to remain low going into the normal EEE peak activity period. Low numbers of *Cs. melanura* can be found throughout the County in many of our NJ light traps and CO_2-baited and un-baited CDC light traps.

CO_2-baited CDC light trap collected a variety of species at low levels including; *Cq. perturbans, Ae. vexans, Cx. salinarius, Oc. triseriatus, Oc. canadensis, Oc. japonicus, Oc. excruicans, Ae. cinereus* and *An. punctipennis.*

Our main focus of trapping was for the EEE aerial application. However gravid traps set in our urban sites collected an average of 50 *Cx. pipiens* and *Cx. restuans*. A high collection of 119 was collected from the New Bedford Cemetery, which has a history of WNV activity but was outside the spray block.

Weather impacts e.g. precipitation/heat. Is it accelerating or slowing things down?

Bristol County received 0.00 inches of rain in New Bedford and 0.3 inches in Taunton.

Number of requests for service, is up, down etc:

Year to date Bristol has received 13,391 calls for service as of 8/7/10, compared to 10,753 in 2009.

How is the MCP responding or what kind of intervention is taking place, Is it working?

Public outreach is a very important component of our Project. We are participating in a variety of City and Town public events, including radio and newspaper interviews. With the aerial application, we are spending extra time talking with Boards of Health and residents interested or concerned about the application.

In general our response will be ground ULV applications in areas of high public demand, virus isolations and mosquito populations. Requests to check stagnant water on private property will continue into the season. We will continue to larvicide catch basins throughout Bristol County.

Bristol County Mosquito Control Project (Bristol CMCP)
Week Ending August 14, 2010
<u>Epi-Week 32</u>

Current mosquito activity/trend, is it increasing, declining, holding steady?

Locations included in the aerial application block have shown a significant reduction (~90%) in the number of mosquitoes collected in the treatment traps.

Appendix 1 from the MA DPH Surveillance and Response Plan: Mosquitoes Associated with Arboviral Activity in Massachusetts

Aedes vexans – low populations, treading up
Coquillettidia perturbans – populations are declining slightly with a mix of old and new
Culex pipiens – increasing
Culex restuans – decreasing
Culex salinarius – increasing in CO_2-baited CDC light traps
Culiseta melanura – low levels throughout the County, increasing slightly in resting boxes
Ochlerotatus canadensis – low populations but increasing
Ochlerotatus japonicus – holding steady at low numbers

Current predominant species that are developing or on the wing:

Cx. salinarius is in low abundance but increasing throughout the County, with collections in our CO_2-baited CDC light traps. *Oc. canadensis* and *Ae. vexans* are holding steady in our traps with a mixture of old and new specimens. In addition we collected *Cx. pipiens* and *Cx. restuans* from urban sites in high numbers.

Comparison to previous season is it the same, better, or worse:

We collected very few *Cs. melanura* over the week from resting boxes at the Freetown/ New Bedford site. The population continues to remain low going into the normal EEE peak activity period. Compared to resting box collections in 2009 during Epi-week 32, over 300 *Cs. melanura* were collected on a *daily* basis. Low numbers of *Cs. melanura* can be found throughout the County in many of our NJ light traps and CO_2-baited and un-baited CDC light traps.

CO_2-baited CDC light trap collected a variety of species at low levels including; *Cq. perturbans, Ae. vexans, Cx. salinarius, Oc. triseriatus, Oc. canadensis, Oc. japonicus, Oc. excruicans, Ae. cinereus* and *An. punctipennis.*

Gravid traps set in our urban sites collected an average of 50 *Cx. pipiens* and *Cx. restuans*. A high collection of 119 was collected from the New Bedford Cemetery in Epi-week 31, which tested positive for WNV. After localized ground based ULV applications the population has been reduced in the area. A new location in Swansea and Mansfield collected 221 and 226 respectively in two traps, which is high for the areas.

Weather impacts e.g. precipitation/heat. Is it accelerating or slowing things down?

Bristol County received 0.03 inches of rain in New Bedford and 0.29 inches in Taunton.

Number of requests for service, is up, down etc:

Year to date Bristol has received 14,061 calls for service as of 8/13/10, compared to 11,961 in 2009.

How is the MCP responding or what kind of intervention is taking place, Is it working?

In general our response will be ground ULV applications in areas of high public demand, virus isolations and mosquito populations. Requests to check stagnant water on private property will continue into the season. We will continue to larvicide catch basins throughout Bristol County.

Public outreach is a very important component of our Project. We are participating in a variety of City and Town public events, including radio and newspaper interviews. Following the aerial application, we are spending extra time talking with Boards of Health and residents interested or concerned about the application.

Bristol County Mosquito Control Project (Bristol CMCP)
Week Ending August 21, 2010
<u>Epi-Week 33</u>

Current mosquito activity/trend, is it increasing, declining, holding steady?

Appendix 1 from the MA DPH Surveillance and Response Plan: Mosquitoes Associated with Arboviral Activity in Massachusetts

Aedes vexans – low populations, treading up
Coquillettidia perturbans – populations are declining
Culex pipiens – increasing
Culex restuans – decreasing
Culex salinarius – increasing in CO_2-baited CDC light traps
Culiseta melanura – low levels throughout the County, increasing slightly in resting boxes
Ochlerotatus canadensis – low populations but increasing
Ochlerotatus japonicus – holding steady at low numbers, increased in one urban site

Current predominant species that are developing or on the wing:

Cx. salinarius is in low abundance and holding steady throughout the County, with collections in our CO_2-baited CDC light traps. *Oc. canadensis* and *Ae. vexans* are holding steady in our traps with a mixture of old and new specimens. In addition we collected *Cx. pipiens* and *Cx. restuans* from urban sites in high numbers with an increase in *Oc. japonicus*.

Comparison to previous season is it the same, better, or worse:

We collected very few *Cs. melanura* over Epi-week 32 from resting boxes but saw an increase in Epi-week 33 at the Freetown/ New Bedford site. Over a two-day collection period we collected 89 with a mix of blood fed and non-blood fed. The population continues to remain low going into the normal EEE peak activity period. Compared to resting box collections in 2009 during Epi-week 32 and 33, over 250 *Cs. melanura* were collected on a *daily* basis. Low numbers of *Cs. melanura* can be found throughout the County in many of our NJ light traps and CO_2-baited and un-baited CDC light traps.

CO_2-baited CDC light trap collected a variety of species at low levels including; *Ae. vexans, Cx. salinarius, Oc. triseriatus, Oc. canadensis, Oc. japonicus,* and *An. punctipennis.* We collected no *Cq. perturbans* this week in our traps but overall the trap counts were very low.

Gravid traps set in our urban sites collected an average of 50 *Cx. pipiens* and *Cx. restuans*. A high collection of 119 was collected from the New Bedford Cemetery in Epi-week 31, which tested positive for WNV. After localized ground based ULV applications the population has been reduced in the area. Numbers remain low in Epi-week 33 with 13 *Cx. pipiens* and *Cx. restuans* submitted for testing. A new location in Swansea collected 78, which is reduction from last week's collection of 219.

Weather impacts e.g. precipitation/heat. Is it accelerating or slowing things down?

Bristol County received 0.61 inches of rain in New Bedford and 0.04 inches in Taunton.

Number of requests for service, is up, down etc:

Year to date Bristol has received 14,706 calls for service as of 8/20/10, compared to 13,132 in 2009.

How is the MCP responding or what kind of intervention is taking place, Is it working?

In general our response will be ground ULV applications in areas of high public demand, virus isolations and mosquito populations. Requests to check stagnant water on private property will continue into the season. We will continue to larvicide catch basins throughout Bristol County.

Public outreach is a very important component of our Project. We are participating in a variety of City and Town public events, including radio and newspaper interviews. We are corresponding with local Board of Health and Park and Recreation officials to coordinate control or public outreach for town and city activities.

Bristol County Mosquito Control Project (Bristol CMCP)
Week Ending August 28, 2010
<u>Epi-Week 34</u>

Current mosquito activity/trend, is it increasing, declining, holding steady?

Due to the weather pattern at the beginning of Epi-week 34, we focused our trapping towards the end of the week. This resulted in very low collections throughout the County.

Appendix 1 from the MA DPH Surveillance and Response Plan: Mosquitoes Associated with Arboviral Activity in Massachusetts

Aedes vexans – low populations, treading up
Coquillettidia perturbans – populations are declining, some areas have few
Culex pipiens – steady
Culex restuans – decreasing
Culex salinarius – few, rare
Culiseta melanura – low levels throughout the County, increasing in resting boxes
Ochlerotatus canadensis – low populations
Ochlerotatus japonicus – holding steady at low numbers, increased in one urban site

Current predominant species that are developing or on the wing:

Cs. melanura collections have increase significantly during the past 2 weeks. In addition we collected *Cx. pipiens* and *Cx. restuans* from urban sites in low numbers with an increase in *Oc. japonicus*.

Comparison to previous season is it the same, better, or worse:

We collected very few *Cs. melanura* over Epi-week 32 from resting boxes but saw an increase in Epi-week 33 at the Freetown/ New Bedford site. Over a two-day collection period we collected 89 with a mix of blood fed and non-blood fed in Epi-week 33. Epi-week 34 showed a continued increase with 153 and 51 collected on 8/26 and 8/27 respectively. Low numbers of *Cs. melanura* can be found throughout the County in many of our NJ light traps and CO_2-baited and un-baited CDC light traps.

CO_2-baited CDC light trap collected a variety of species at low levels including; *Ae. vexans, Oc. triseriatus, Oc. japonicus,* and *An. punctipennis. Cq. perturbans* were collected this week in our traps but overall the trap counts were very low.

Gravid traps set in our urban sites collected below average amounts of *Cx. pipiens* and *Cx. restuans*. Most traps collected less than 10 individuals per trap in our urban areas. Traps did not meet the minimum requirement for testing by DPH and therefore only a few pools were submitted this Epi-week.

Weather impacts e.g. precipitation/heat. Is it accelerating or slowing things down?

Bristol County received 1.96 inches of rain in New Bedford and 3.2 inches in Taunton.

Number of requests for service, is up, down etc:

Year to date Bristol has received 15,366 calls for service as of 8/27/10, compared to 13,944 in 2009.

How is the MCP responding or what kind of intervention is taking place, Is it working?

Public outreach is a very important component of our Project. We are participating in a variety of City and Town public events, including radio and newspaper interviews. We are corresponding with local Board of Health and Park and Recreation officials to coordinate control or public outreach for town and city activities.

At the request of the Mayor and Director of the Board of Health of Fall River, we were in attendance at the Holy Ghost Festival where over 200,000 people were expected to attend the 4-day event. Prior to the event, a large ground-based ULV application took place around the site. We were present to hand out information, fact sheets and answer questions the public had regarding the pesticide and mosquitoes.

In general our response will be ground ULV applications in areas of high public demand, virus isolations and mosquito populations. Requests to check stagnant water on private property will continue into the season. We will continue to larvicide catch basins throughout Bristol County.

Bristol County Mosquito Control Project (Bristol CMCP)
Week Ending September 4, 2010
<u>Epi-Week 35</u>

Current mosquito activity/trend, is it increasing, declining, holding steady?

Bristol County had the following positive mosquito pools:
Fall River 8/31- *Cx. pipiens* and *Cx. restuans*- WNV
Swansea 8/31- *Cx. pipiens* and *Cx. restuans*- WNV
New Bedford 9/1- *Cx. pipiens* and *Cx. restuans*- WNV
New Bedford 9/1- *Cx. pipiens* and *Cx. restuans*- **WNV & EEE** (39 mosquitoes in pool)
Berkley 9/1- *Cs. melanura*- EEE

Appendix 1 from the MA DPH Surveillance and Response Plan: Mosquitoes Associated with Arboviral Activity in Massachusetts

Aedes vexans – low populations
Coquillettidia perturbans – low populations
Culex pipiens – steady, increasing
Culex restuans – decreasing
Culex salinarius – few, rare
Culiseta melanura – low levels throughout the County, decreasing in resting boxes
Ochlerotatus canadensis – low populations
Ochlerotatus japonicus – decreasing

Current predominant species that are developing or on the wing:

Cs. melanura collections have decreased during Epi-week 35. In addition we collected *Cx. pipiens* and *Cx. restuans* from urban sites in higher numbers with a decrease in *Oc. japonicus*.

Comparison to previous season is it the same, better, or worse:

We collected very few (29) *Cs. melanura* in Epi-week 35 from the resting boxes. Epi-week 34 showed a continued increase with 153 and 51 collected on 8/26 and 8/27 respectively, however this did not continue. Low numbers of *Cs. melanura* can be found throughout the County in many of our NJ light traps and CO_2-baited and un-baited CDC light traps. We did collect our first Berkley EEE positive from a pool of 46 *Cs. melanura*.

CO_2-baited CDC light trap collected a variety of species at low levels including; *Ae. vexans, Oc. triseriatus, Oc. japonicus, Cq. perturbans, Ur. sapphirina, Oc. canadensis,* and *An. punctipennis.*

Gravid traps set in our urban sites collected above average amounts of *Cx. pipiens* and *Cx. restuans*. Most traps collected more than 40 individuals per trap in our urban areas. The hot and humid weather pattern at the beginning of the week was perfect weather for *Culex*.

Weather impacts e.g. precipitation/heat. Is it accelerating or slowing things down?

Bristol County received 1.12 inches of rain in New Bedford and 1.51 inches in Taunton, all from Tropical Storm Earl.

Number of requests for service, is up, down etc:

Year to date Bristol has received 16,502 calls for service as of 9/3/10, compared to 14,792 in 2009.

How is the MCP responding or what kind of intervention is taking place, Is it working?

Public outreach is a very important component of our Project. We are participating in a variety of City and Town public events, including radio and newspaper interviews, especially following all the positive isolations. We are corresponding with local Board of Health and Park and Recreation officials to coordinate control or public outreach for town and city activities. BCMCP has set up large area ULV spray blocks in Fall River and New Bedford to control both WNV and EEE.

In general our response will be ground ULV applications in areas of virus isolations, high public demand, and mosquito populations. Requests to check stagnant water on private property will continue into the season. We will continue to larvicide catch basins throughout Bristol County.

Bristol County Mosquito Control Project (Bristol CMCP)
Week Ending September 11, 2010
<u>Epi-Week 36</u>

Current mosquito activity/trend, is it increasing, declining, holding steady?

Appendix 1 from the MA DPH Surveillance and Response Plan: Mosquitoes Associated with Arboviral Activity in Massachusetts

Aedes vexans – low but increasing populations
Coquillettidia perturbans – low populations
Culex pipiens – steady, increasing
Culex restuans – decreasing
Culex salinarius – few, rare
Culiseta melanura – low levels throughout the County, increasing in resting boxes
Ochlerotatus canadensis – low populations
Ochlerotatus japonicus – decreasing

Current predominant species that are developing or on the wing:

Cs. melanura collections have increased during Epi-week 36. In addition we collected *Cx. pipiens* and *Cx. restuans* from urban sites in slightly lower amounts then Epi-week 35 with a decrease in *Oc. japonicus*. This may be an artifact of the amount of ground based ULV adulticiding that took place in these urban areas for both WNV and EEE.

Comparison to previous season is it the same, better, or worse:

We collected 69 *Cs. melanura*, an increase from the 29 *Cs. melanura* collected in Epi-week 35 from the resting boxes. Low numbers of *Cs. melanura* can be found throughout the County in many of our NJ light traps and CO_2-baited and un-baited CDC light traps. Populations ranged from 19, 18, and 29 specimens in Berkley and Freetown.

CO_2-baited CDC light trap collected a variety of species at low levels including; *Ae. vexans, Oc. triseriatus, Cx. territans, Oc. japonicus, Cq. perturbans, Ur. sapphirina, Oc. canadensis,* and *An. punctipennis.*

Gravid traps set in our urban sites collected below average amounts of *Cx. pipiens* and *Cx. restuans*. Most traps collected an average of 5 individuals per trap in our urban areas compared to 40 per trap in Epi-week 35.

Weather impacts e.g. precipitation/heat. Is it accelerating or slowing things down?

Bristol County received 0.08 inches of rain in New Bedford and no rain in Taunton.

Number of requests for service, is up, down etc:

Year to date Bristol has received 16,931 calls for service as of 9/11/10, compared to 15,964 in 2009.

How is the MCP responding or what kind of intervention is taking place, Is it working?

Public outreach is a very important component of our Project. We are participating in a variety of City and Town public events, including radio and newspaper interviews, especially following all the positive isolations. We are corresponding with local Board of Health and Park and Recreation officials to coordinate control or public outreach for town and city activities. BCMCP had set up large area ULV spray blocks in Fall River and New Bedford to control both WNV and EEE.

In general our response will be ground ULV applications in areas of virus isolations, high public demand, and mosquito populations. Requests to check stagnant water on private property will continue into the season. We will continue to larvicide catch basins throughout Bristol County.

Bristol County Mosquito Control Project (Bristol CMCP)
Week Ending September 18, 2010
<u>Epi-Week 37</u>

Current mosquito activity/trend, is it increasing, declining, holding steady?

New Bedford 9/9- *Cx. pipiens* and *Cx. restuans*- WNV

Appendix 1 from the MA DPH Surveillance and Response Plan: Mosquitoes Associated with Arboviral Activity in Massachusetts

Aedes vexans – low populations
Coquillettidia perturbans – low populations
Culex pipiens – steady, decreasing
Culex restuans – decreasing
Culex salinarius – few, rare
Culiseta melanura – low levels throughout the County
Ochlerotatus canadensis – low populations
Ochlerotatus japonicus – decreasing

Current predominant species that are developing or on the wing:

Cs. melanura collections have decreased during Epi-week 37 with only 18 collected. In addition we collected *Cx. pipiens* and *Cx. restuans* from urban sites in lower amounts then Epi-week 36 with a decrease in *Oc. japonicus*.

