

**MASSACHUSETTS MOSQUITO CONTROL  
ANNUAL OPERATIONS REPORT**

---



2011 Year of Report

Date of Report: January 11, 2011

Project/District Name: **Cape Cod Mosquito Control Project**

Address: 86 WILLOW STREET

City/Town: YARMOUTH PORT

Zip: 02675

Phone: 508 775 1510

Fax: 508 362 7917

E-mail: CCMCP@CCMCP.NET

**Report prepared by: Gabrielle Sakolsky, Assistant Superintendent and Caitlin Barrett**

If you have a mission statement, please include it here:

---

**ORGANIZATION SETUP:**

Please list your Commissioner's names:

Jere Downing, Chairman  
Charles Sumner, Vice Chairman  
J. Gregory Milne, Secretary  
James Quirk  
Arthur Neill

Please list the Supt./Director's name: John W. Doane

Please list the Supt./Director's contact phone number: 508 775 1510

Please list your Asst. Supt./Asst. Director's name: Gabrielle Sakolsky

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: 23

Part time:

Seasonal: 1

Other: (please describe)

Please break these down into the following areas:

Administrative staff: 3

Field staff: 20

Please check off all that apply, and list employee name(s) next to each category:

- Public relations John W. Doane, Superintendent, Gabrielle Sakolsky, Assistant Superintendent
- Information technology Caitlin Barrett
- Entomologist Gabrielle Sakolsky
- Wetland Scientist
- Biologist
- Education Gabrielle Sakolsky,
- Laboratory Gabrielle Sakolsky
- Operations John W. Doane
- Facilities Bart Morris
- Other (please list)

For the year of this report, we maintained:

16 vehicles

2 modified wetland equipment (list type) Piston Bulley with rotary ditcher & low ground pressure excavator

0 ULV sprayers (list type)

Larval control equipment (list type) 16 four gallon electric backpack sprayers

Other (please be specific):

**Comments:** Cape Cod Mosquito Control Project is overseen by five commissioners. One of these is appointed by the Cape Cod Selectmen and Town Councilors Association and one is appointed by the Cape cod Municipal Managers Association.

How many cities & towns in your service area? 15

Please list: Barnstable, Bourne, Brewster, Chatham, Dennis, Eastham, Falmouth, Harwich, Mashpee, Orleans, Provincetown, Sandwich, Truro, Wellfleet, Yarmouth

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

## **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):

Comments: \_\_\_\_\_

## **LARVAL MOSQUITO CONTROL:**

Do you have a larval mosquito suppression program? Yes

If yes, please describe the purpose of this program: The purpose of this program is to manage mosquito populations in Barnstable County below the nuisance level and to protect public health.

Please give the time frame for this program: April through October

Describe the areas that this program is used: All fresh water & salt water areas found to contain mosquito larvae.

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:** AquabacXT#62637-1, Aquabac G#62637-3, Agnique MMF#53263-28, Agnique MMF PAK 35#53263-30, BVA2#70589-1,

**Catch basins:** Altosid WSP#2724-448, Vectolex WSP#73049-20, Agnique MMF PAK 35#53263-30,

**Containers:** Altosid WSP#2724-448

**Other (please list):**

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

**Wetlands:** AquabacXT is 0.5 to 1 pint per acre AquabacG is 2.5 to 10 pounds per acre, Agnique MMF 02 to 1 gallon per acre, Agnique MMF PAK 35 is used at 10 lbs per acre, BVA 2 is 2 to 3 gallons per acre

**Catch basins:** Altosid WSP is 1 seven gram packet per basin, Vectolex WSP is 1 ten gram packet per basin, Agnique MMF PAK 35 is used at 1 packet per basin

**Containers:** Altosid WSP 1 packet per 135 ft of surface

**Other:**

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

Larval dip counts – please list trigger for application: 10 DIPS AVERAGE 5 MOSQUITO LARVAE PER DIP

Historical records

Best professional judgment

**Comments:** \_\_\_\_\_

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

### **ADULT MOSQUITO CONTROL:**

Do you have an adult mosquito suppression program? No

If yes, please describe the purpose of this program:

Please give the time frame for this program:

Describe the areas that this program is used:

Do you use:

**Truck applications**

- Portable applications
- Aerial applications
- Other (please list):

Comments: \_\_\_\_\_

Please list the names of the products used with EPA #:

- 1).
- 2).
- 3).
- 4).
- 5).
- 6).

Please list your application rates for each product:

- 1).
- 2).
- 3).
- 4).
- 5).
- 6).

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

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
- Complaint calls - please list trigger for application
- Arbovirus data
- Best professional judgment

Comments: \_\_\_\_\_

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

## **SOURCE REDUCTION**

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

If yes, please describe your program: We educate home and business owners to remove any containers on their property that would create larval habitat for mosquitoes

What time frame during the year is this method employed? yearround

Comments: \_\_\_\_\_

## **DITCH MAINTENANCE**

Do you have a ditch maintenance program? Yes

Please check all that apply:

- Inland/freshwater
- Saltmarsh

If yes, please describe: We remove obstructions in ditches that prevent water from flowing

Please check off all that apply INLAND DITCH MAINTENANCE:

- Hand tools
- Mechanized equipment
- Other (please list):

Comments: \_\_\_\_\_

Please check off all that apply SALTMARSH DITCH MAINTENANCE:

- Hand cleaning
- Mechanized cleaning
- Other (please list):