Comparison to previous season is it the same, better, or worse:

We collected 17 *Cs. melanura,* a decrease from the 63 *Cs. melanura* collected in Epi-week 36 from the resting boxes. Low numbers of *Cs. melanura* can be found throughout the County in many of our NJ light traps and CO_2-baited and un-baited CDC light traps.

CO_2-baited CDC light trap collected a variety of species at low levels including; *Ae. vexans, Oc. triseriatus, Cx. territans, Oc. japonicus,* and *An. punctipennis.*

Gravid traps set in our urban sites collected below average amounts of *Cx. pipiens* and *Cx. restuans*. Most traps collected an average of 3 individuals per trap in our urban areas compared to 40 per trap in Epi-week 35. The sites in New Bedford collected 53 and 41 in two traps from locations where positive EEE and WNV had been found. One *Ae. albopictus* was collected from the Washburn site in New Bedford, the same location it was found in 2009. We have added BG sentinel traps to the location, trying to collect more specimens. This finding is a concern because this was the area where a pool of 39 *Cx. pipiens* and *Cx. restuans* tested positive for WNV and EEE in Epi-week 35.

Weather impacts e.g. precipitation/heat. Is it accelerating or slowing things down?

Bristol County received 0.53 inches of rain in New Bedford and 0.35 in Taunton.

Number of requests for service, is up, down etc:

Year to date Bristol has received 17,302 calls for service as of 9/17/10, compared to 15,964 in 2009.

How is the MCP responding or what kind of intervention is taking place, Is it working?

Due to cooler morning temperatures, our response will be limited ground ULV applications in areas of virus isolations, high public demand, and mosquito populations. Public outreach is a very important component of our Project and we are in contact with local Board of Health's and School Departments as the season ends.

Bristol County Mosquito Control Project (Bristol CMCP)
Week Ending September 25, 2010
<u>Epi-Week 38</u>

Current mosquito activity/trend, is it increasing, declining, holding steady?

Raynham 9/20- *Cs. melanura*- WNV

Appendix 1 from the MA DPH Surveillance and Response Plan: Mosquitoes Associated with Arboviral Activity in Massachusetts

Aedes vexans – low populations
Coquillettidia perturbans – rare
Culex pipiens – increasing
Culex restuans – decreasing
Culex salinarius – few, rare
Culiseta melanura – decreasing
Ochlerotatus canadensis – rare
Ochlerotatus japonicus – increasing

Current predominant species that are developing or on the wing:

Cs. melanura collections have decreased during Epi-week 38 with none collected compared to 18 in Epi-week 37. In addition we collected *Cx. pipiens* and *Cx. restuans* from urban sites in increased amounts compared to Epi-week 37 with an increase in *Oc. japonicus*.

Comparison to previous season is it the same, better, or worse:

We collected no *Cs. melanura* from the resting boxes.

BG sentinel traps were set at the New Bedford site where we collected *Ae. albopictus* during Epi-week 37. Increased trapping did not yield an increase in samples with only 1 other specimen collected. The trap did collect *Cx. pipiens*, *Oc. altropalpus* and 3 male *Ae. albopictus*.

All gravid traps set in our urban sites collected above average amounts of *Cx. pipiens* and *Cx. restuans*. Most traps collected an average of 3 individuals per trap in our urban areas during Epi-week 37. The sites in New Bedford collected 52 and 31 in two traps from locations where positive EEE and WNV had been found. Our WNV positive site in Swansea collected 131 mostly *Cx. pipiens* and few *Cx. restuans* compared to 13 in Epi-week 37. Fall River collected 36 and 73 *Cx. pipiens* and *Cx. restuans* compared to 3 and 15, respectively. There was also a significant increase in *Oc. japonicus* from one Fall River site, from 2 to 16 specimens.

Weather impacts e.g. precipitation/heat. Is it accelerating or slowing things down?

Bristol County received 0.0 inches of rain in New Bedford and 0.0 in Taunton.

Number of requests for service, is up, down etc:

Year to date Bristol has received 17,473 calls for service as of 9/24/10, compared to 15,964 in 2009.

How is the MCP responding or what kind of intervention is taking place, Is it working?

Due to cooler morning temperatures, our response will be limited ground ULV applications in areas of virus isolations, mosquito populations, and high public demand. Public outreach is a very important component of our Project and we are in contact with local Board of Health's and School Departments as the season ends.

THE COMMONWEALTH OF MASSACHUSETTS
STATE RECLAMATION AND MOSQUITO CONTROL BOARD

BRISTOL COUNTY MOSQUITO CONTROL PROJECT

140 NORTH WALKER STREET, TAUNTON, MA 02780
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Bristol County Mosquito Control Project (BCMCP)
End of the 2010 Season Report

This report is based on data collected from CO_2-baited CDC traps, UV light traps, resting boxes and gravid traps.

Total Pools Submitted for Testing 2010: 221 Pools

- The 2010 season marked the second year that the MA DPH assessed a $25.00 fee for testing of each mosquito pool.
- Total Pools Submitted for Testing 2009: 253 Pools

Total Pools Submitted from Bristol Co. by MA DPH in 2010: 161 Pools

Total Number of Mosquitoes Tested in 2010: 7,391

- Total Number of Mosquitoes Tested in 2009: 10,838

Total Number of Mosquitoes Tested from Bristol Co. by MA DPH in 2010: 4,662

- Total Number of Mosquitoes Tested in 2009: 18,961

Total Number of Non-submitted Mosquitoes 2010: 6,010

- Total Number of Non-submitted Mosquitoes 2009: 5,571

Total Number of Non-submitted Mosquitoes from Bristol Co. by MA DPH 2010: 10,548

2010 Combined Data:
Total Pools Tested: 382
Total Mosquitoes Tested: 12,053
Total Non-Submitted: 16,558
Total Collected: 28,611

2009 Combined Data:
Total Pools Tested: 671
Total Mosquitoes Tested: 29,799
Total Non-Submitted: 37,807
Total Collected: 67,606

Virus Isolations:

- **WNV 2010: 14 Pools**
  - 3 pools of *Cs. melanura*
  - 11 pools of *Cx. pipiens/ restuans* complex

- **WNV 2009: 9 Pools**
  - 4 pools of *Cs. melanura*
  - 4 pools of *Cx. pipiens/ restuans* complex- all collected from gravid traps
  - 1 pool of *Oc. canadensis*

- **EEE 2010: 10 Pools**
  - 8 pools of *Cs. melanura*
  - 1 pools of *Cx. pipiens/ restuans*
  - 1 pool of *Cq. perturbans*
  - Most EEE positive mosquitoes were collected from CO_2 – baited traps, with 1 pool collected from a gravid trap.

- **EEE 2009: 23 Pools**
  - 20 pools of *Cs. melanura*
  - 2 pools of *Oc. canadensis*
  - 1 pool of *Ae. vexans*
  - Most EEE positive mosquitoes were collected from CO_2 – baited traps, with 5 pools collected from resting boxes.

Mosquito activity/trends for the 2010 Season?

Surveillance for Eastern Equine Encephalitis (EEE) in 2010 began at normal levels in Bristol County. High numbers of *Cs. melanura* were being collected from our traps in areas of past EEE isolations and high populations. An early season trapping event coordinated by MA DPH resulted in 45 *Cs. melanura* collected from CO_2 – baited traps compared to the 2 collected in 2009 and 7 collected in 2008. During the same time frame in 2007, 750 *Cs. melanura* were collected. The 2010 season showed an increase in temperatures, with average highs of 90ºF and lows of 70ºF, well above average for the summer.

Resting boxes collected low numbers for the beginning of the season with a reduction in August and September. BCMCP did not collect any EEE positive *Cs. melanura* from resting boxes this season. The first EEE isolation was from Fairhaven on July 25th from *Cs. melanura* with a *Cq. perturbans* EEE positive on August 1st in Freetown. Bristol County's activity was low compared to the activity in Plymouth County. Due to Plymouth's increased virus isolations, especially from *Cq. perturbans*, the state initiated an aerial application of Anvil® 10 + 10 ULV to approximately 284,000 acres in southeastern Massachusetts. The application was conducted over three-nights from August 5-7, 2010. Efficacy of the application reduced the overall mosquito population by 80 percent and mammal biting mosquitoes by 90 percent.

Bristol County Mosquito Control Project's Efficacy Results

Species	August 6-7	August 7
Cs. melanura	96.2%	96.5%
Cq. perturbans	87%	80.7%
Ae. vexans	100%	60.8%
Oc. canadensis	100%	58.3%
Overall	87%	90.6%

Surveillance for West Nile virus was comparable to 2008 and 2007 season in regards to population size and virus isolations and above 2009 data. Gravid trap collections compared to 2009 were up by 80% in most of our trapping locations. A new site in Swansea continued to collect significant numbers *Cx. pipiens/ restuans*, including collections of 153, 221 and a positive WNV pool of 50. High populations were collected from Fall River throughout the season. Fall River did not have any mosquitoes test positive for WNV in 2009, however this season 2 pools were positive. New Bedford had an active season with WNV at both trap locations within the city. This continued from mid-July till mid-September. One pool of *Cx. pipiens/ restuans* tested positive for both WNV and EEE from New Bedford. Epi-week 35 (Week ending September 4) was a very active time with both EEE and WNV positives found in New Bedford (2 sites), Swansea, Fall River, and Berkley.

We collected 2 Asian Tiger Mosquitoes- *Ae. albopictus* from the New Bedford site located in close proximity to a tire recycling plant. This was the second year in a row that *Ae. albopictus* was collected from this site. One was collected in a gravid trap on 9/14/10 and then on 9/20/10 from BG Sentinel trap. Additional traps were placed in the area but no further specimens were collected. We also placed BG Sentinel traps in the areas of Swansea, Fairhaven and Dighton to check for any other areas of introduction.

Virus Interventions:

There was modest WNV activity this season in Bristol County; however it has been detected every year since 2001. There were limited interventions for the virus except in conjunction with EEE positives in New Bedford. During Epi-weeks 30-40, truck-based interventions around trap sites continued in an attempt to reduce the *Culex* populations in the areas. Fall River had sections of the city sprayed following WNV positives and large outdoor social events at the request of the Mayor and Board of Health.

Truck-based EEE interventions were completed in conjunction with the aerial application. This was especially important in areas of Acushnet and Fairhaven where the potential for positive EEE mosquitoes could be collected following the aerial. Even with 90% reduction in the *Cq. perturbans* populations, the Project was concerned about the remaining population. Unlike the 2006 outbreak, *Cq. perturbans* was the main epizootic vector in 2010. There were low levels of *Ae. vexans* and *Oc. canadensis* therefore they did not play a role in EEE this season.

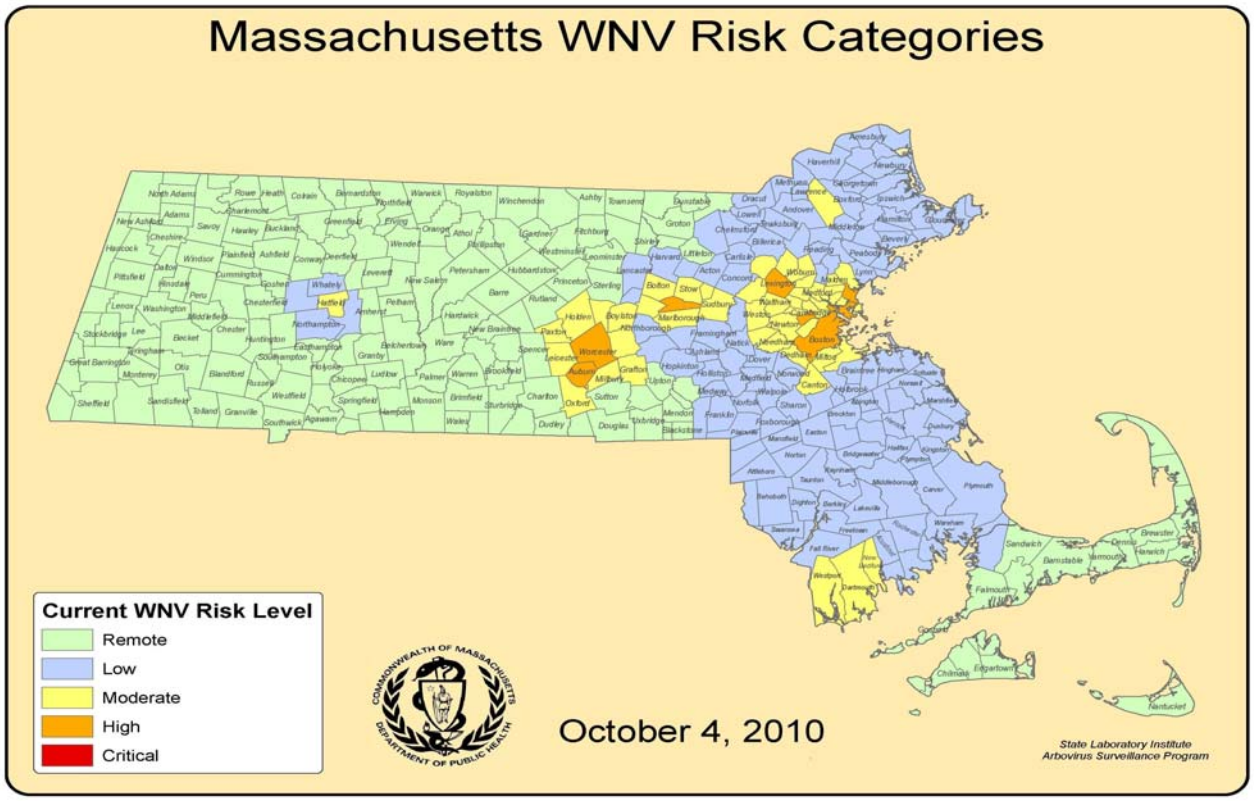
To date the towns of Taunton, Berkley, Raynham, Freetown, Acushnet, Fairhaven and New Bedford are in the High-risk category for EEE. The towns of Easton, Norton, Dighton, Somerset, Fall River, and Dartmouth are in the Moderate-risk category for EEE. To date the towns of Westport, Dartmouth and New Bedford are in the Moderate-risk category for WNV. There are no reported human or horse cases for WNV or EEE in Bristol County.

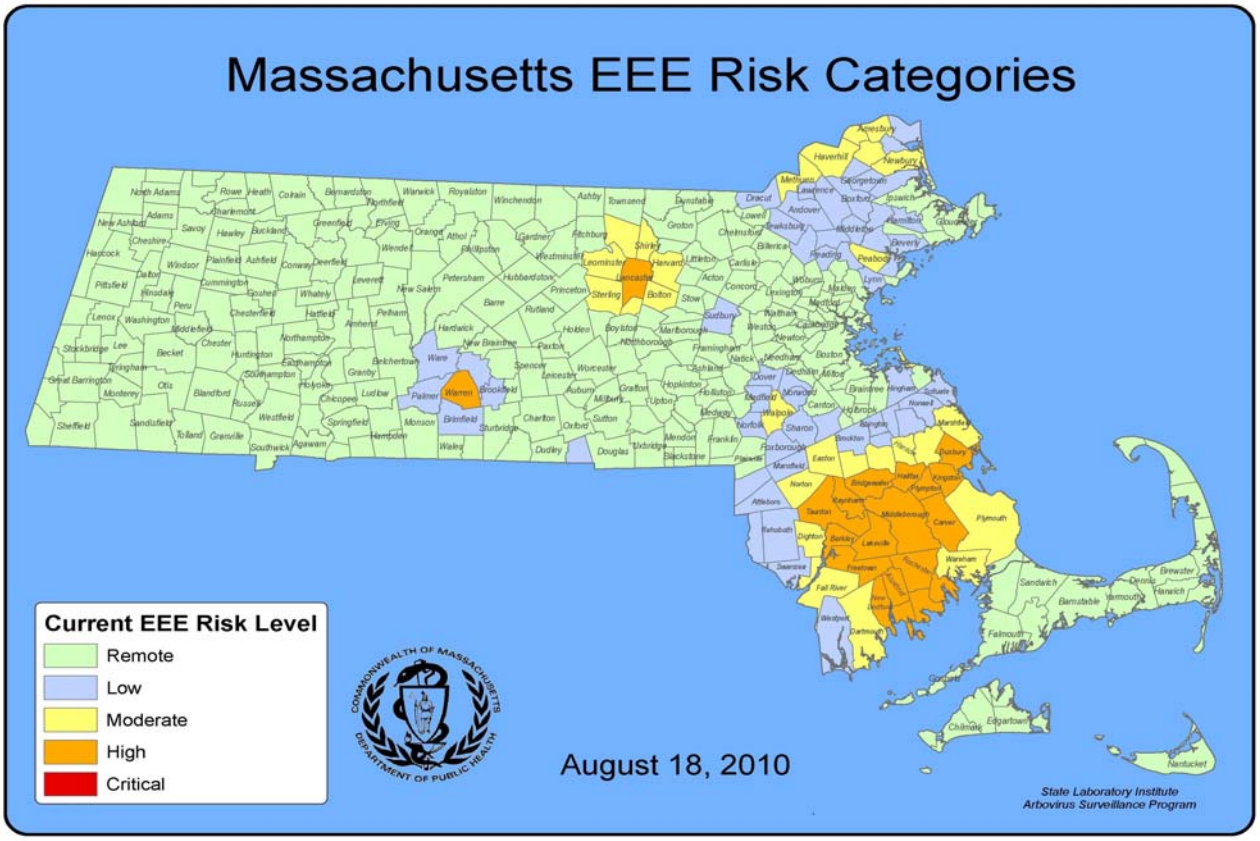
Number of requests for service, is up, down etc:

Year to date Bristol has received 17,508 calls for service as of 10/18/09 and we had stopped taking residential requests as of 9/24/09. This is a new record for the Project. In 2008, Bristol had received 11,985 calls for service as of 10/17/08 and 15,964 calls for service as of 10/28/09.

Bristol County Mosquito Control Project's Outreach:

Coordination between BCMCP and the local Boards of Health was ongoing relative to control/surveillance options in the vicinity of WNV and EEE positive mosquito pools. We participated in a variety of public outreach projects including radio, newspaper, and television interviews. We appeared before Board of Health Commissions in many of our towns to explain the importance of mosquito control, surveillance and adulticide applications.


Massachusetts WNV Risk Categories
Current WNV Risk Level
Remote
Low
Moderate
High
Critical
October 4, 2010
State Laboratory Institute
Arbovirus Surveillance Program


Massachusetts EEE Risk Categories
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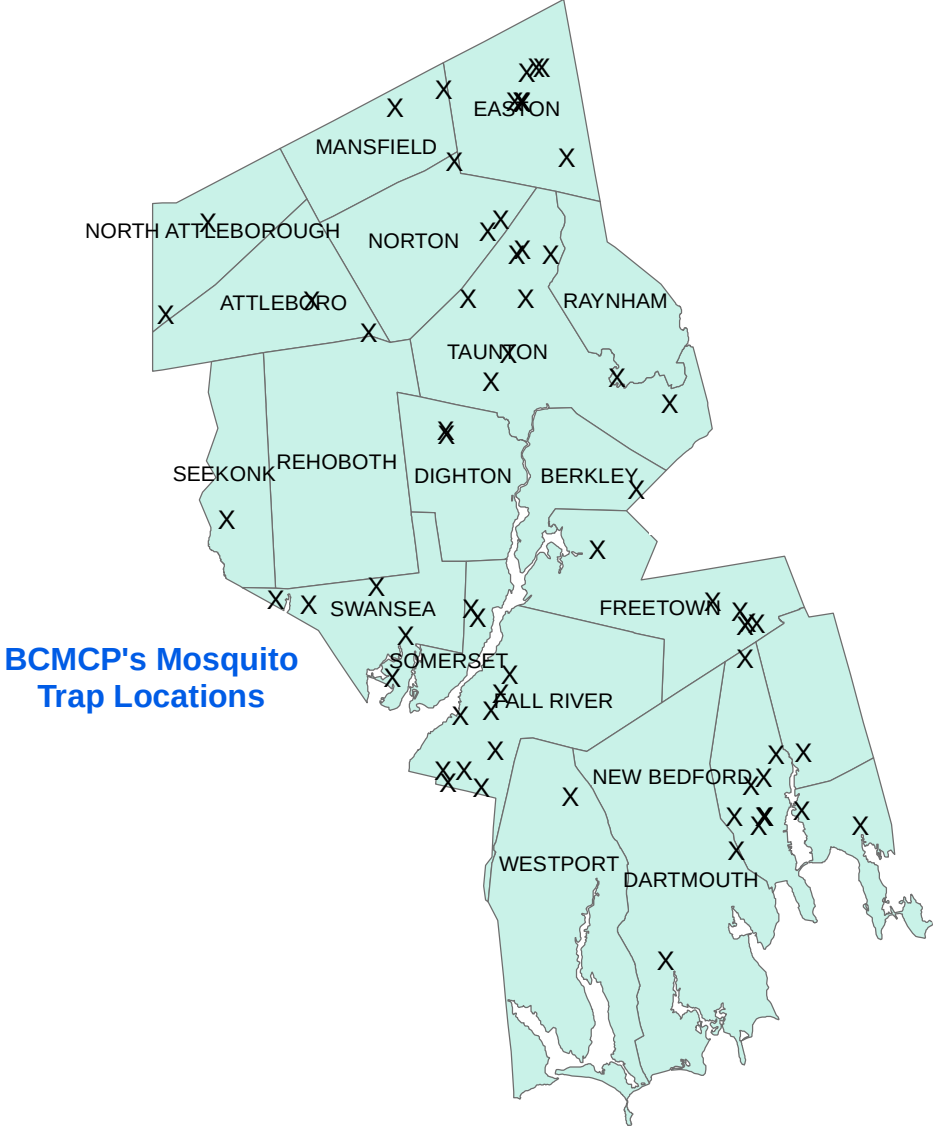


BCMCP's Mosquito Trap Locations

Determining the susceptibility of *Culiseta melanura* to a biorational mixture of *Bacillus sphaericus* (Serotype H5a5b Strain 2362) and *Bacillus thuringiensis* var. *isrealensis* (Strain AM65-52) in a laboratory bioassay

Priscilla Matton and Wayne Andrews

Bristol County Mosquito Control, Taunton, Massachusetts 02780

Introduction

There is a close association between Eastern Equine Encephalitis virus and cedar swamps, in particular white cedar swamps along the East coast of the United States. The main reason for this association is the mosquito *Culiseta melanura*, principal enzootic vector of EEEv, utilizes these cedar swamps for their larval habitat. Larvae tend to favor crypts under mature cedar trees where the pH is 5.0 or lower. The adaptation to living in this environment provides protection from pathogens and predators. In many regions, cedar wetlands are refugia for species that are rare, endangered, or threatened locally or nationally (Laderman 1989). The need for biorational mosquito control products for use in these environmentally sensitive areas is important.

Figure 1. Distribution of *Chamaecyparis thyoides*. Records were compiled from field observations, herbarium records, published sources, and personal communications. Counties in which Atlantic white cedar has been found are inked in black (from Laderman 1982).

Purpose

A series of experiments were conducted to determine if field collected *Cs. melanura* 4th instar larvae are susceptible to the biorational mixture of *B. sphaericus* and *B.t.i.* and at what concentration.

Materials and methods

Culiseta melanura Susceptibility Test Protocol

Test System:

Bioassay will be carried out in standard bioassay cups (120 ml plastic). Each cup will first be filled with 80 ml of field collected crypt water (pH 4.3). Twenty 4th instar *Cs. melanura* in de-ionized distilled water (no more than 5 ml) will be added to each cup. One drop of larval food (2 g of mortar and pestle ground TetraMin® fish food in 20 ml distilled water) will also be added to each cup.

Appropriate quantities of the serial dilutions of test material will be added to produce the desired concentrations. De-ionized, distilled water will then be added to produce a final volume of 100 ml per cup. All concentrations tested in the final bioassays, including the untreated controls, will be replicated three times.

Test Material:

VectoMax® WSP – 50 BsITU/mg Water Soluble Pouch will be used in performance of the bioassays.

Test Concentrations:

Test concentrations should be selected following a non-replicated, range finding assay using the following concentrations of test material: 0.25 ppm, 0.2 ppm, 0.15 ppm, 0.1 ppm, 0.05 ppm, 0.025 ppm, and 0.00 ppm (UTC). Results of this assay will be used to select a range of five concentrations for the final assays with the objective of having the LC_{50} and LC_{90} fall within the selected range.

Materials and methods (cont.)

Range-finding Stock Suspensions and Dilutions:

Initial suspension (4.2%) will be prepared by adding 10 g of test material to 240 ml of de-ionized, distilled water and vigorously shaking the suspension in a flask for 1 minute and then refrigerate for 24 hours. Gentle agitation will be used to maintain this and subsequent dilutions in suspension. A second serial dilution will be made by adding 1 ml of the first suspension to 99 ml of de-ionized, distilled water to produce a concentration of 400 mg/L. A final range-finding stock suspension with a concentration of 2.5 ppm (mg/L) will be produced by adding 1 ml of the second dilution to 159 ml of deionized, distilled water and similar agitation.

Sample Weight
10 g + 240 ml of water = 250 ml

	GMS or ml	INTO	FINAL CONC.
FIRST DILUTION (1:249)	1	250 ml	40,000 mg/L
SECOND DILUTION (1:99)	1	100 ml	400 mg/L
STOCK CONC. (1:159)	**1**	**160 ml**	**2.5 mg/L**

Preparation of Range-finding Dilutions:

A single, non-replicated set of cups containing the range-finding concentrations will be prepared as described above under "Test System". Concentrations to be used are shown below.

TOTAL VOLUME	160 ml
HIGHEST CONC.	0.25 mg/L
MAX. STOCK APPLIED	10 ml
STOCK CONC.	2.5 mg/L

CONC. mg/L	mg/CUP	STOCK APPLIED
0.250	0.0250	10.0 ml
0.200	0.0200	8.0 ml
0.150	0.0150	6.0 ml
0.100	0.0100	4.0 ml
0.050	0.0050	2.0 ml
0.025	0.0025	1.0 ml
0	0	0.0

Bioassay Conditions:

Treated cups with *Cs. melanura* larvae will be held in low-light conditions at 15°C to 20°C between treatment and taking mortality readings.

Mortality Readings:

Mortality of larvae will be read at 24, 48, 96, 144 and 192 hours after treatment. Moribund larvae that do not surface to breathe or elicit an evasive response when probed will be counted as dead. Both live and dead larvae will be counted and recorded, but only live larvae will be considered in calculations, to avoid errors due to potential larval cannibalism.

Selection of Final Concentrations:

Range-finding bioassay results will be plotted in order to estimate in which range the LC_{50} and LC_{90} will be found. It may be necessary to repeat the range-finding assay before selecting the final concentrations.

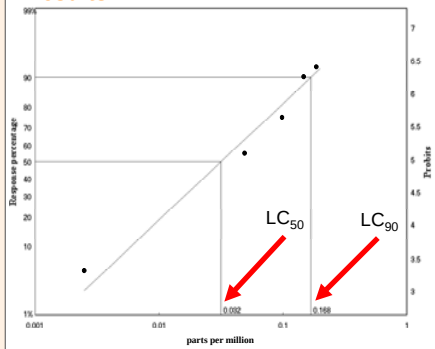
Final Bioassays:

Final bioassays will be carried out similarly to the range-finding assays replicating each treatment three times simultaneously. It will be important to attempt to complete final bioassays with larvae of approximately the same age/instar as the range-finding assays.

Data Analysis:

Mean percent mortality will be calculated for each concentration tested, and data will be subject to log/dose/probit analysis to estimate LC_{50} and LC_{90} values and associated 95% confidence intervals for the materials tested.

Results



DATA

NUMBER	TREATED	CONCENTRATION	% OBSERVED RESPONSE	% LINEAR RESPONSE	LOG (Conc.* 1000)	LINEAR PROBITS
1	60	0.0025	5	2.578	0.398	3.046
2	60	0.0050	55	63.667	1.699	5.350
3	60	0.1000	75	81.125	2.000	5.883
4	60	0.1500	90	88.375	2.176	6.194
5	60	0.2000	100	92.147	2.301	6.416

STATISTICS

Slope	1.77 +/- 0.198	
Chi	10.218 tabulated	7.8
p	0.0168	
h	3.406	
g	0.433	
Cycles	7	
r	0.836 tabulated	0.878

LETHAL CONCENTRATION (95 % CI)

LC	CONC. (mg/ L)	LOWER LIMIT (mg/ L)	UPPER LIMIT (mg/ L)
25	0.013	0.0008	0.015
50	0.032	0.0056	0.050
75	0.076	0.0300	0.204
90	0.168	0.1070	0.937
95	0.270	0.2080	2.558
99	0.654	0.6530	18.560

Conclusions

Culiseta melanura 4th instar larvae are susceptible to a biorational mixture of *Bacillus sphaericus* (Serotype H5a5b Strain 2362) and *Bacillus thuringiensis* var. *isrealensis* (Strain AM65-52). We screened field collected 4th instar *Cs. melanura* from 0.25 mg/L to 0.0025 mg/L. We found that this mosquito has a LD_{50} of 0.032 mg/L and a LD_{90} of 0.168 mg/L. Mortality could be determined by day 4 at an average temperature of 16.2°C. These concentrations are within the recommended application rates for this product.

To date, there are only a few successful products shown to control *Cs. melanura* in field studies. Methoprene (2 lbs/acre) (Woodrow et al. 1995), granular heptachlor (1 lb/acre), and granular dieldrin (1 lb/acre) (Hayes 1962) were effective in controlling the larvae. Wettable DDT dust was unsuccessful as a winter prehatch control measure at a rate of 1 to 2 lbs/acre (Hayes 1962). Unpublished laboratory work on *B. sphaericus* showed control of *Cs. melanura* after 7 days with potential for success in field trials. The mixture of *B. sphaericus* and *B.t.i.* exhibited control 3 days earlier.

Future field studies could include placing quantified amounts of *B. sphaericus* and *B.t.i.* in *Cs. melanura* crypts. We would measure the deposition and diffusion of the larvicide into the larval crypts. Continued research is needed on the potential for this biorational product to control other mosquito species in the open water areas between the crypts.

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Acknowledgments

We would like to thank Valent BioSciences Corporation for protocol development and preparation of sample material.

For further information

Please contact *brismosqwa@comcast.net* with any questions. More information on this and related projects can be obtained at *www.nmca.org/AMCA2010poster.pdf*

Determining the susceptibility of *Culiseta melanura* to *Bacillus sphaericus* (Serotype H5a5b Strain 2362) in a laboratory bioassay

Wayne N. Andrews, M.Sc. & Priscilla Matton, M.Sc.

Bristol County Mosquito Control Project
140 North Walker Street
Taunton, MA 02780

VectoLex® WDG

Water Dispersible Granule (51.2% Bs)

Thanks to Peter DeChant, Valent BioScience Corporation for material and protocol development

Why do we have EEE?

Culiseta melanura

- Atlantic White Cedar swamps provide **PERFECT** larval habitat
  - Crypts under tree roots
- Historically feeds primarily on birds, with recent evidence of human, cow and horse blood- The Connecticut Agricultural Experiment Station
- Overwinters in the larval stage
- Problem: Priority habitat in Massachusetts

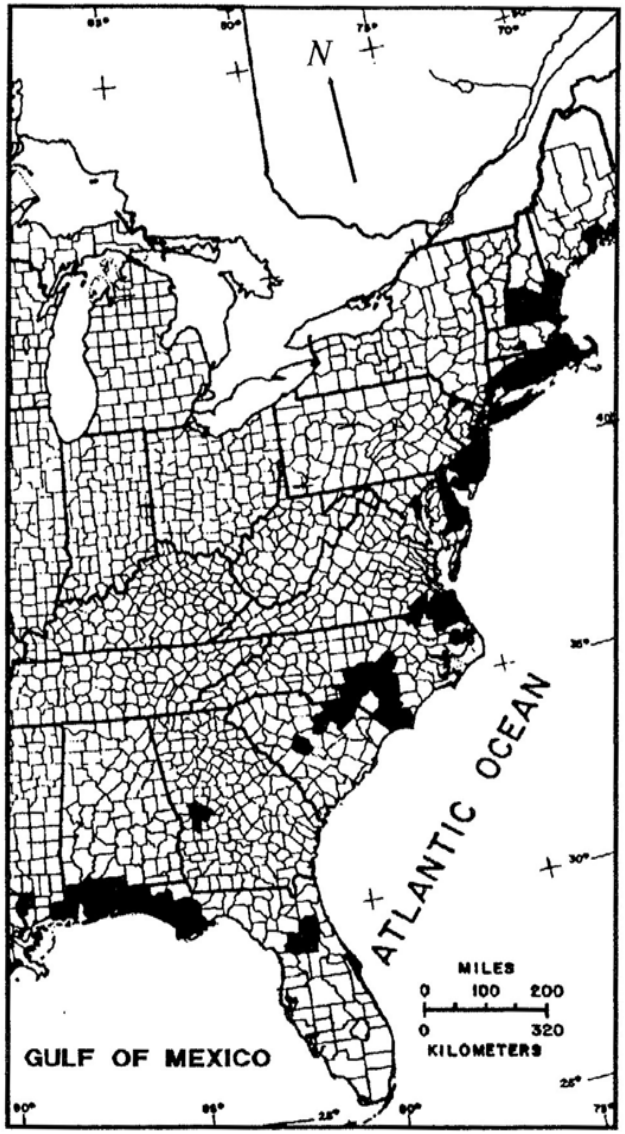


Figure 1. Distribution of *Chamaecyparis thyoides*. Records were compiled from field observations, herbarium records, published sources, and personal communications. Counties in which Atlantic white cedar has been found are inked in black (from Laderman 1982).

***Culiseta melanura* habitat**

What is a Bioassay?

Determination of the potency of a physical, chemical or biological agent by means of a biological indicator

What Properties are Measured Using a Bioassay?