Comments: \_\_\_\_\_

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

**Hand cleaning 151,910 feet**

**Mechanized cleaning**

**Other (please list):**

Comments: \_\_\_\_\_

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

**Hand cleaning 50,807 feet**

**Mechanized cleaning 3,250 feet**

**Other (please list):**

What time frame during the year is this method employed? October 1<sup>st</sup> to April 1st

Comments: \_\_\_\_\_

**\*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:**

**Larvicide – catch basins:**

**Larvicide-hand/small area**                      **pre and post larval dip counts**

**Ground ULV Adulticide:**

**Source Reduction:**                      **Source reduction projects are only undertaken in response to high larval counts. Larval counts and amount of pesticide application is monitored in following years.**

**Open Marsh Water Management:**

**Other (please list):**

Provide or list standard steps, criterion, or protocols regarding the documentation of efficacy, (pre and post data) and resistance testing (if any): **All larval habitats are monitored regularly throughout the treatment season. Data is entered into a GIS data base and reviewed in a timely manner. Larvicide efficacy is checked at the beginning and the end of the season at a minimum of 18 sites. Source reduction projects are evaluated on a yearly basis.**

### **OPEN MARSH WATER MANAGEMENT**

Do you have an OMWM program? No

If yes, please describe:

Please give an estimate of total square feet or acreage:

What time frame during the year is this method employed?

Comments: \_\_\_\_\_

**\*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: none

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

- |   |                                 |
|---|---------------------------------|
| <input checked="" type="checkbox"/> Gravid traps                      |                                 |
| <input checked="" type="checkbox"/> Resting boxes                     |                                 |
| <input checked="" type="checkbox"/> CDC light traps                   | <input type="checkbox"/> Canopy |
| <input checked="" type="checkbox"/> CDC light traps w/CO <sub>2</sub> | <input type="checkbox"/> Canopy |
| <input type="checkbox"/> ABC light traps                              | <input type="checkbox"/> Canopy |
| <input type="checkbox"/> ABC light traps w/CO <sub>2</sub>            | <input type="checkbox"/> Canopy |
| <input type="checkbox"/> NJ light traps                               | <input type="checkbox"/> Canopy |
| <input type="checkbox"/> NJ light traps w/CO <sub>2</sub>             | <input type="checkbox"/> Canopy |

Other (please describe): Bioquip EVS light traps used with carbon dioxide

Please describe the purpose of this program: To sample adult mosquito populations to assess efficacy of our larval control project and monitor for the presence of arbovirus

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

If yes, please describe how you chose these long-term sites. Long term sites for resting boxes were chosen based on the presence of *Culiseta melanura* and roosting bird populations. Gravid traps are placed in locations where there are high *Culex* populations or where crows congregate as a sentinel. Long term light traps locations are placed in a variety of habitats to target certain mosquitoes of concern. This includes control sites where larviciding is not permitted.

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

- |   |   |
|---|---|
| <input type="checkbox"/> <i>Ae. albopictus</i>            | <input checked="" type="checkbox"/> <i>Oc. cantator</i>       |
| <input type="checkbox"/> <i>Ae. cinereus</i>              | <input checked="" type="checkbox"/> <i>Oc. excrucians</i>     |
| <input type="checkbox"/> <i>Ae. vexans</i>                | <input type="checkbox"/> <i>Oc. fitchii</i>                   |
| <input type="checkbox"/> <i>An. punctipennis</i>          | <input checked="" type="checkbox"/> <i>Oc. j. japonicus</i>   |
| <input type="checkbox"/> <i>An. quadrimaculatus</i>       | <input type="checkbox"/> <i>Oc. punctor</i>                   |
| <input checked="" type="checkbox"/> <i>Cq. perturbans</i> | <input checked="" type="checkbox"/> <i>Oc. sollicitans</i>    |
| <input checked="" type="checkbox"/> <i>Cx. pipiens</i>    | <input type="checkbox"/> <i>Oc. stimulans</i>                 |
| <input checked="" type="checkbox"/> <i>Cx. restuans</i>   | <input checked="" type="checkbox"/> <i>Oc. taeniorhynchus</i> |
| <input checked="" type="checkbox"/> <i>Cx. salinarius</i> | <input type="checkbox"/> <i>Oc. triseriatus</i>               |
| <input checked="" type="checkbox"/> <i>Cs. melanura</i>   | <input type="checkbox"/> <i>Oc. trivittatus</i>               |
| <input type="checkbox"/> <i>Cs. morsitans</i>             | <input type="checkbox"/> <i>Ps. ferox</i>                     |
| <input checked="" type="checkbox"/> <i>Oc. abserratus</i> | <input type="checkbox"/> <i>Ur. sapphirina</i>                |
| <input checked="" type="checkbox"/> <i>Oc. canadensis</i> |   |

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:

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

Please explain:

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

**WNV: remote**  
**EEE: Remote**

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

**WNV: remote**  
**EEE: remote**

What time frame during the year is this method employed?

**Comments:** \_\_\_\_\_

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

## **EDUCATION, OUTREACH & PUBLIC RELATIONS**

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

If yes, please describe: We present educational programs to a variety of organizations in Barnstable county. Our field crews hand out informational pamphlets to homeowners.

Please check off all that apply:

- School based program
- Website
- PR brochures/handouts
- Community events

Science fairs

Meeting presentations

X Other (please describe): Annual Budget and Operations meeting with public notice

Please give an estimate of attendance/participants in this program: 1200

Please list some events you participated in for the year of this report: Cape Cod Community College Environmental Technology lectures; Green Briar Nature Center Animal Day exhibit, Classroom programs at Yarmouth elementary school, Educational Program at Cape Cod Academy, Town Boards of Health meetings, Barnstable County Review Committee

What time frame during the year is this method employed? yearround

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

If yes, please elaborate on your research projects: We evaluated different trap designs for greenhead fly control

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

If yes, please elaborate on your collaborations this past year: We work closely with Dr. Aimlee Laderman, Director of the Swamp Research Center at the Marine Biological Laboratory regarding Atlantic white cedar swamps; Dr. Steven Mihok, inventor of NZI traps evaluating trap designs in Northeast U.S. marshes

Please provide a list of technical reports, white/grey papers, publication in journal or trade magazines, etc. Pesticide Environmental Stewardship Program reports to EPA, Wetlands and Mosquitoes paper in progress, NZI trapping paper in progress

Does your staff participate in educational opportunities? Yes

If yes, please list the training and education your staff received this year: Staff attended Field Day training sponsored by NMCA and NMCA Meeting; Backpack sprayer calibration training; AMCA webinars

Please list the certifications and degrees held by your staff: Mass Pesticide Applicators license and commercial certification; CDL and hydraulic license

**Comments:** \_\_\_\_\_

## BIOLOGICAL CONTROL EFFORTS

Do you have a biological control program? Yes

If yes, please describe: We perform selective ditch maintenance to allow predatory fish access to stagnant pools. We also use bacterial larvicides such as BTI in our program.

Is this program the introduction of mosquito predators or the enhancement of habitat for native predators? Enhancement of habitat for native predators and introduction of natural pathogens to control mosquito populations.

Please check off all that apply:

- Predatory fish
- Predatory invertebrates
- Other (please describe): *Bacillus thuringiensis israelensis* and *Bacillus sphaericus*

What time frame during the year is this method employed? Yearround

Comments: \_\_\_\_\_

## INFORMATION TECHNOLOGY

Does your program use (check all that apply):

- Computers
- GIS mapping
- GPS equipment
- Computer databases
- Aerial Photography
- Other (please describe):

Please describe your capabilities in these areas: We have a Trimble GPS unit that we use to record trap sites, location of pipes, etc. Access Computer databases are used to record all work completed as well as all trap information. We have historical aerial photographs as well as Mass GIS orthos.

Please describe your current GIS abilities: Intermediate

Give details if possible on your GIS abilities: We are currently using Mass GIS with ARC GIS 9 viewer. We have added a layer to the Mass GIS maps showing the unique numbers for each of our work sites. All work is entered into an Access data base that is connected to the maps.

Please describe any changes/enhancements in this area from the previous year: All field crews are now able to enter work reports in an electronic form

**Comments:** \_\_\_\_\_

## **REVENUES & EXPENDITURES**

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

For Fiscal Year 2011 revenue total \$1,662,428 from all 15 towns in Barnstable County. Expenditures were as follows: AA payroll account \$1,004,912.00; FF account was \$9,350.00; DD account was \$287,633.00; EE account \$9442.00; GG account as \$69,000.00; BB account \$1,000.00.

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

Barnstable	\$294,390.00
Bourne	91,486.00
Brewster	76,271.00
Chatham	125,138.00
Dennis	133,331.00
Eastham	59,295.00
Falmouth	239,394.00
Harwich	103,764.00
Mashpee	101,745.00
Orleans	78,067.00
Provincetown	50,737.00
Sandwich	87,201.00
Truro	44,963.00
Wellfleet	49,884.00
Yarmouth	126,662.00

**Comments: Town funding assessments include State Reclamation Board.**

## **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: Agnique MMF  
EPA Reg. #: 53263-28  
Application method: hand sprayer  
Targeted life stage: Larvae/pupae  
Total amount of concentrate applied: 265 gallons  
Comments: 32% active ingredient; 768 applications to 400 sites

Product Name: Aquabac G  
EPA Reg. #: 62637-3  
Application method: hand  
Targeted life stage: Larvae  
Total amount of concentrate applied: 1006 pounds  
Comments: 2.8% active ingredient 83 applications to 58 sites

Product Name: Aquabac XT  
EPA Reg. #: 62637-1  
Application method: hand/backpack sprayer  
Targeted life stage: Larvae  
Total amount of concentrate applied: 342 gallons  
Comments: 8% active ingredient 2538 applications to 902 sites

Product Name: BVA2  
EPA Reg. #: 70589-1  
Application method: hand sprayer  
Targeted life stage: Larvae/pupae  
Total amount of concentrate applied: 563 gallons  
Comments: 97% active ingredient 469 applications to 371 sites

Product Name: Altosid WSP  
EPA Reg. #: 2724-448  
Application method: hand  
Targeted life stage: Larvae  
Total amount of concentrate applied: 12 pounds  
Comments: 4.25% active ingredient 740 road drains and containers treated

Product Name: Vectolex WSP  
EPA Reg. #: 73049-20  
Application method: hand  
Targeted life stage: Larvae  
Total amount of concentrate applied: 146 pounds  
Comments: 7.5% active ingredient 6629 road drains treated

Product Name: Altosid Pellets  
EPA Reg. #: 2724-448  
Application method: hand  
Targeted life stage: Larvae

Total amount of concentrate applied: 3.3 lbs  
Comments: 4.25% active ingredient 215 road drains treated

Product Name: Agnique MMF PAK 35  
EPA Reg. #: 53263-30  
Application method: hand  
Targeted life stage: Larvae/Pupae  
Total amount of concentrate applied: 113 lbs  
Comments: 32% active ingredient 48 applications to 40 sites

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 weblink if possible. We are limited in our applications within the boundaries of Cape Cod National Seashore and Mashpee Wildlife Refuge

### **SPECIAL PROJECTS**

Do you perform any inspectional services such as inspections at sewage treatment facilities or review sub division plans? No

If yes, please elaborate

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: If we are contacted by local or state officials about clogged stormwater systems, clogged culverts or other areas that create larval habitat we address the problem through water management or larvicide treatment.