- Toxicity (General Statement)
- Resistance (differences between populations)
- Tolerance (differences between species)
- Residues (Clean Water Act)
- Others

General Types of Bioassays

- Feeding
- Aqueous
- Topical
- Residue contact
- Vapor (fumigants, attractants, and repellent)
- Injection
- Drenching

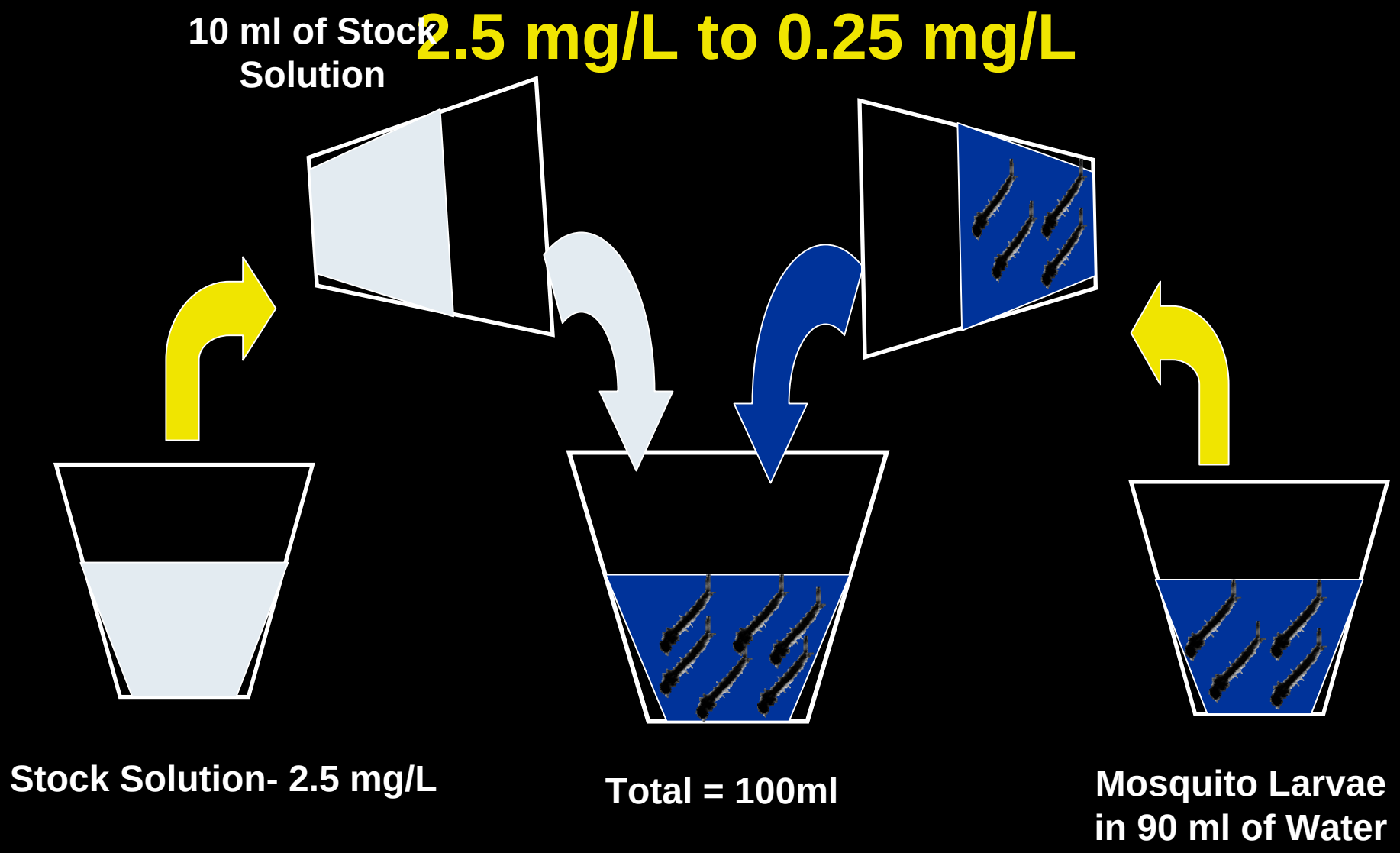
What Types of Biological Responses are Measured?

- Death
- Paralysis
- Knockdown
- Development
- Others

Factors Affecting Toxicity

- Environment - temperature, humidity, photoperiod, etc.
- Organism - size, sex and age
- Adjuvants - solvents
- Test chemicals - purity and sampling errors

log Dilution



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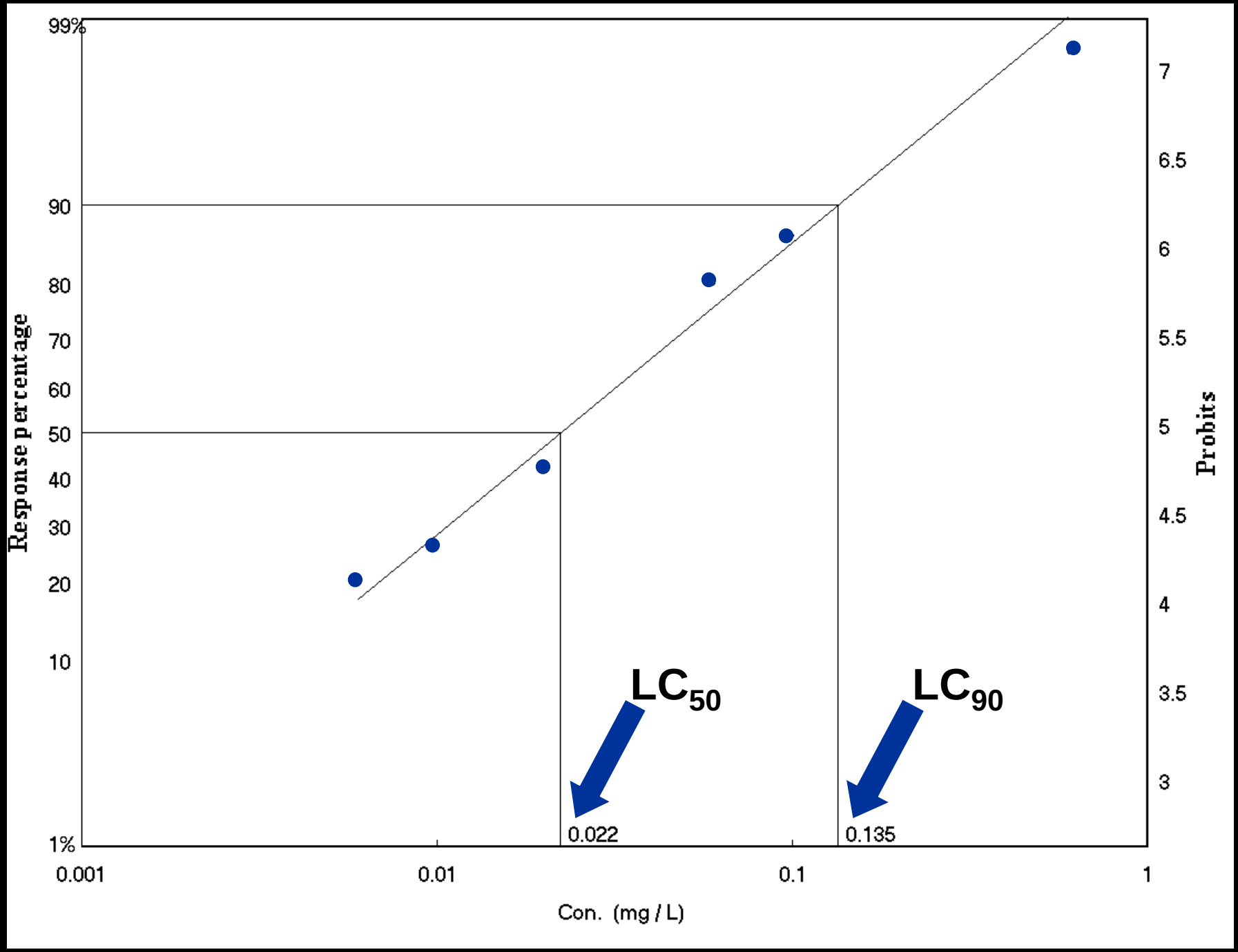
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0.01
0.1
1
Con. (mg / L)

Contact Information

Wayne Andrews, M.Sc.- Superintendent

Bristol County Mosquito Control Project

140 North Walker Street

Taunton, MA 02780

508-823-5253

brismosqwa@comcast.net

THE COMMONWEALTH OF MASSACHUSETTS
STATE RECLAMATION AND MOSQUITO CONTROL BOARD

BRISTOL COUNTY MOSQUITO CONTROL PROJECT

140 NORTH WALKER STREET, TAUNTON, MA 02780
TEL:(508) 823-5253 FAX: (508) 828-1868

COMMISSIONERS
ARTHUR F. TOBIN, CHAIRMAN
GREGORY D. DORRANCE
CHRISTINE A. FAGAN
JOSEPH BARILE
ROBERT DAVIS

SUPERINTENDENT
WAYNE N. ANDREWS M.S.

November 24, 2010

Minutes of the PUBLIC MEETING TO PRESENT AND DISCUSS ITS PRELIMINARY PROPOSED BUDGET FOR F/Y 2012 held at East Taunton Elementary School, 58 R Stevens Street, Taunton, MA 02780 on, October 25, 2010

The meeting was called to order at 7:12 P.M.

COMMISSIONERS PRESENT
- Arthur Tobin
- Robert F. Davis
- Gregory Dorrance
- Christine Fagan

ALSO PRESENT
- Wayne N. Andrews, Superintendent, BCMCP
- Stephen Burns, Assistant Superintendent, BCMCP
- Priscilla Matton, BCMCP
- Lee Corte-Real, Chairman State Reclamation and Mosquito Control Board
- State Representative James Fagan
- Mark Mahoney, City of New Bedford
- Greg Boyd, Berkley resident
- Peter Cullen, Taunton resident
- Anthony Texeira, Superintendent- Plymouth County MCP
- Dan Daly, Plymouth County MCP
- Taunton Police and Fire Department

I. Introductory Remarks

Chairman Tobin welcomed everyone to the meeting and asked them to introduce themselves. Following introductions, Chairman Tobin explained the importance of the meeting to discuss the upcoming FY 2012 budget and our services to the Cities and Towns.

II. Presentation (copy attached)

BCMCP Budget Overview- Robert Davis
BCMCP's Activities and Services- Wayne Andrews
WNV and EEE Overview- Priscilla Matton

III. Discussion and Questions

Mark Mahoney from the City of New Bedford asked for clarification as to the increase in FY 2012 budget for payroll/salaries. It was explained by Superintendent Andrews that this was to replace 2 full-time employees whose positions has not yet been filled since their departure.

Greg Boyd from Berkley explained the importance of our services and trapping for WNV and EEE. BCMCP currently sets traps at his residence. He encouraged the increase to our budget and the importance of seasonal help to fulfill our mandates. He expressed his gratitude for what Superintendent Andrews and Priscilla have done and the time they spend explaining the mosquito situation to him and the County.

Assistant Superintendent Stephen Burns explained the importance of the entire Project and field crew in particular that go above and beyond to fulfill the requirements to the residents. With over 17,500 residential requests, the field crew works tirelessly to complete all aspects of the job.

IV. Closing Remarks

Chairman Tobin again thanked everyone for attending. He reminded them that copies of the preliminary proposed budget would be available for inspection at the Project. Comments may also be sent directly to the State Reclamation and Mosquito Control Board via the Executive Director or Project Administrator by April 15th. If any comments or questions are received by the Project after the minutes are presented, they will be forwarded to the State Reclamation and Mosquito Control Board.

Meeting Adjournment

VOTED: To adjourn the October 25, 2010 Meeting.

Moved: Robert Davis
Second: Christine Fagan
Approved: 4-0
Meeting adjourned at 8:02 P.M.

Mosquito Control in Bristol County
2012 Budget and Information

BRISTOL COUNTY MOSQUITO CONTROL

EST. 1959

THE COMMONWEALTH OF MASSACHUSETTS
STATE RECLAMATION AND MOSQUITO CONTROL BOARD

BRISTOL COUNTY MOSQUITO CONTROL PROJECT

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JOSEPH BARILE
ROBERT DAVIS

SUPERINTENDENT
WAYNE N. ANDREWS M.S.

October 8, 2010

NOTICE OF PUBLIC MEETING TO PRESENT AND DISCUSS
ITS PRELIMINARY PROPOSED BUDGET FOR F/Y 2012

Notice is hereby given that the Bristol County Mosquito Control Project (the "District") will hold an informational public meeting at the time and place indicated below in order to present and discuss the District's preliminary proposed budget for F/Y 2012, and to receive comments and answer questions from the public and local public officials in connection therewith.

Date: October 25, 2010
Time: 7:00 p.m. – 10:00 p.m.
Location: East Taunton Elementary School
58 R Stevens Street
Taunton, MA 02780

A copy of the District's preliminary proposed budget is available for inspection during regular business hours at the following location:

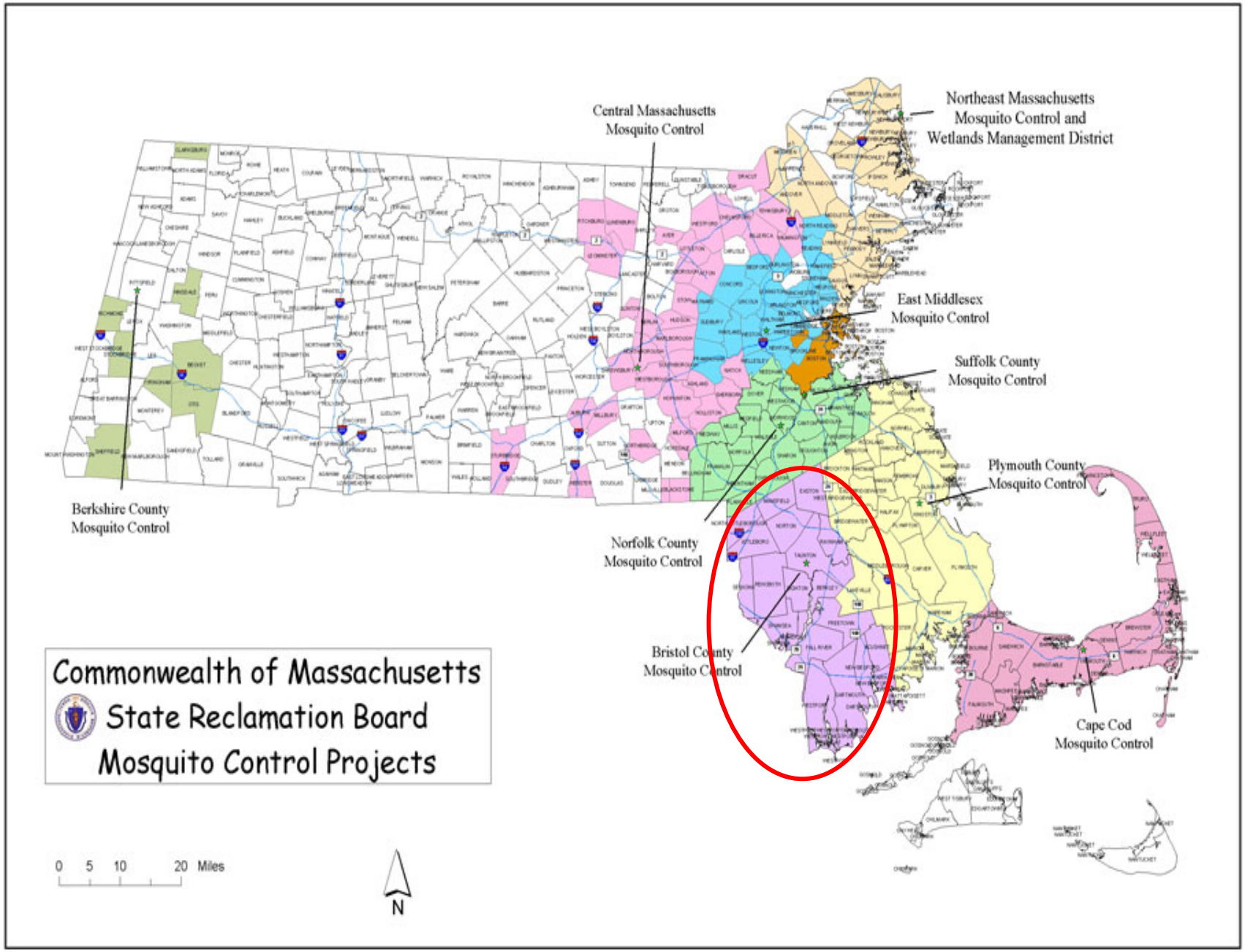
Bristol County Mosquito Control Project
140 North Walker Street
Taunton, MA 02780

The total dollar amount of the District's preliminary proposed budget for F/Y 2012 and for the fiscal year immediately proceeding are as follows:

F/Y 2011 = $1,136,441.66
F/Y 2012 = $1,445,023.00

The member municipalities within the District together with each municipality's estimated proportionate share thereof, expressed both as a percentage and as a dollar amount, is as set forth on Form SRB-1, Page 2. As of the date of this notice, the District is comprised of 20 municipalities as listed on Form SRB-1, Page 2. If the composition of the District changes because one or more municipalities join or withdraw from the District, the total preliminary budget will be adjusted pro rata.

Copies of the preliminary proposed budget will be available for inspection at the meeting, at which reasonable time will be accorded to those in attendance to ask questions and to offer comments. Comments may also be sent directly to the State Reclamation and Mosquito Control Board via the Executive Director or Project Administrator by April 15th.