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

If yes, please elaborate: For example, in Barnstable we continue to work with the Town of Barnstable to keep a culvert in Cotuit open. We also worked with the Town of

Falmouth on restoring tidal flow in a marsh area in Woods Hole. Town of Eastham partnered with us on a culvert issue in the area of Dyer Prence and Governor Prence Roads.

## **CHILDREN AND FAMILIES PROTECTION ACT**

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

If yes, please explain: All schools located in Barnstable County were required to add our larvicide products to their outdoor IPM plan.

If you have data on compliance with this Act and your program, please list here: All public schools, private schools and parochial schools have notified us.

If you had difficulties with implementation of your program due to this law, please elaborate here: no

Comments:

## **GENERAL COMMENTS**

Please list any comments not covered in this report: Cape Cod Mosquito Control Project is a partner under the EPA's Pesticide Environmental Stewardship Program under the auspices of the American Mosquito Control Association. Cape Cod Mosquito Control Project works closely with Town Boards of Health, Town Conservation Commissions and occasionally with the County Board of Health, as well as working with local citizens who have mosquito concerns.

## Cape Cod Mosquito Control Pesticide Discharge Management Plan

Cape Cod Mosquito Control  
86 Willow Street  
Yarmouth Port, MA 02675  
(O) 508-775-1510  
(F) 508-362-7917

- A. Pesticide Discharge Management Team. All persons may be contacted at: Cape Cod Mosquito Control, 86 Willow Street, Yarmouth Port, MA 02675, (O) 508-775-1510, (F) 508-362-7917.
1. Person(s) responsible for managing pests in relation to the pest management area.
    - a. John Doane – Superintendent
    - b. Gabrielle Sakolsky – Entomologist, Assistant Superintendent
  2. Person(s) responsible for developing and revising the PDMP.
    - a. Gabrielle Sakolsky – Entomologist, Assistant Superintendent
  3. Person(s) responsible for developing, revising, and implementing corrective actions and other effluent limitation requirements.
    - a. John Doane - Superintendent
    - b. Gabrielle Sakolsky – Entomologist, Assistant Superintendent
  4. Person(s) responsible for pesticide applications (mix, load, apply).
    - a. John Doane - Superintendent
    - b. Gabrielle Sakolsky - Entomologist, Assistant Superintendent
    - c. Paul McCarthy - Field Supervisor
    - d. Barton Morris - Facilities and Equipment Coordinator
    - e. Greg Baker - Crew Chief
    - f. Peter Bennett - Field Technician
    - g. James Bergquist - Crew Chief
    - h. Vernon Crownshaw - Field Technician
    - i. Robert Davis - Crew Chief
    - j. Braddock Doane - Field Technician
    - k. Paul Eldredge – Crew Chief
    - l. Thomas Eldredge – Field Technician
    - m. Mike Bridges – Field Technician
    - n. Andrew Fletcher – Field Technician
    - o. John Harris – Field Technician
    - p. Eugene McNeill – Crew Chief

- q. Robert Motta – Field Technician
- r. Mark Niquette – Crew Chief
- s. Brian Slowik – Crew Chief
- t. Michael Slowik – Field Technician
- u. Ryan Watson – Field Technician
- v. Charles White – Crew Chief

## B. Pest Management Area Description

1. Pest Problem Area Description: Cape Cod Mosquito Control is charged with managing mosquito populations in Barnstable County. Barnstable County is located in the southeastern corner of Massachusetts. Barnstable County is within the Cape Cod Watershed. Extending 70 miles into the Atlantic Ocean, the Cape Cod Watershed is surrounded by the salt waters of Buzzards Bay, Cape Cod Bay, the Atlantic Ocean, and Nantucket Sound. The watershed encompasses a drainage area of approximately 440 square miles and includes 559 miles of coastline, 360 ponds, and 52 separate embayment watersheds (MA EEA). Barnstable County has a land area of 396 square miles, or 253,440 acres. Pest problem areas can best be separated into 2 broad types within our service area that can be further divided into more specific groups based on habitat type.



### i. Natural Environments

1. Coastal and intercoastal islands, hammocks, and high marsh areas are dispersed throughout our coastal region. These areas are

affected by high river stages in the spring, rains, and tides. *Ochlerotatus taeniorhynchus* and *Oc. sollicitans* are major problems in these areas, although *Culex salinarius* is also common to such sites.

2. Woodland ponds, pools, and depressions are isolated wetlands occurring throughout the county within in forested uplands and pasture areas. Examples of these habitats include bogs, shrub swamps, fens, wooded coniferous/deciduous swamps, and depressions caused by uprooted trees. Many of these sites only contain water during the wet seasons of the year, and serve as excellent nurseries for most species of mosquitoes found in our region.
3. Other natural environments include springs, seeps, tree holes, tree cavities, burrows made by various species of wildlife

ii. Man-made Environments

1. Ditches and canals are frequently suggested as sources of mosquito problems by the general public. However, these structures usually contain fish, and are seldom the primary source of a mosquito infestation, especially if these systems tend to hold water on a permanent basis. On the other hand, shallow, roadside ditches do contribute to mosquito populations at times. Such sites often remain dry throughout much of the year or because of temperature, oxygen content, or other factors do not support fish life. Mosquito species encountered in such sites include *Aedes vexans*, *Culex salinarius*, *Cx. restuans*, and many species of *Ochlerotatus*.
2. Fallow cranberry bogs serve as habitat for a number of species of mosquitoes in our area. These shallow acidic wetlands can produce high numbers of mosquitoes.
3. Storm drains and catch basins are found throughout areas of the county, and provide a pristine environment for *Culex pipiens*, our primary WNV vector.
4. Containers come in all sorts of shapes and sizes. These may be represented by something as small as a bottle top to something as large as a discarded or unkempt boat. Containers serve as the primary larval site for *Culex pipiens* which is frequently associated with mosquito problems in our more urban and suburban areas of the county.

5. Other man-made sites include retention and detention ponds. These areas generally do not cause problems except during drought conditions as many will contain fish.

## 2. Pest Problem Description

- a. Barnstable County is located in the southeastern corner of Massachusetts. Barnstable County is within the Cape Cod Watershed. Extending 70 miles into the Atlantic Ocean, the Cape Cod Watershed is surrounded by the salt waters of Buzzards Bay, Cape Cod Bay, the Atlantic Ocean, and Nantucket Sound. The watershed encompasses a drainage area of approximately 440 square miles and includes 559 miles of coastline, 360 ponds, and 52 separate embayment watersheds (MA EEA). Barnstable County has a land area of 396 square miles, or 253,440 acres. The county is known to contain 30 species of mosquitoes, although CCMC actively surveys and conducts control efforts primarily on 12 species.

- i. Aedes vexans*, is a common woodland mosquito that has the potential to fly up to 5 miles. It is generally encountered in the spring, but can be found at other times of the year as well. This species has been implicated as a vector of eastern equine encephalitis (EEE), West Nile virus (WNV), and dog heartworm.
- ii. Coquillettidia perturbans*, is a fairly large mosquito that is often associated with aquatic habitats containing cattails, *Typha* spp. It is generally considered a bridge vector of EEE to mammals, but has also tested positive for WNV in the United States. It commonly takes blood meals from both bird and mammal species (including humans).
- iii. Culex pipiens*, the house mosquito, is our region's primary WNV vector. It prefers somewhat stagnant or polluted water conditions as larval habitat, and can be a common species in storm drain systems, especially in drainage lines equipped with sumps in the catch basins that tend to hold water on a permanent basis.
- iv. Culex restuans*, is an early season mosquito. Larval habitats for this species typically include a variety of semi-permanent waterways, including roadside ditches and woodland pools. It has been reported to carry both EEE and WNV, and may be an important vector in the initial amplification of these viruses in bird populations as birds appear to be its primary blood hosts.
- v. Culex salinarius*, is a common *Culex* mosquito throughout much of the year in our region. Adults are readily attracted to light traps, and larvae are found in both freshwater and somewhat saline environments. This species has been recorded to carry dog heartworm, EEE, SLE, and WNV. It appears to be an opportunistic feeder of birds, mammals, and

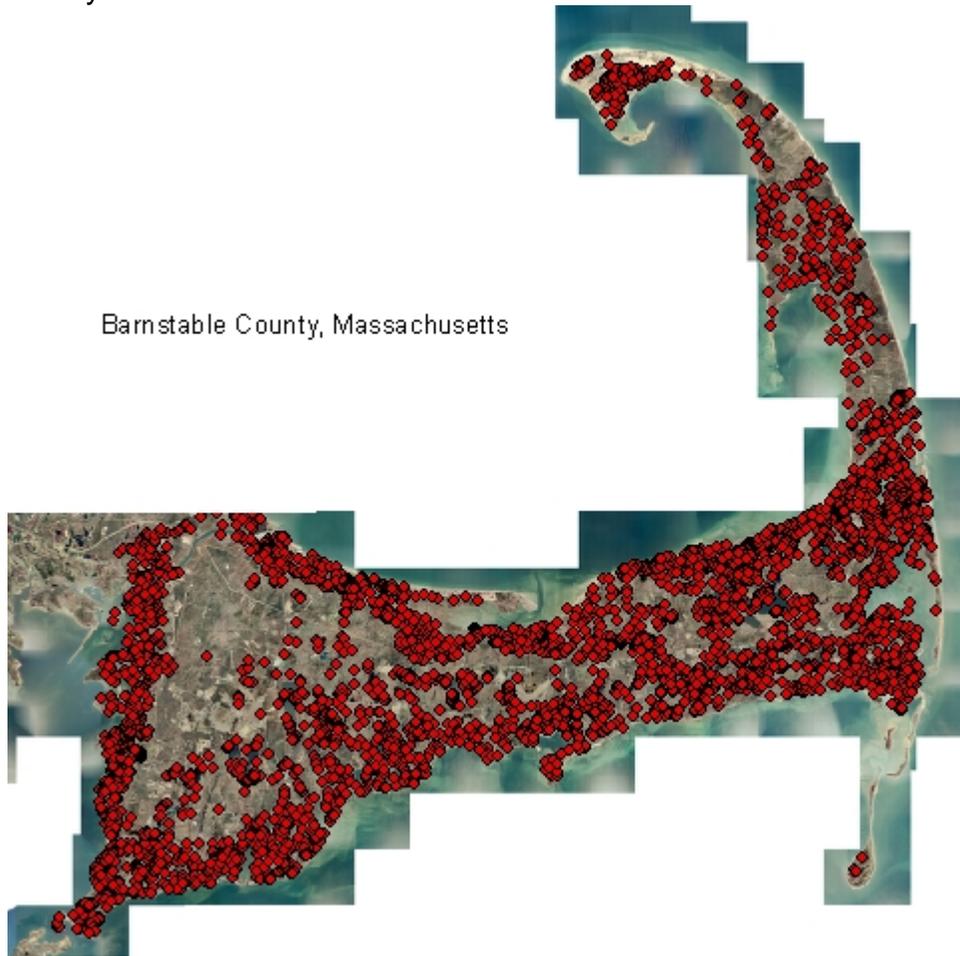
even reptiles, and may serve as an important bridge vector in the transmission of arbovirus in the southeastern United States.