Commonwealth of Massachusetts
State Reclamation Board
Mosquito Control Projects
Berkshire County Mosquito Control
Central Massachusetts Mosquito Control
Northeast Massachusetts Mosquito Control and Wetlands Management District
East Middlesex Mosquito Control
Suffolk County Mosquito Control
Plymouth County Mosquito Control
Norfolk County Mosquito Control
Bristol County Mosquito Control
Cape Cod Mosquito Control
0 5 10 20 Miles
N

Budgets FY 2004- FY 2012

FISCAL YEAR	TOWN/CITY APPROPRIATED	TRUST FUND	TOTAL BUDGET
FY 2004	$972,643.00	$321,433.36	$1,294,076.36
FY 2005	$919,573.00	$321,433.36	$1,241,006.36
FY 2006	$1,037,123.00	$407,915.00	$1,445,038.00
FY 2007	$1,037,123.00	$444,450.00	$1,481,573.00
FY 2008	$1,089,627.00	$486,931.00	$1,576,558.00
FY 2009	$1,116,868.00	$595,151.66	$1,712,019.00
FY 2010	$794,609.00	$645,347.00	$1,439,956.00
FY 2011	$794,609.00	$341,802.66	$1,136,411.66
FY 2012	$1,445,023.00	$0.00	$1,445,023.00

SPENDING CATAGORIES	BUDGET APPROP. FY2010	BUDGET APPROP. FY2011	BUDGET APPROP. FY2012
SUB AA PAYROLL	$580,318.00	$595,868.00	$744,430.00 $16,444.00
SUB BB EXPENSES, TRAVEL	$3,750.00	$3,750.00	$5,600.00
SUB DD RET.; INS.; TAXES	$218,335.00	$220,000.00	$320,016.00
SUB EE OFFICE EXPENSES,LICENSE,VEH.INS.	$29,575.00	$29,575.00	$26,369.00
SUB FF VEHICLE MAINT-REPAIR	$17,800.00	$25,000.00	$28,800.00
SUB GG RENT,HEATING & VEH. FUEL, UTILITIES	$70,800.00	$70,800.00	$73,068.00
SUB JJ TEMP. HELP, AUXILIARY SVCS.	$19,500.00	$5,000.00	$5,000.00
SUB KK EQUIPMENT PURCHASE	$96,000.00	$65,000.00	$57,146.00
SUB LL EQUIP. LEASE-MAINTENANCE-REPAIR	$18,200.00	$6,500.00	$13,700.00
SUB NN INSECTICIDES FACILITY-MAINT & REPAIR	$315,937.00	$79,948.00	$109,500.00
SUB UU INFORMATION TECH	$69,750.00	$35,000.00	$44,950.00
TOTAL BUDGETS	**$1,439,965.00**	**$1,136,441.00**	**$1,445,023.00**

Object Class	BRISTOL COUNTY MOSQUITO CONTROL PROJECT PROPOSED BUDGET FOR FY2012	54. FY2012 Maintenance
AA	PAYROLL	744,430
BB	TRAVEL, TRAINING & MEMBERSHIP, CLOTHING ALLOWANCE, JOB RELATED EXPENSES	5,600
CC	CONTRACTED SEASONAL EMPLOYEES	16,444
DD	FRINGE BENEFITS, WORKERS' COMP, PENSION & INSURANCE EXPENSES	320,016
EE	OFFICE/POSTAGE/PRINTING, ADVERTISING FEES, FINES. LICENSES, PERMITS, VEHICLE INSURANCES	26,369
FF	LAB SUPPLIES, PARTS TO MAINTAIN & REPAIR MOTOR VEHICLES IN HOUSE	28,800
GG	RENT, ELECTIC, FUEL FOR HEAT, FUEL FOR VEHICLES	73,068
JJ	TEMPORARY HELP, AUXILIARY SERVICES	5,000
KK	MOTORIZED & HEAVY EQUIPMENT PURCHASES	57,146
LL	MOTORIZED & HEAVY EQUIPMENT REPAIRS AND MAINTENANCE	13,700
NN	PESTICIDES, GARDEN/FIELD TOOLS AND SUPPLIES, FACILITY INFRASTRUCTURE MAINTENACNE & REPAIR TOOLS	109,500
UU	Information Technology Professionals & Equipment, Telecommunication Services Data and Voice	44,950
Totals		1,445,023

FISCAL YEAR 2012	CONTRIBUTION	ASSESSMENTS
Name of Municipality	% OF	Dollar amount to be deducted from
	TOTAL BUDGET	Local Aid Distribution
ACUSHNET	2.62%	$37,860
ATTLEBORO	5.99%	$86,557
BERKLEY	2.16%	$31,212
DARTMOUTH	10.16%	$146,914
DIGHTON	2.76%	$39,883
EASTON	5.10%	$73,696
FAIRHAVEN	2.79%	$40,316
FALL RIVER	7.90%	$114,357
FREETOWN	4.35%	$62,859
MANSFIELD	4.65%	$67,194
NEW BEDFORD	6.85%	$98,984
NORTH ATTLEBORO	4.87%	$70,473
NORTON	4.48%	$64,737
RAYNHAM	3.47%	$50,175
REHOBOTH	5.55%	$80,199
SEEKONK	3.35%	$48,408
SOMERSET	2.97%	$42,917
SWANSEA	3.87%	$55,922
TAUNTON	9.02%	$130,342
WESTPORT	7.06%	$102,019

Bristol County Mosquito Control Project’s Services

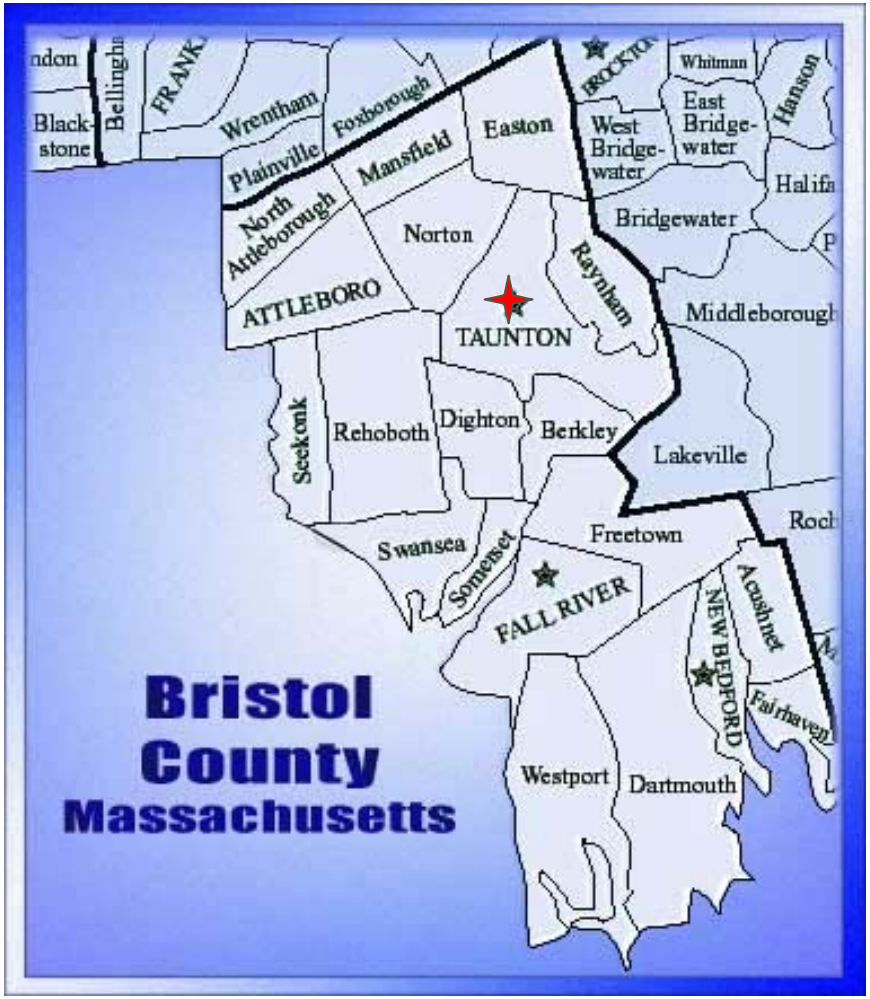
Mission Statement

Serve the communities by suppressing both nuisance and disease carrying mosquito population to tolerable levels in the most environmentally sensitive and economical manner.

We utilize a variety of methods in such a way as to minimize potential effects on people, wildlife and the environment.

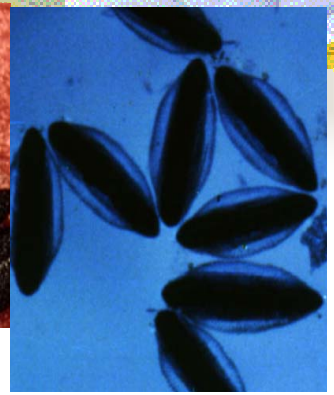
Bristol County

- 20 towns
- Population ~ 547,000
- ~ 691 square miles
- ~ 74,000 acres of Wetlands
- 17,508 residential spray request



Massachusetts Mosquitoes

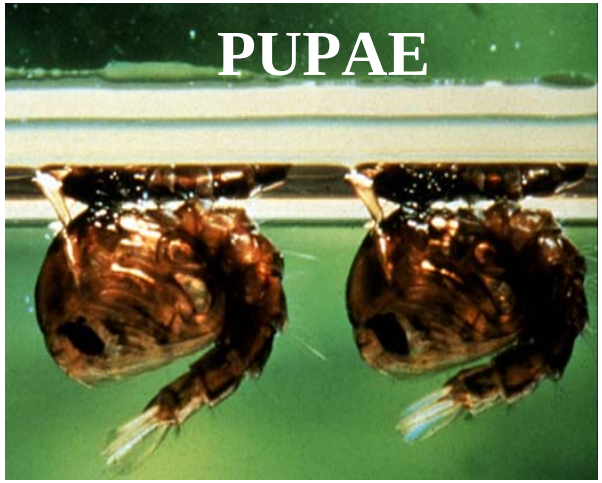
- There are 51 species in the state
- Only the females bite, and not all of our species need blood, or bite people
- The overwintering stage is species specific; eggs, larvae, or adult females may overwinter



EGGS

Life Cycle of a Mosquito

ADULT



PUPAE

LARVAE

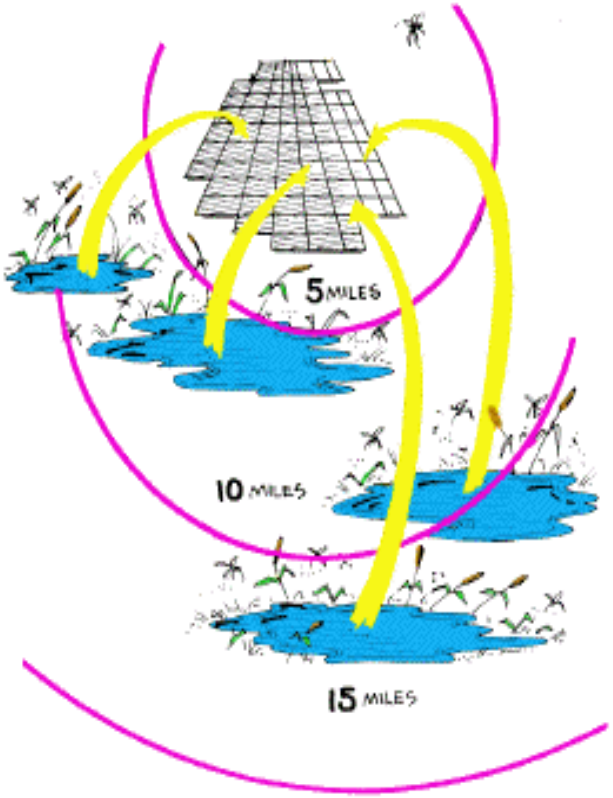
Mosquito Flight Range

- *Cs. melanura* – New York, 1986-7
  - 6.1 Miles

(J. Howard, et al. JME 26: 190-199.)

- *Aedes vexans* - Manitoba, 1979
  - 5.0 Miles

(R. Brust,. Can. Entomol. 112: 31-42.)



Integrated Pest Management IPM

- Integrated: using all means available
- Pest: anything that causes damage to humans, food or property
- Management: Using all the information available in a scientific manner

BCMCP Activities

- **Mosquito Viral Surveillance**: Cooperative program with the MA Department of Public Health to monitor for Eastern Equine Encephalitis, West Nile Virus and Highlands Jay in the adult mosquito populations. We use a variety of trap types depending on the environment and the species of mosquitoes wanted. Our trap types include, CDC Light traps baited with CO_2, Gravid traps, Resting boxes, UV Light traps and New Jersey Light traps.
- **Light Trapping Program**: Monitoring of the adult mosquito populations as to their type and number, useful to determine which areas have nuisance populations of mosquitoes and need control.
- **Spring and Summer Larviciding**: To reduce the emergence of adult mosquitoes in areas where mosquito larvae are present.

BCMCP Activities cont.

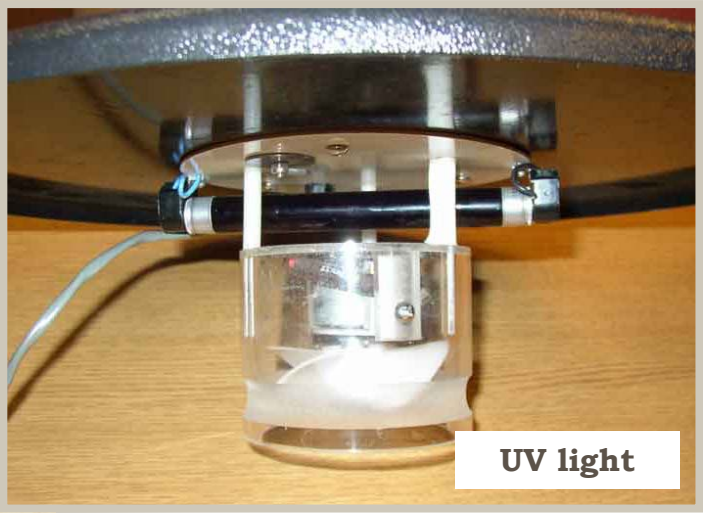
- **Catch Basin Treatment**: To stop mosquito emergence from rain-filled catch basins and storm drains.
- **Ground-Based Adulticiding**: Truck based ultra-low volume (ULV) adulticiding to control both nuisance and vector mosquitoes.
- **Water Management**: A year round endeavor to clean and maintain mosquito drainage ditches in areas to reduce standing water conducive to mosquito larvae.
- **Public Outreach**: Providing important information to the residents of the county with respect to personal protection against mosquito bites, mosquito breeding prevention on one's property and mosquito data.

Surveillance

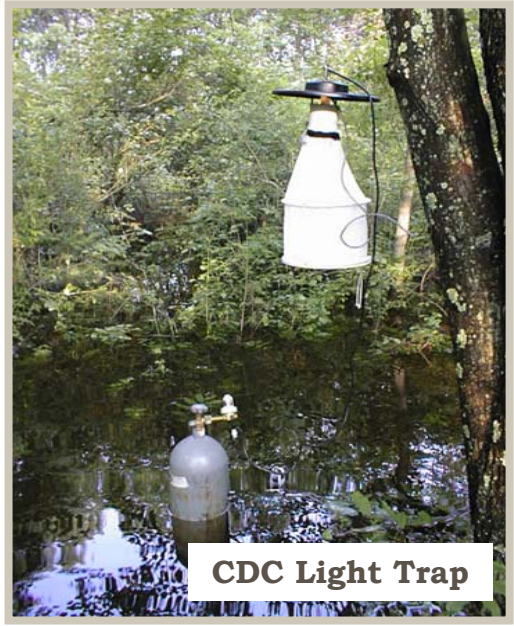
The Cornerstone of Integrated Mosquito Management

- Best when performed over long periods of time- Years not Days
  - Northern Bristol County- Hockomock Swamp, has over 50+ years of continuous trapping data
- Multiple traps set at same site
  - Decreases the chance of a trap failure
  - Increases the chance of finding a virus