- vi. *Culiseta melanura* and *Cs. morsitans*, are swamp mosquitoes that occur in Atlantic White Cedar Swamps – hardwood floodplains and other aquatic habitats characterized by low pH. The larvae often are found within subterranean pockets that are difficult to treat with conventional larvicide agents. *Cs. melanura* almost exclusively obtains its blood meals from birds, and is our primary vector in the amplification of EEE in our area. It has also been found to carry WNV.
- vii. *Ochlerotatus sollicitans*, the brown salt-marsh mosquito is a fairly large mosquito that can be a serious pest along the immediate coast. It is active during both daytime and nighttime periods, and can fly great distances from its original source. It has been reported to carry EEE in the northeastern US.
- viii. *Ochlerotatus taeniorhynchus*, the black salt-marsh mosquito is a nuisance mosquito species that is capable producing tremendous numbers of adults after coastal flooding events caused by rains or extreme high tides.
- ix. *Ochlerotatus canadator*, the brown salt-marsh mosquito is a fairly large mosquito that can be a serious pest along the immediate coast. It is active during both daytime and nighttime periods, and can fly great distances from its original source.
- x. *Ochlerotatus canadensis* and *Oc. excrucians*, are freshwater mosquitoes. Larvae develop in temporary or semi-permanent woodland pools. The females will bite in the woods any time of day, but are most active in the evening. They are aggressive and long-lived.

### 3. Action Threshold

- a. Recently the following thresholds were established to trigger larviciding missions within our service area:
  - i. Treatments of larval mosquito habitat may be conducted in areas that are found to contain an average of at least 1 larva per dip (using a standard 12 oz. dipper). Actual treatments will be based on local demographics, mosquito species present, and other historic and current conditions.
  - ii. The storm water system may be treated in selected areas of the county where vector species have been found or there is a history of arbovirus activity.

4. General Location - General location map of all known mosquito breeding sites within Barnstable County, Massachusetts. Red symbols (x=4255) indicate areas treated by hand. Currently, we do not treat freshwater swamps within the boundaries of the Cape Cod National Seashore for larval mosquito control. CCMCP also treats a tremendous number of storm drains and catch basins (x=±15,000) during the mosquito season. These basins are located through the entire county.



5. Water Quality Standards - Waterways in Barnstable County are not impaired with any pesticides used by Cape Cod Mosquito Control Project.

C. Control Measure Description.

1. A description of the control measures to demonstrate how the operators specifically plan to meet the applicable technology-based or water quality-based effluent limitations.
  - a. Prevention, mechanical/physical methods and cultural methods are by definition very similar in nature and share many characteristics. These methods can be as basic as simply emptying water from containers or as complex as repairing broken water lines which often require the involvement of other county departments, such as Public Works. Educational programming at local schools and area events allow CCMCP staff the opportunity to suggest ways that residents can assist in the prevention of mosquito problems by removing containers and articles from their yards that provide larval habitat, and to be mindful that birdbaths and pet water bowls could serve as mosquito sanctuaries when not properly maintained.
  - b. Cultural methods like the previous two methods manipulate larval habitat to prevent favorable conditions for mosquitoes to complete their aquatic development. Physical manipulation of environments such as removing blockages in ditches that serve as barriers to natural predators of mosquitoes are sometimes quick and effective means for our Field Technicians to resolve problems on a localized level (also see above).
  - c. Biological control agents CCMCP uses various biological control agents for the control of larval stages of mosquitoes. Formulations containing *Bacillus sphaericus* and/or *Bacillus thuringiensis israelensis* are used to treat flood water and salt-marsh mosquito larval sites. These products are also used in alternating years to treat catch basin/storm drains, as a precaution against resistance in our primary WNV vector species.
  - d. Pesticides often are any abatement agency's last choice of control measures. These products are applied as directed by their respective label, and all equipment used in this process is closely monitored and calibrated by staff.

Operators must consider impact to non-target organisms, impact to water quality, pest resistance, feasibility, and cost effectiveness when evaluating and selecting the most efficient and effective means of pest management to minimize pesticide discharge to waters of the U.S.

2. A brief explanation of the control measures used at the site to reduce pesticide discharge, including evaluation and implementation of the six pest management tools:
  - a. no action
  - b. prevention
  - c. mechanical/physical methods
  - d. cultural methods
  - e. biological control agents
  - f. pesticides

Operators must consider impact to non-target organisms, impact to water quality, pest resistance, feasibility, and cost effectiveness when evaluating and selecting the most efficient and effective means of pest management to minimize pesticide discharge to waters of the U.S.

3. Control measures are evaluated separately on the basis of mosquito life stage as follows:
  - a. Efficacy can be determined from pre and post treatment trap counts when a trap site is located in the vicinity of a treatment area. In addition, landing rates taken by staff are used to supplement this data when trap sites are not located near a treatment area.
  - b. Larval control efficacy is easy to access. Post-treatment surveys verify successful treatments when using larvicide oils and films, or biological control measures, such as Bti products

#### D. Schedules and Procedures.

1. Pertaining to Control Measures Used to Comply with the Effluent Limitations in Part 2.
  - a. Application Rate and Frequency Procedures.
    - i. Application Rate Determination
      1. Determine species and age of target mosquito(es)
      2. Evaluate environmental conditions
      3. Consider target area flora and fauna

4. Determine appropriate application rate based on product label recommendations, previous experience and efficacy tests.
- ii. Frequency Determination
    1. Determine target site treatment history with selected pesticide
    2. Evaluate effect of selected pesticide use on frequency and quantity thresholds for active ingredient.
    3. Consider alternate treatment options
  - iii. Resistance Considerations
    1. Consider documented resistance of target species to selected pesticide and/or any other compounds that are in the same class or exhibit similar modes of action. Also consider the possibility of cross resistance.
    2. Consider the use of alternate control options.
- b. Spill Prevention Procedures.
- i. Perform daily and weekly inspections of pesticide storage areas.
  - ii. Chemical spill response plan:
    1. Contain spill then notify the office (508) 775-1510.
    2. Isolate contaminated area.
    3. Soak up spill with absorbent pads and/or absorbent granules. Collect material for disposal.
    4. Clean contaminated vehicles and equipment according to label instructions.
    5. Dispose of contaminated material according to label.
- CCMCP Chemical List and PPE Requirements attached.
- c. Pesticide Application Equipment Procedures.
- i. Backpack Sprayer - larviciding
    1. Operations:

- a. Application equipment must be calibrated annually to confirm application rate is according to the label of the pesticide being used. Calibration Protocol attached.
  - b. A visual inspection of spray equipment for leaks or wear in the lines, tanks and nozzle is done prior to the start up of spray equipment.
  - c. Routine cleaning and maintenance of the spray system must be performed to ensure system is operating properly.
2. Maintenance:
- a. Daily Checks - Visually check the sprayer each day before use and make any necessary adjustments and /or repairs.
- d. Pest Surveillance Procedures.

i. Adult Surveillance

- 1. Service request inspections are taken during normal working hours and from telephone messages or emails outside of the normal work day. Many of these are simple requests for treatments, although occasionally such calls lead to finding problems needing attention. Technicians generally will check for mosquito larvae and determine if adult populations warrant treatment during these inspections from observed densities.
- 2. Gravid trap collections are paramount to our WNV surveillance. This trap type is particularly effective in catching gravid *Culex pipiens/retuans*, which is our primary WNV vector. Fifteen gravid traps are deployed throughout the county each week during the mosquito season.
- 3. Carbon dioxide baited light trap collections are used for nuisance mosquito census. Currently, 18 CDC light traps are deployed on a weekly basis.
- 4. Resting boxes are used by our staff to aid in earlier detection of any possible EEE threat in the county. A resting box is a passive trap that attracts certain species of mosquitoes after they have taken a bloodmeal. All *Culiseta melanura*, *Cs. morsitans*, and *Oc. japonicus* captured from these traps are pooled based on location and sent for virus testing.

ii. Larval Surveillance

1. Service request inspections performed by our Field Technicians will check for mosquito larvae. Generally, these requests for service stem from localized, container-breeding species of mosquitoes that are easily remedied by simply dumping water from articles such as buckets, birdbaths, tarps, and other items that are holding water. Occasionally, service requests investigations uncover larger scale problems, like blocked drainage systems, leaking septic tanks, broken water lines, etc. that may require further action by either the land owner or other town departments to correct.
2. Breeding site inspections are conducted by our Field Technicians following flooding events caused by rains, or spring tides. Larval surveillance entails locating the larval source (if not already known), sampling for larvae and estimating larval density, determining larval developmental stage(s), and collecting larvae for identification purposes. Other factors considered during larval inspections include the water depth at the specific location, current extended forecast, water temperature, and if any natural predators are present.

iii. Disease Surveillance

1. Mosquito pool analysis is a most useful indicator of the presence of WNV (and occasionally EEE) in our service area. Up to 50 adult *Culex* sp., *Oc. japonicus*, *Cs. moristans* or *Culiseta melanura* mosquitoes are grouped to form a single sample for WNV or EEE virus analysis, respectively.
2. Dead bird lab work during our early history with WNV played a role in the initial detection of areas of high concern. However, this aspect of viral detection has been diluted over the years as we have become more familiar with the ecology of this virus and our local bird populations. More recent work conducted throughout the US has established that three groups of birds (crows, blue jays, and raptors) are more susceptible to WNV than others.

e. Assessing Environmental Conditions Procedures.

- i. Larval mosquito treatments. Two major environmental considerations are tree canopy and the amount of aquatic vegetation present within the treatment site. Tree canopy may deflect or otherwise prevent the penetration of pesticide from reaching the target area. Heavy vegetation within a wetland can interfere with the migration of the larviciding agent through the water column.