Traps: Monitoring Tools


UV light

NJ Light Trap

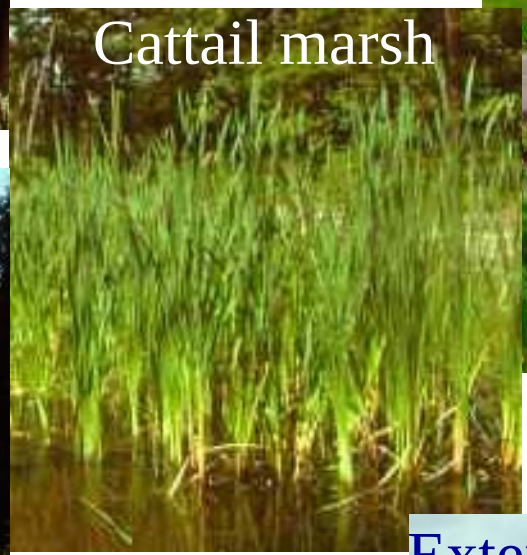

CDC Light Trap

Resting Boxes

Gravid Trap

Larviciding Locations

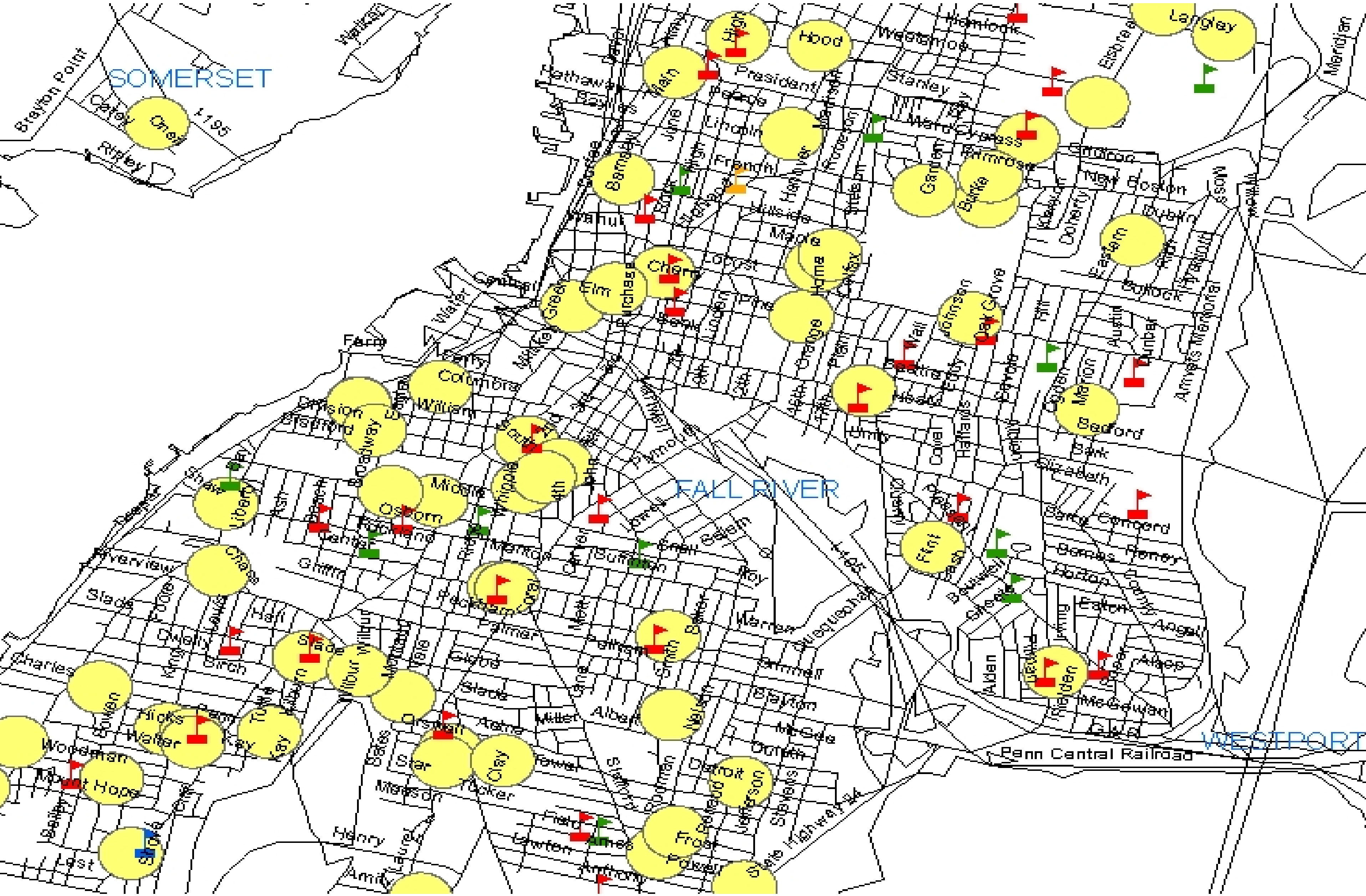
Summer floodwater in ditch



Cedar Swamp Crypts

Extensively flooded freshwater marsh extending into swamp

Adapco Monitor® ULV Unit



City of Fall River with school and day cares represented by flags and circles respectively. The flags represent a point at the school and does not contain all property owned or operated by the school. These areas are “spray restricted” under the Children’s and Families’ Protection Act.

GeoTracker - MABristol

File View Mission Maps Routes Waypoints Preferences Chemicals Trucks Drivers Tools Help

4509: 08/24/06 04:47

Pts Lines

Pts Lines

Pts Lines

Pts Lines

Run REPORT CLOSE

4509: 08/28/06 04:36

Pts Lines

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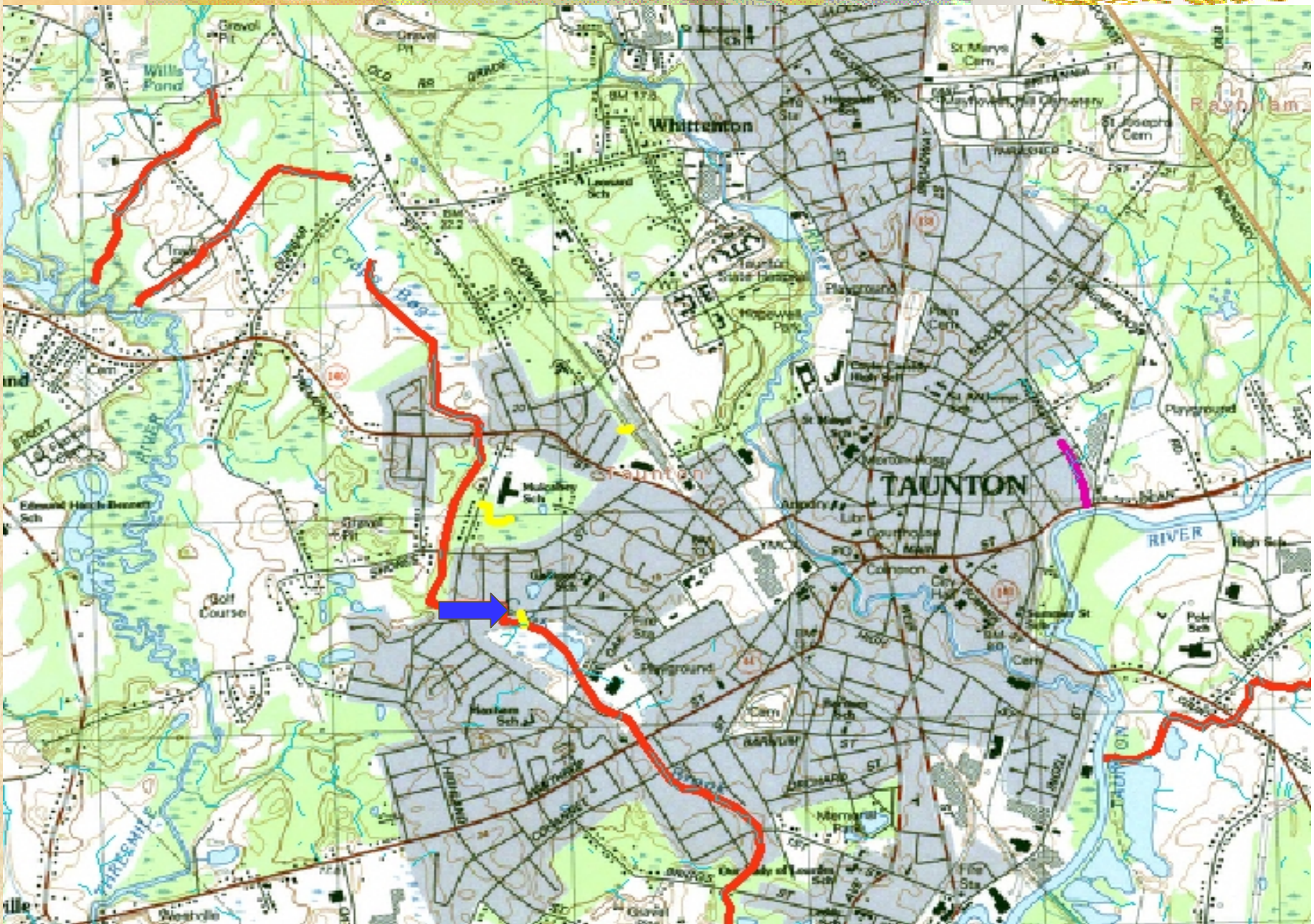
Run REPORT CLOSE

Ready -- Scale: 1.09

start Inbox - Outlook Express GeoTracker - MABristol 1:38 PM

GIS Ditch Work



DITCH DIGITIZE.mxd - ArcMap - ArcView

File Edit View Insert Selection Tools Window Help

1:27,182 | Search | Editor | Task: Create New Feature | Target:

Layers
- Wayne's Ditch
- Pending Sites
- DITCH
- Half-Meter Color Orthos (MrSID Mc
- MA Towns
  - Boundaries
    - Towns
    - Interstate
    - Coast
  - Towns
- USGS Topographic Maps

Display | Source | Selection

Identify Results

Layers: <Top-most layer>

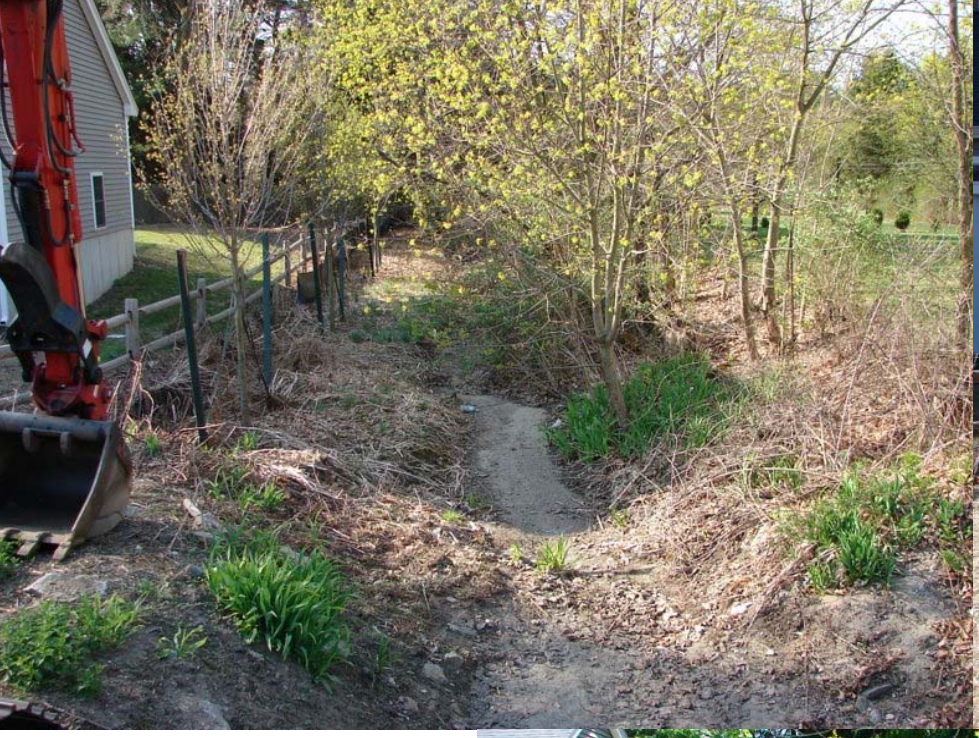
Wayne's Ditch
0

Location: (232261.797077 849953.896668)

Field	Value
FID	25
Shape	Polyline
Id	0
Project	TA-03-011
LENGTH_FT	200
LENGTH	61

Drawing | Arial | 10

144.32 528.12 Miles



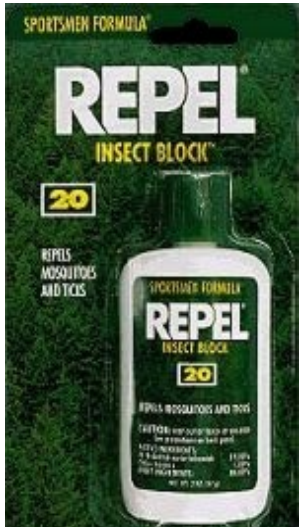
Attleboro

Seekonk

New Bedford

Public Outreach
Protecting Yourself

- Avoid outdoor activities at dusk and dawn
  - Wear long sleeves and pants when outdoors
- Use repellents and follow the label:
  - DEET
  - Picaridin
  - Oil of Lemon Eucalyptus
  - Permethrin (great for ticks)
- Remove Standing Water



Research and Development

- Bottle Bio-assay & Resistance Testing- larvicides and adulticides
- EPA Clean Water- NPDES permits
- Invasive Species monitoring- Asian Tiger Mosquito
- School-based programs including internships, science fair mentors and judges
- Presentations at Scientific Meetings
- USDA NE-IPM competitive grant program panel

Determining the susceptibility of *Culiseta melanura* to *Bacillus sphaericus* (Serotype H5a5b Strain 2362) in a laboratory bioassay

Wayne Andrews and Priscilla Matton

Bristol County Mosquito Control Project, Taunton, Massachusetts 02780

Introduction

There is a close association between Eastern Equine Encephalitis virus and cedar swamps, in particular white cedar swamps along the East coast of the United States. The main reason for this association is the mosquito *Coliseta melanura*, principal enzootic vector of EEEV, utilizes these cedar swamps for their larval habitat. Larvae tend to favor crypts under mature cedar trees where the pH is 3.0 or lower. The adaptation to living in this environment provides protection from pathogens and predators. In many regions, cedar wetlands are refugia for species that are rare, endangered, or threatened locally or nationally (Lederman 1989). The need for transitional mosquito control products for use in these environmentally sensitive areas is important.

Figure 1. Distribution of Cedar Swamps in the Northeastern United States. Cedar swamps highlighted in green. [illegible]

Purpose

A series of experiments were conducted to determine if *Cs. melanura* 4th instar larvae are susceptible to the bacteria *Bacillus sphaericus* and at what concentrations.

Materials and methods

Culiseta melanura Susceptibility Test Protocol

Test System:

Bioassay will be carried out in standard bioassay cups (120 ml plastic). Each cup will first be filled with 90 ml of field collected crypt water (pH 4.0). Twenty 3rd instar or early 4th instar *Cs. melanura* in de-ionized distilled water (no more than 1 ml) will be added to each cup. One drop of larval food (2 g of nettle and pelle ground TetraMin® fish food in 20 ml distilled water) will also be added to each cup.

Appropriate quantities of the serial dilutions of test material will be added to produce the desired concentrations. De-ionized, distilled water will then be added to produce a final volume of 100 ml per cup. All concentrations tested in the final bioassays, including the untreated controls, will be replicated three times.

Test Material:

VectoLex® WDG – 475 *B. sphaericus* ITI Water Dispersible Granule will be used in performance of the bioassays.

Test Concentrations:

Test concentrations should be selected following a non-replicated, range finding assay using the following concentrations of test material: 0.15 ppm, 0.2 ppm, 0.15 ppm, 0.1 ppm, 0.02 ppm, 0.002 ppm, and 0.00 ppm (UTC). Results of this assay will be used to select a range of five concentrations for the final assays with the objective of having the LC_{50} and LC_{90} fall within the selected range.

Materials and methods (cont.)

Range-finding Stock Suspensions and Dilutions:

Initial suspension (1%) will be prepared by adding 1 g of test material to 99 ml of de-ionized, distilled water and vigorously shaking the suspension in a flask for 1 minute. Gentle agitation using a magnetic stirrer will be maintained to keep this and subsequent dilutions in suspension. A second serial dilution will be made by adding 1 ml of the first suspension to 99 ml of de-ionized, distilled water under moderate agitation to produce a concentration of 100 ppm (mg/L). A final range-finding stock suspension with a concentration of 2.5 ppm will be produced by adding 1 ml of the second dilution to 39 ml of de-ionized, distilled water and maintaining under similar agitation.

Sample Weight

	Unit (g/ml)	INTO	FINAL CONC
FIRST DILUTION (1:99)	1	100 ml	10000 mg/L
SECOND DILUTION (1:99)	1	100 ml	100 mg/L
STOCK CONC. (1:39)	1	40 ml	2.5 mg/L

Preparation of Range-finding Dilutions:

A single, non-replicated set of cups containing the range-finding concentrations will be prepared as described above under "Test System". Concentrations to be used are shown below.

TOTAL VOLUME	100 ml
HIGHEST CONC.	0.25 mg/L
MAX. STOCK APPLIED	10 ml
STOCK CONC.	2.5 mg/L

CONC. mg/L	mg/CUP	STOCK APPLIED
0.250	0.0250	10.0 ml
0.200	0.0200	8.0 ml
0.150	0.0150	6.0 ml
0.100	0.0100	4.0 ml
0.050	0.0050	2.0 ml
0.025	0.0025	1.0 ml
0	0	0.0

Bioassay Conditions:

Treated cups with larvae will be held in low-light conditions at 17 to 20°C between treatment and taking mortality readings.

Mortality Readings:

Mortality of larvae will be read at 24, 48, 96, 144 and 192 hours after treatment. Moribund larvae that do not surface to breathe or exhibit an erratic response when probed will be counted as dead. Both live and dead larvae will be counted and recorded, but only live larvae will be considered in calculations, to avoid errors due to potential larval cannibalism.

Selection of Final Concentrations:

Range-finding bioassay results will be plotted in order to estimate in which range the LC_{50} and LC_{90} will be found. It may be necessary to repeat the range-finding assay before selecting the final concentrations.

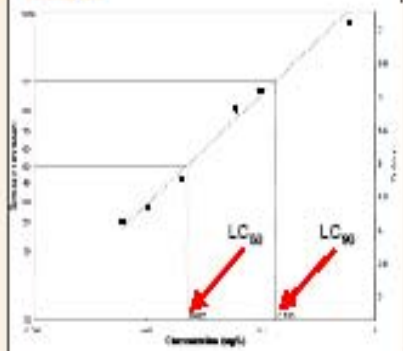
Final Bioassays:

Final bioassays will be carried out similarly to the range-finding assays replicating each treatment three times simultaneously. It will be important to attempt to complete final bioassays with larvae of approximately the same age/size as the range-finding assays.

Data Analysis:

Mean percent mortality will be calculated for each concentration tested, and data will be subject to logit/probit analysis to estimate LC_{50} and LC_{90} values and associated 95% confidence intervals for the materials tested.

Results



Dose	Number	Dead	Corrected Response	Concentration	Log Dose (base 10)	Probit Response
1	60	6	0.06	0.00	[illegible]	[illegible]
2	60	6	0.07	0.00	[illegible]	[illegible]
3	60	6	0.07	0.00	[illegible]	[illegible]
4	60	10	0.13	0.05	[illegible]	[illegible]
5	60	16	0.23	0.10	[illegible]	[illegible]
6	60	34	0.53	0.15	[illegible]	[illegible]
7	60	54	0.87	0.25	[illegible]	[illegible]

Statistics

Dose	N	% Dead
1	180	5.0
2	180	Saturated 0.5
3	0.000	
4	0.000	
5	0.000	
6	0.000	
7	0.000	
Control	0	
7	0.000	Saturated 0.001

LETHAL CONCENTRATION (95 % CI)

LC	CONC. (mg/L)	LOWER LIMIT (mg/L)	UPPER LIMIT (mg/L)
25	0.009	0.005	0.011
50	0.022	0.018	0.028
75	0.058	0.045	0.079
90	0.135	0.096	0.217
95	0.225	0.149	0.404
99	0.585	0.338	1.303

Conclusions

Cultivated *Cs. melanura* 4th instar larvae are susceptible to the bacterium *Bacillus sphaericus* (Serotype H5a5b Strain 2362). We screened field collected 4th instar *Cs. melanura* from 0.0 mg/L to 0.200 mg/L. We found that this mosquito has a LC_{50} of 0.022 mg/L and a LC_{90} of 0.135 mg/L. Mortality could not be determined until day 7 at an average temperature of 16.2°C. These concentrations are 10 to 100 times lower when compared to application rates for control of *Culex pipiens*, and well within the recommended application rates.

Performing the laboratory experiment with field collected crypt water provided additional information. The pH of 4.3 did not adversely effect the efficacy of VectoLex® WDG.

To date, there are only a few successful products shown to control *Cs. melanura* in field studies. Methoprene (1 Briseze) (Woodrow et al. 1991), granular bacteriae (1 Briseze), and granular abatiza (1 Briseze) (Hayes 1962) were effective in controlling the larvae. Wettable DDT dust was unsuccessful as a winter prebloom control measure at a rate of 1 to 2 Briseze (Hayes 1962).

Future field studies would include placing specified amounts of *B. sphaericus* in *Cs. melanura* crypts. The deposition and diffusion of the larvicide into the larval crypts would be measured. The bioassay technique employed in this study could be used to determine developing resistance of *B. sphaericus* in other mosquito species, such as *Cx. pipiens* and *Cs. bergiana*.

Literature cited

Hayes, D.C. 1962. Studies of the control of larvae of *Coliseta melanura* (Coquillett). Mosq. News 22:137-141.

Lederman, A.D. 1989. Comparative community structure of *Ochlerotatus sticticus* larval habitat: canopy density. Wetlands 9:210-230.

Lederman, A.D. 1989. The ecology of cedar White-cedar swamps with an emphasis on *Coliseta melanura*. U.S. Fish Wildl. Serv. Biol. Rep. 89(7.13).

Woodrow, R.J., J.J. Howard, D.J. White. 1991. Preliminary results with methoprene, temephos, and *Bacillus thuringiensis* serovar *israelensis* for the control of larval *Coliseta melanura*. J. Am. Mosq. Control Assoc. 7(4):424-427.

Acknowledgments

We would like to thank Dow DeCoast Valent BioSciences Corporation for personal development and preparation of sample material, John Smith, Florida County Mosquito Control Project for assistance in the collection of *Cs. melanura*.

For further information

Please contact bmatton@[illegible] or wandrews@[illegible]. More information on this and related projects can be obtained at www.[illegible]/MCCD/[illegible]/

West Nile Virus (WNV)
&
Eastern Equine Encephalitis (EEE)

Why do we have WNV?

Culex pipiens

- Common name: *Northern House Mosquito*
- Will readily enter into homes
- Larval habitat- General, high pollution tolerance
- Primarily bird feeder but will feed on mammals
- Greatest risk for transmission is from late July through September
- Overwinters as an adult female

WNV Monitoring Tool: Gravid Traps

- Gravid = Full of Eggs
  - Females already had a blood meal and possible exposure to an arbovirus
- Uses “stink water” to attract mosquitoes
- Females come to lay eggs on the water surface
- Fan pulls the mosquitoes up into a collection chamber

What Residents Can Do To Reduce Mosquito Populations

Backyard Breeding Sites:
Clogged Gutters, Trash Barrels, Empty Flower pots, Buckets, Wheel Barrels, Animal Water Troughs and anything that can hold water

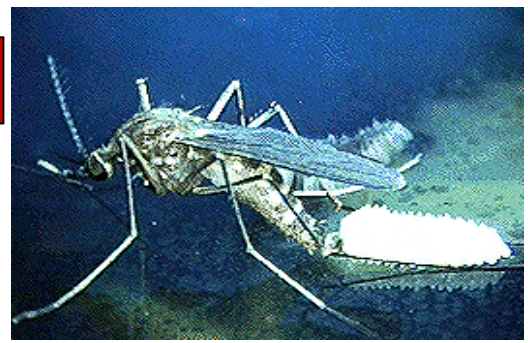
WNV Transmission Cycle

Various Potential Bridge Vectors

Birds act as reservoirs for the virus. Crows, Hawks, Blue Jays and Kestrels can die from WNV infection because they are native species

Various Potential Bridge Vectors

People serve as dead-end host, meaning they are unable to pass the virus on to anything including another mosquito



Culex spp. are the main amplification vector in the WNV cycle

Horses serve as dead-end host, meaning they are unable to pass the virus on to anything including another mosquito

Recent WNV Summary

2004 -2006

9 Human Cases

0 Equine Cases

157 Mosquito Isolates

2007

6 Human Cases

0 Equine Cases

65 Mosquito Isolates

2008

1 Human

0 Equine

136 Mosquito Isolates

2009

0 Human

1 Equine

26 Mosquito Isolates

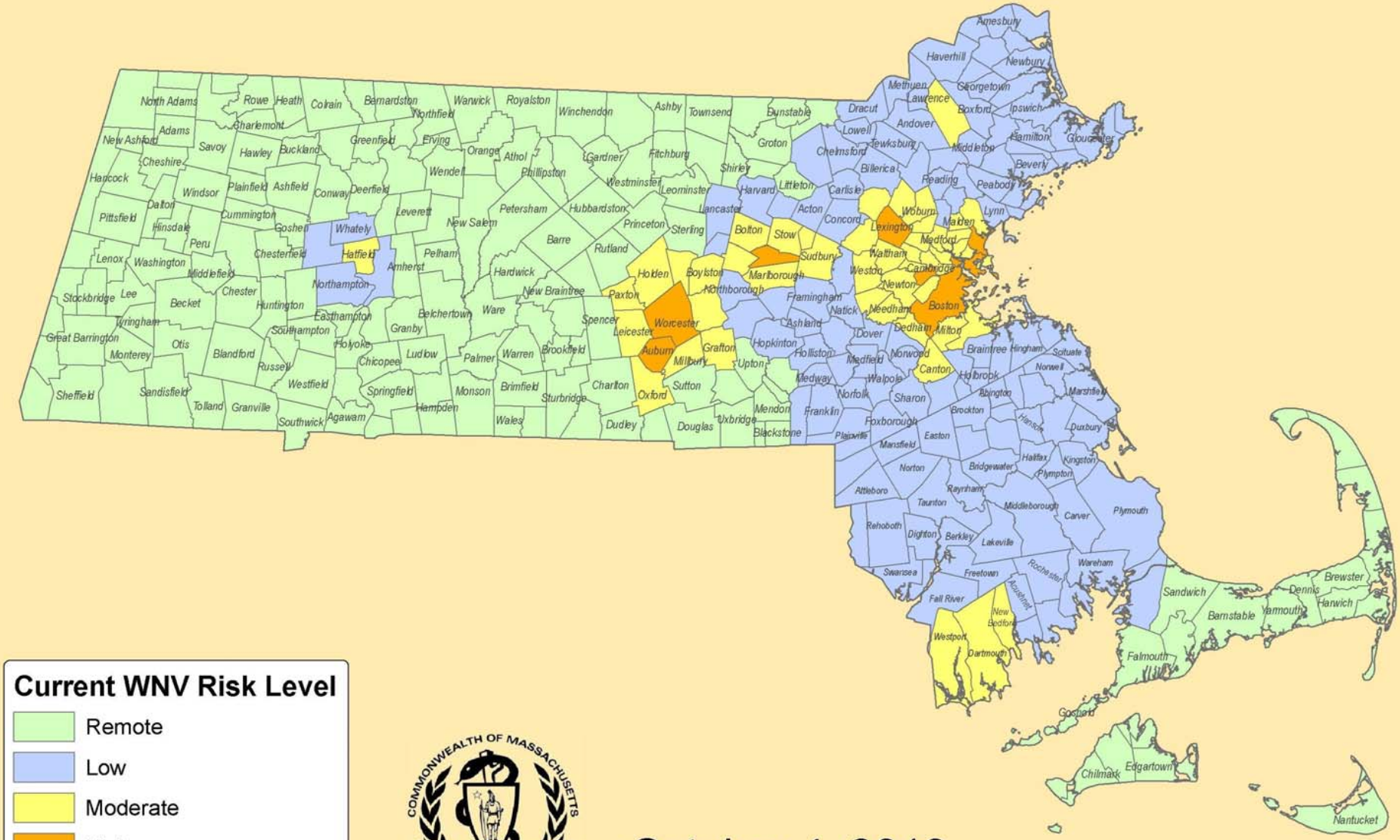
2010

5 Human

1 Equine

121 Mosquito Isolates

Massachusetts WNV Risk Categories



Current WNV Risk Level

- Remote
- Low
- Moderate
- High
- Critical

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC HEALTH

October 4, 2010

State Laboratory Institute
Arbovirus Surveillance Program

Why do we have EEE?

Culiseta melanura

- White Cedar swamps provide larval habitat
  - Crypts under tree roots
  - Hockomock, Bolton and Pine Swamp
- Historically feeds primarily on birds, with recent evidence of human, cow and horse blood- The Connecticut Agricultural Experiment Station
- Overwinters in the larval stage

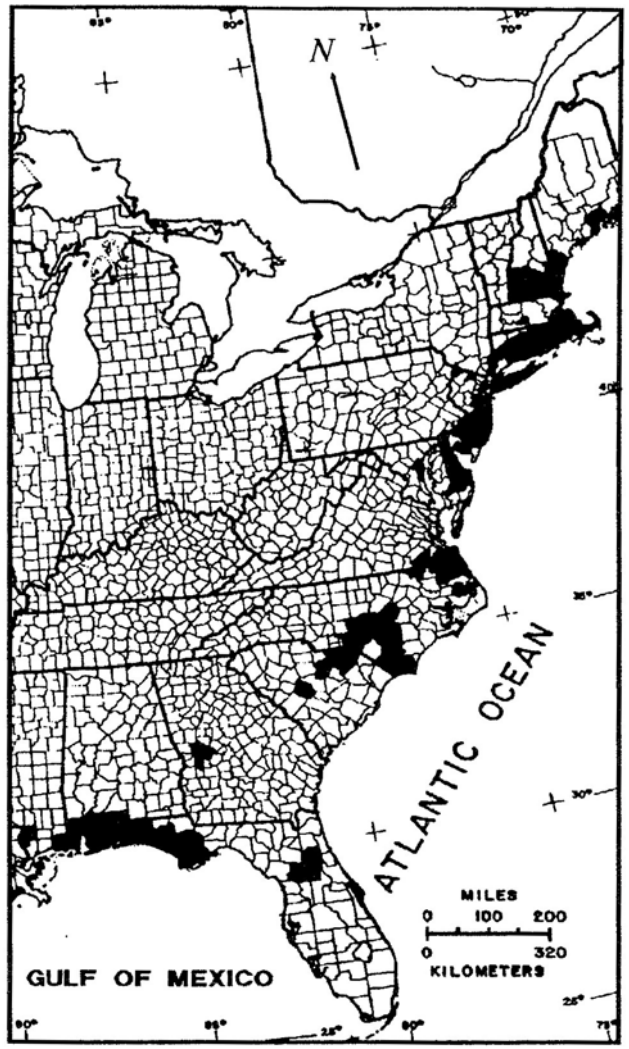


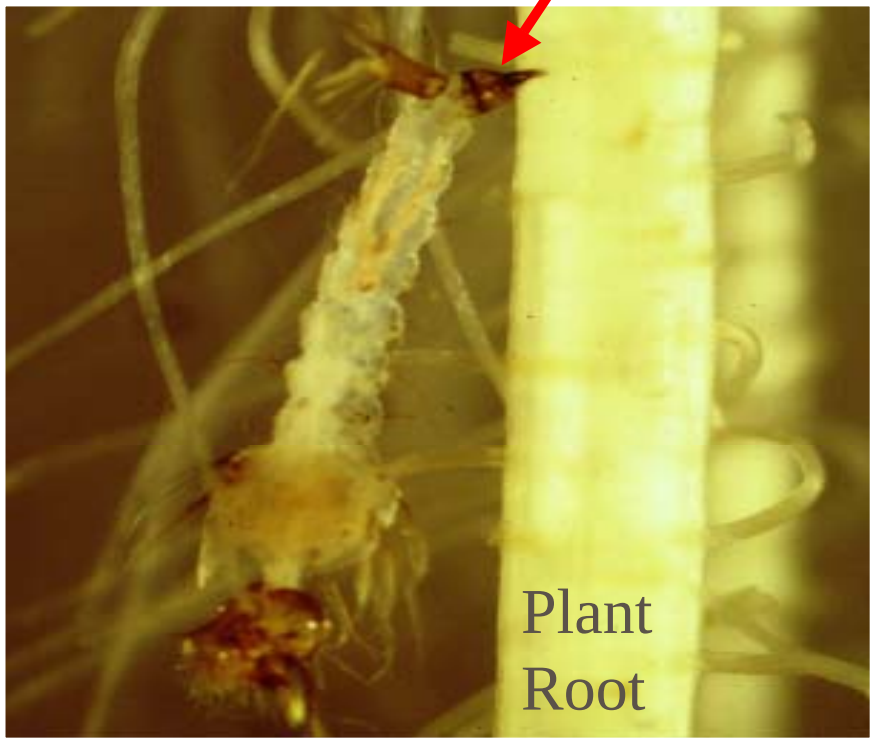
Figure 1. Distribution of *Chamaecyparis thyoides*. Records were compiled from field observations, herbarium records, published sources, and personal communications. Counties in which Atlantic white cedar has been found are inked in black (from Laderman 1982).

Why do we have EEE?

Cq. perturbans

- Common name: *Cattail Mosquito*
- Important Bridge Vector
- Cattail plants provide larval habitat
- Opportunistic feeder
- Overwinters in the larval stage

Breathes air through plant root



EEE Monitoring Tool: CDC CO_2-baited Light Traps

- Collects a variety of insects that are attracted to CO_2 and light
- Collects mosquitoes searching for a blood meal
  - Unknown if mosquitoes have been exposed to an arbovirus

Cs. melanura/ *Cq. perturbans* Habitat

Cs. melanura Habitat

EEE Transmission Cycle

Cq. perturbans

Passerine Birds act as reservoirs for the virus, which include: Red-winged Blackbirds, Blue Jays, and Chickadees. Starlings and House Sparrows can die from EEE infection because they are an introduced species.