2. Pertaining to Other Actions Necessary to Minimize Discharges.
  - a. Spill Response Procedures.
    - i. Chemical Spill Response training is required for staff handling, loading or applying pesticides.
  - b. Adverse Incident Response Procedures.
    - i. Procedures for responding to any incident resulting from pesticide applications
    - ii. Procedures for notification of an incident:
      1. Operator notifies office of incident (508)775-1510.
      2. Office will notify town where incident occurred to coordinate any needed remediation.
  - c. Pesticide Monitoring Schedules and Procedures.
    - i. For application by, or under the supervision of, personnel certified/trained in public health pest control or mosquito control. For each application, a record must be kept of:
      1. Date, time and areas where application occurred.
      2. Name and EPA registration number for the product being applied.
      3. Type and size of spray nozzle used.
      4. Dilution and application rate.
      5. Employees involved in mixing, loading and applying larvicide.
      6. These records must be kept by the responsible public agency or their designee for a minimum of three years using storage methods that will allow the records to be easily retrieved.

## Backpack Sprayer Calibration Protocol

1. Label each sprayer with a unique number to identify.
2. Time how long it takes to spray 400 sq feet, by have the applicator spray water in a 4 foot swath walking a distance of 100 feet.
3. Spray water into buck for the amount of time determined in step 2. Measure the volume of the water in the bucket.
4. An acre is 43,560 sq feet, so 400 sq feet is  $1/109$  of an acre. Therefore, all measured volume from step 3 needs to be multiplied by 109. This gives you the ml applied per acre at the rate out application measured.
5. Take the figure determined in step 4 and convert to gallons.
6. Read pesticide label to determine the number of gallons that should be applied per acre and follow application directions.

### Pesticides and Required PPE\*

<b>Pesticide</b>	<b>EPA Registration Number</b>	<b>PPE Requirement</b>
Agnique MMF	53263-28	None
Agnique MMF PAK 35	53263-30	None
Aquabac XT	62637-1	None
Aquabac G	62637-3	Dust Mask (N-95, R-95,P-95)
BVA2	70589-1	Goggles, rubber gloves, rubber overshoes.
Altosid WSP	2724-448	None
Vectolex WSP	73049-20	None

\* For use, according to the label, when mixing, filling, or cleaning after a spill.





**D. Endangered Species Protection: Complete Section D for each Pest Management Area for which coverage under EPA's Pesticide General Permit is desired. Copy this section for non-electronic submissions.**

Pest Management Area # \_\_\_ of ## \_\_\_

Federally Listed Threatened or Endangered Species (i.e., Species) and/or Federally Designated Critical Habitat (i.e., Habitat) (check one):

- A.  Pesticide application activities will not result in a point source discharge to one or more Waters of the United States containing NMFS Listed Resources of Concern, as defined in Appendix A, for this permit.
- B.  Pesticide application activities for which permit coverage is being requested will discharge to one or more Waters of the United States containing NMFS Listed Resources of Concern, as defined in Appendix A, but consultation with NMFS under section 7 of the ESA has been concluded for pesticide application activities covered under this permit. Consultations can be either formal or informal, and would have occurred only as a result of a separate federal action. The consultation addressed the effects of pesticide discharges and discharge-related activities on federally-listed threatened or endangered species and federally-designated critical habitat, and must have resulted in either:
  - i. A biological opinion from NMFS finding no jeopardy to federally-listed species and no destruction/adverse modification of federally-designated critical habitat; or
  - ii. Written concurrence from NMFS with a finding that the pesticide discharges and discharge-related activities are not likely to adversely affect federally-listed species or federally-designated critical habitat.
- C.  Pesticide application activities for which permit coverage is being requested will discharge to one or more Waters of the United States containing NMFS Listed Resources of Concern, as defined in Appendix A, but all "take" of these resources associated with such pesticide application activities has been authorized through NMFS' issuance of a permit under section 10 of the ESA, and such authorization addresses the effects of the pesticide discharges and discharge-related activities on federally-listed species and federally-designated critical habitat. (The term "take" means to harass, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. See Section 3 of the Endangered Species Act, 16 U.S.C. § 1532 (19).)
- D.  Pesticide application activities were, or will be, discharged to one or more Waters of the United States containing NMFS Listed Resources of Concern, as defined in Appendix A, but only in response to a declared pest emergency situation.
- E.  Pesticide application activities for which permit coverage is being requested will discharge to one or more Waters of the United States containing NMFS Listed Resources of Concern, as defined in Appendix A. Eligible discharges include those from pesticide application activities performed consistent with appropriate measures to avoid or eliminate the likelihood of adverse effects as provided in writing from NMFS, and the Operator must provide EPA with the required relevant supporting information from NMFS.
- F.  Pesticide application activities for which permit coverage is being requested will discharge to one or more Waters of the United States containing NMFS Listed Resources of Concern, as defined in Appendix A. Eligible discharges include those from pesticide application activities that are demonstrated not likely to adversely affect federally-listed species or their designated critical habitat.

If you checked item F. above, list all NMFS Listed Resources of Concern identified within the area for which permit coverage is being requested:

1. Pest(s) to be controlled: \_\_\_\_\_  
\_\_\_\_\_
2. Pesticide product(s) to be discharged: \_\_\_\_\_
3. Planned quantity and rate of discharge(s) \_\_\_\_\_
4. Number of planned discharges: \_\_\_\_\_
5. Approximate date(s) of planned discharge(s) (in MM/DD/YYYY format): \_\_\_\_\_
6. Your rationale supporting your determination that you meet Criterion F, including appropriate measures to be undertaken to avoid or eliminate the likelihood of adverse effects. (Attach additional pages as necessary.) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