Various Potential Bridge Vectors

People serve as dead-end host, meaning they are unable to pass the virus on to anything including another mosquito

Main amplification vector in the EEE cycle

Horses serve as dead-end host, meaning they are unable to pass the virus on to anything including another mosquito

Recent EEE Summary

2004 -2006

- 13 Human Cases
- 17 Equine Cases
- Emu, Llama, Alpaca
- Mosquito Isolates: (39-157)

← Aerial Intervention →

State based process

2010

2 Human

4 Equine

65 Mosquito Isolates

2007

0 Human Cases

0 Mammal Cases

31 Mosquito Isolates

2008

1 Human

1 Equine

13 Mosquito Isolates

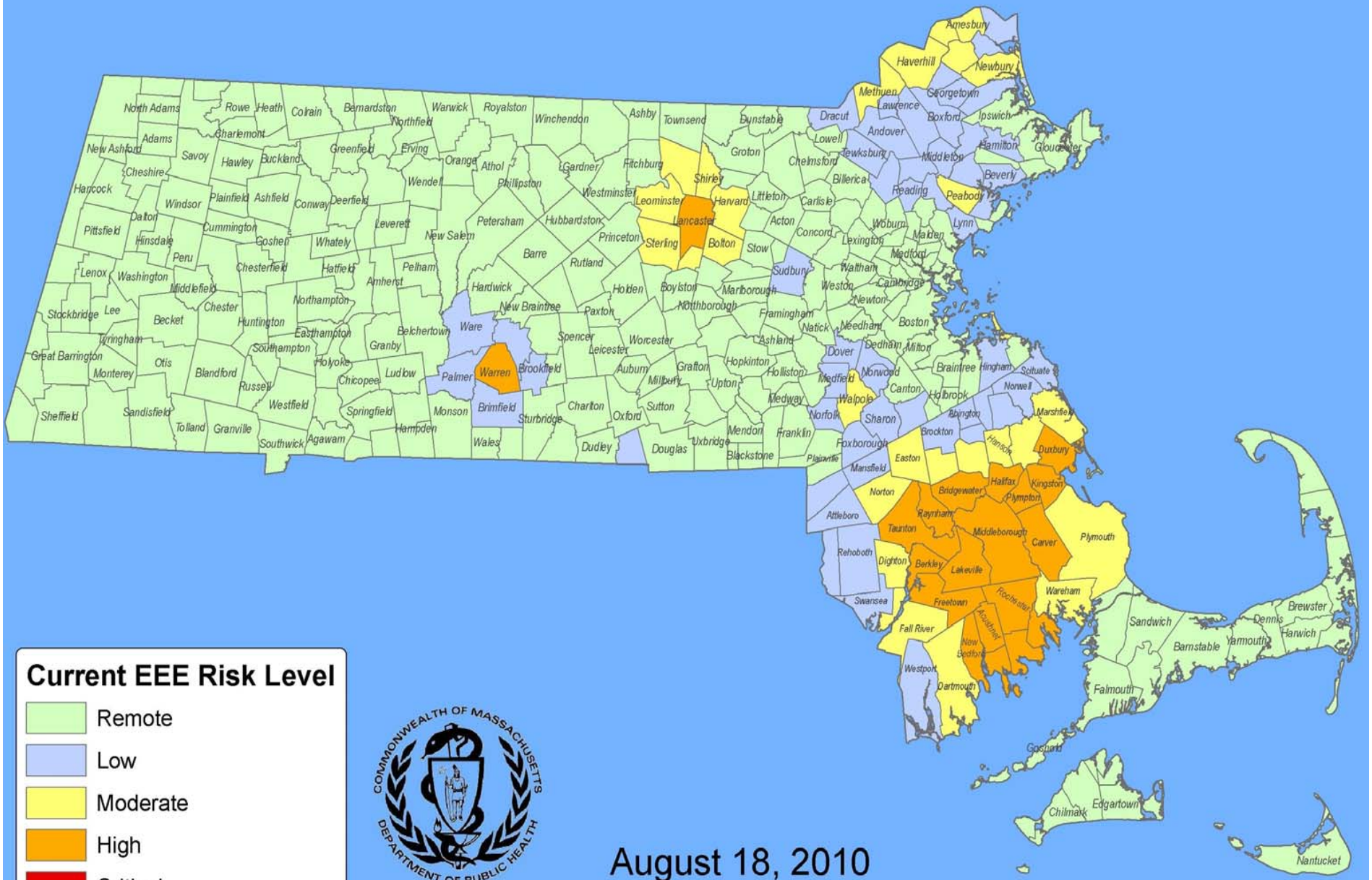
2009

0 Human

3 Mammal

54 Mosquito Isolates

Massachusetts EEE Risk Categories



Contact Information

- **Address:** **Bristol County Mosquito Control Project**

140 North Walker St.

Taunton, MA 02780

508-823-5253

RequestBristolMCP@comcast.net

- **Email Questions:**

Wayne Andrews: brismosqwa@comcast.net

Priscilla Matton: brismosqpc@comcast.net

FY 2010 MONTHLY EXPENSE REPORT

Bristol County Mosquito Control

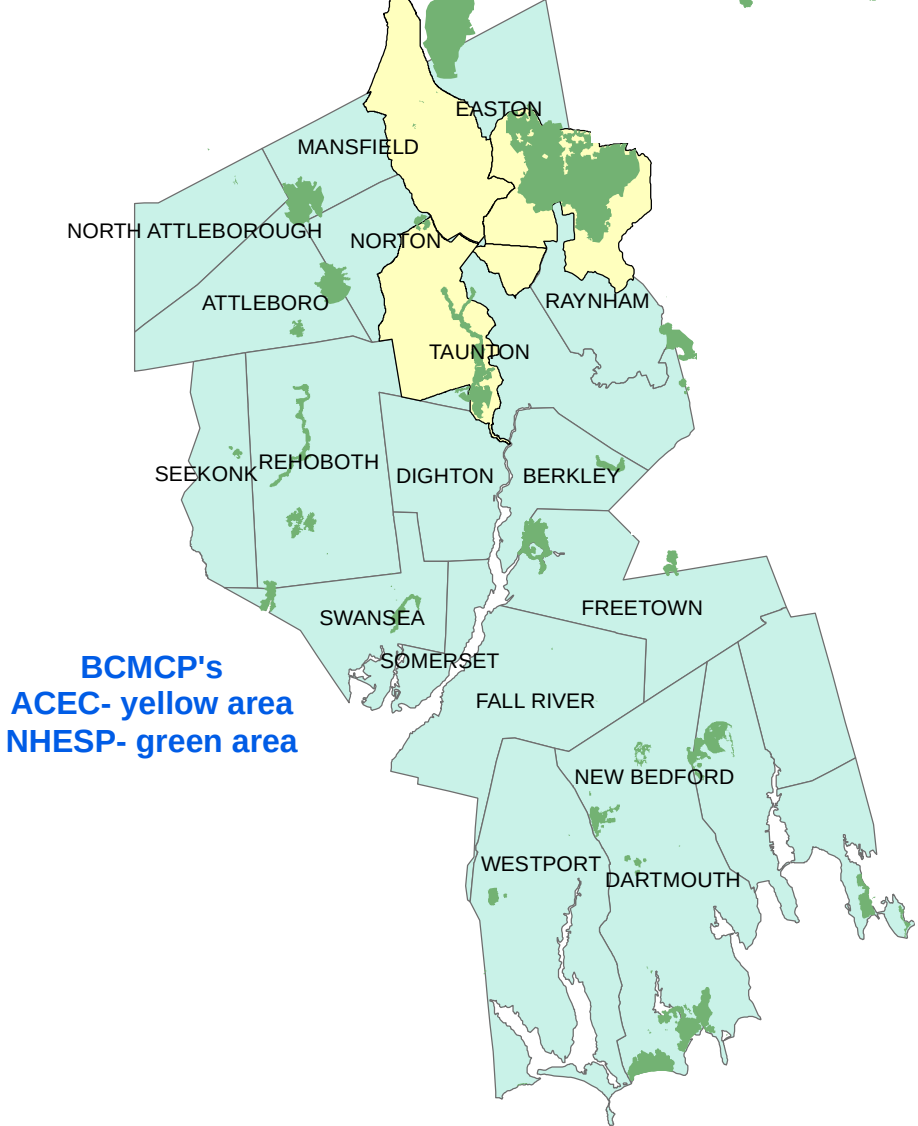
FY 2010

FY2010 BUDGET	$794,609.00
CARRYOVER	$645,356.00
TOTAL BUDGET	$1,439,965.00

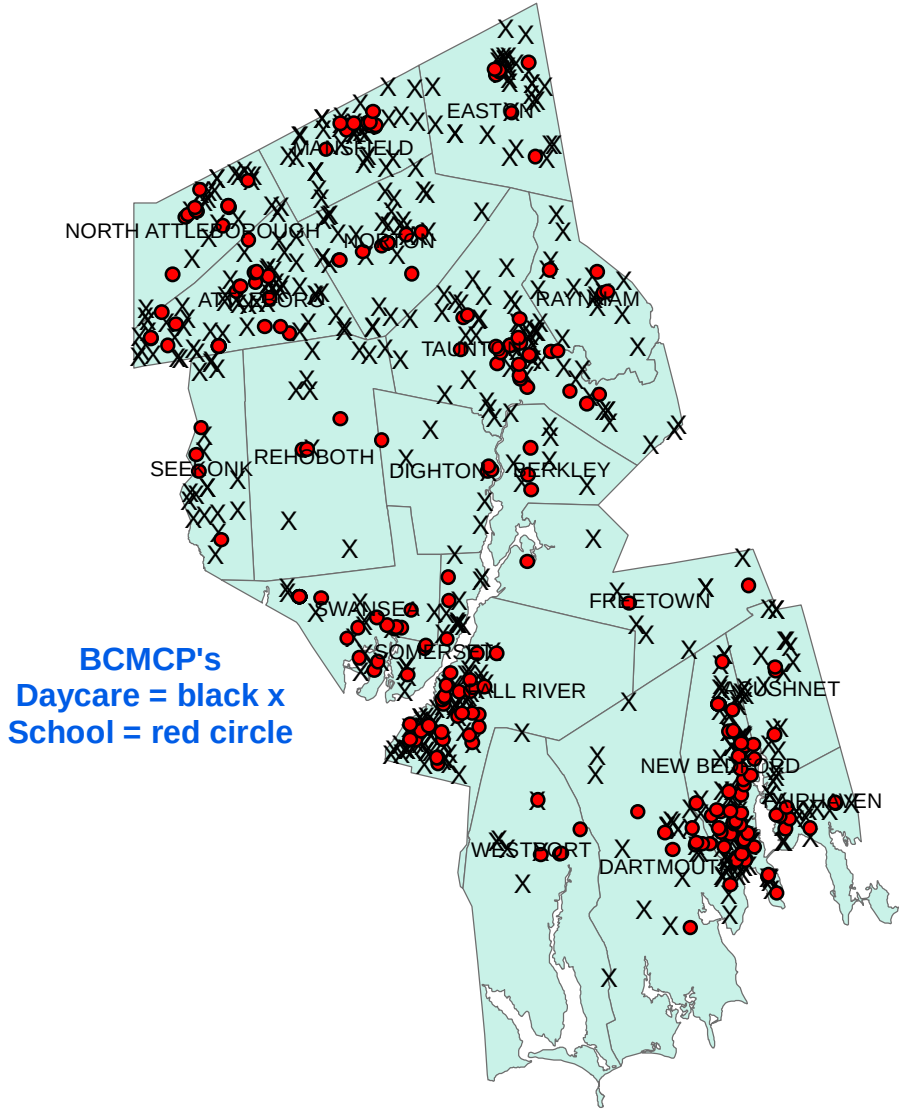
	APPROP.	JULY	AUG	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	YTD TOTAL
SUB AA														
PAYROLL	557,318.00	50,719.67	44,325.16	40,234.56	35,549.82	33,662.95	34,470.03	51,525.60	34,483.31	35,649.49	36,491.04	36,636.48	74,369.91	508,118.02
(contract seasonal)	23,000.00													
SUB BB														
EXPENSES, TRAVEL	3,750.00		260.29	286.90	154.70	52.80	665.56	122.30	175.84	115.20	1886.29	147.96	503.05	4,370.89
SUB AMTS														
COMMISSIONERS		150.00		200.00	1,400.00	400.00	400.00	500.00	400.00	400.00	400.00	400.00	800.00	5,450.00
SUB DD	218,335.00													
RET.; INS.; TAXES		104,641.00	5000.32	7,634.31	11,789.02	7,347.31	7,576.40	7,632.44	7,433.43	7,534.78	11,277.16	7,788.75	21,726.12	207,381.04
SUB EE	29,575.00													
OFFICE EXPENSES		398.30	32.47	491.97	2,416.14	217.78	19,340.45	363.07	918.39	2.29	379.57	752.51	48.28	25,361.22
SUB FF	17,800.00													
VEHICLE MAINT-REPAIR		1,222.49	564.04	565.80	987.61	46.22		3,790.20	3,481.69	3,857.54	1,421.58	4,858.84	2,497.64	23,293.65
SUB GG	70,800.00													
RENT; FUEL; UTILITIES		5,654.43	5,722.44	5,077.53	4,345.86	4,258.55	4,661.04	6,941.90	3,939.66	6,154.66	4,762.99	4,932.25	5,398.37	61,849.68
SUB HH	0.00													
CONSULTANT SERV.														0.00
SUB JJ	19,500.00													
OPERATIONAL SERV.		2,958.64	1,491.46	2,644.34	1,580.04							392.88	57.00	9,124.36
SUB KK	96,000.00													
EQUIPMENT			61.64		227.32		494.46	54.23		47,300.00			59,042.17	107,179.82
SUB LL	18,200.00													
LEASE-PURCHASE		76.77	80.75	77.73	77.64	1,719.31	77.46	76.24	77.75	608.77	237.00	76.72	155.10	3,341.24
SUB NN	315,937.00													
INSECTICIDES		503.47	744.70	702.54							19,601.48	75,982.45		97,534.64
FACILITY-MAINT & REPAIR		260.87	15.10	78.88	804.12	147.61	850.99	696.64	493.05	372.50	618.78	735.37	34.91	5,108.82
SUB UU	69,750.00													
INFORMATION TECH		95.00	4,013.78	3,551.42	3,791.17	5252.75	3,882.96	2899.50	2059.96	1,380.85	683.81	2536.62	4,043.07	34,190.89
	1,439,965.00													1,092,304.27

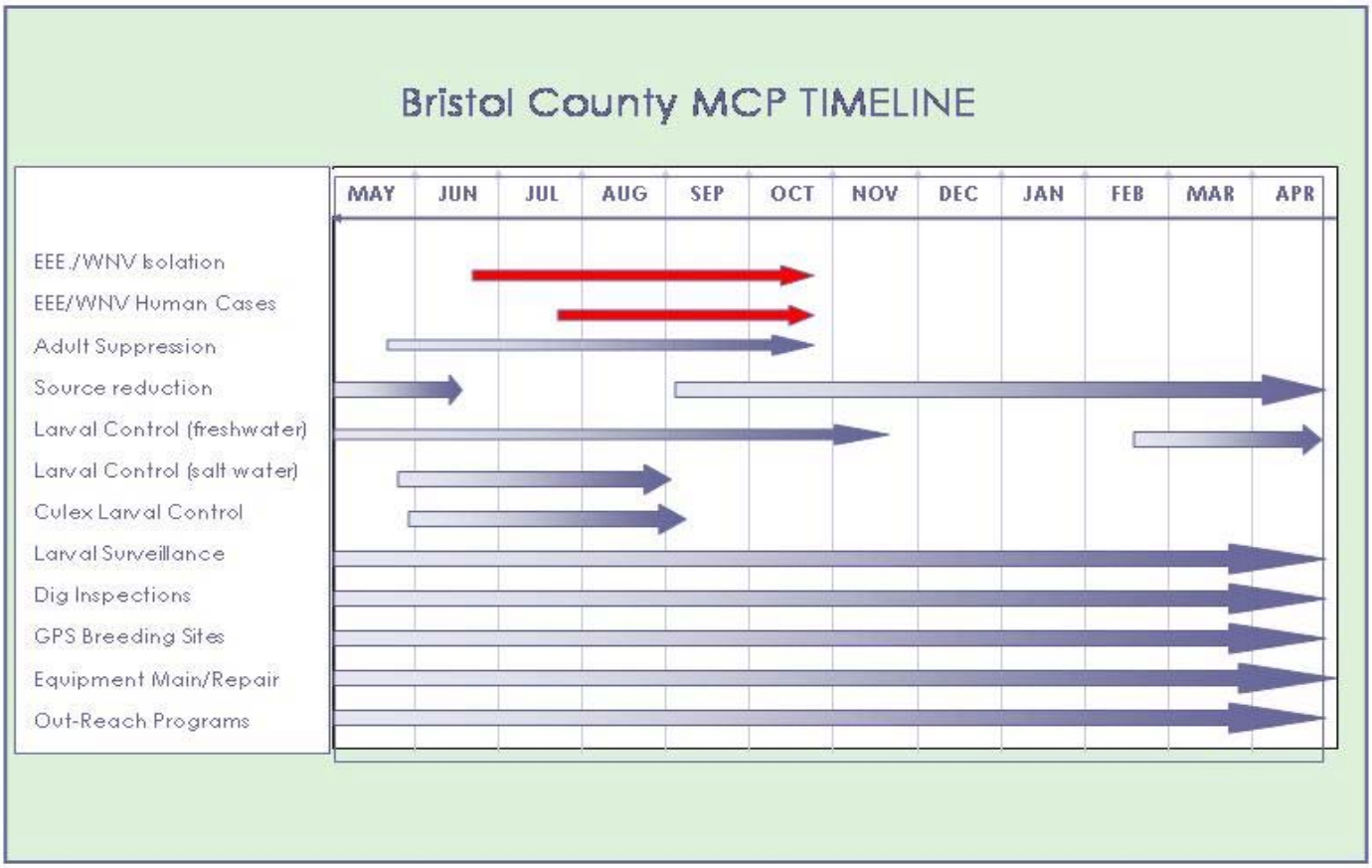
BCMCP BUDGET FUNDING CONTRIBUTIONS/CHERRY SHEET

TOWN	CITY/TOWN	FY2010
ACUSHNET	TOWN	$21,230
ATTLEBORO	CITY	$49,027
BERKLEY	TOWN	$17,465
DARTMOUTH	TOWN	$81,872
DIGHTON	TOWN	$22,204
EASTON	TOWN	$41,274
FAIRHAVEN	TOWN	$22,921
FALLRIVER	CITY	$64,625
FREETOWN	TOWN	$35,138
MANSFIELD	TOWN	$37,113
NEW BEDFORD	CITY	$56,276
NORTH ATTLEBOROUGH	TOWN	$39,694
NORTON	TOWN	$35,425
RAYNHAM	TOWN	$28,482
REHOBETH	TOWN	$45,831
SEEKONK	TOWN	$27,870
SOMERSET	TOWN	$22,804
SWANSEA	TOWN	$30,703
TAUNTON	CITY	$72,543
WESTPORT	TOWN	$57,779
TOTAL CONTRIBUTION		**$810,276**



BCMCP's
ACEC- yellow area
NHESP- green area


EASTON
MANSFIELD
NORTH ATTLEBOROUGH
NORTON
ATTLEBORO
RAYNHAM
TAUNTON
SEEKONK
REHOBOTH
DIGHTON
BERKLEY
FREETOWN
SWANSEA
SOMERSET
FALL RIVER
DUXBURY
NEW BEDFORD
FAIRHAVEN
WESTPORT
DARTMOUTH
BCMCP's
Daycare = black x
School = red circle


Bristol County MCP TIMELINE
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
EEE./WNV Isolation
EEE/WNV Human Cases
Adult Suppression
Source reduction
Larval Control (freshwater)
Larval Control (salt water)
Culex Larval Control
Larval Surveillance
Dig Inspections
GPS Breeding Sites
Equipment Main/Repair
Out-Reach Programs