

AERIAL MOSQUITO LARVAL CONTROL PROGRAM – SPRING 2007

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ABSTRACT

Aerial application of *Bacillus thuringiensis israelensis* (Bti) has become a standard procedure in many Massachusetts mosquito control programs. CMMCP used rotary aircraft over selected wetlands in Chelmsford, Billerica and Boxborough. Emergence of spring species of mosquitoes was reduced by 86.91% in targeted wetlands.

OBJECTIVE

To reduce the emergence of spring brood mosquito species *Ochlerotatus excrucians* and *Ochlerotatus abserratus* in the towns of Billerica, Chelmsford & Boxborough, with a secondary goal of reducing the early emergence of *Oc. canadensis* from the treated wetlands. *Oc. excrucians* and *Oc. abserratus* emerge in vast numbers from the targeted wetlands and result in significant adulticide requests in the early summer months. *Oc. canadensis* emerge throughout the late spring into summer, and can transmit important diseases like EEE to horses and humans¹.

MATERIALS AND METHODS

Using helicopter applications of a granular form of *Bacillus thuringiensis israelensis* (Bti), a non-reproducing bacteria used for the control of mosquito larvae, the total numbers of spring brood mosquitoes can be reduced. This is the same product used as part of our regular ground larval control program. First registered as an insecticide by the EPA in 1983, this form of the soil bacteria is active for approximately 48 hours and causes toxins in the mosquito larvae gut when ingested². The product chosen for the aerial larvicide was Vectobac G®. The suggested rate range provided by the manufacturer is 2.5-10lbs/acre, with CMMCP applying at 5lbs/acre. This is the standard application rate used by other mosquito control districts in Massachusetts. Maps of the treatment sites using GIS software will be prepared for the contractor. Our staff will collect pre- and post larval surveillance data. Wetlands that were chosen for the aerial application were based on several aspects including historical larval collection data, wetland acreage, resident density, and other factors. A contract has been established with North Fork Helicopters out of

Cutchogue, New York. The contract price per acre has been established at \$14.15. This contractor has been involved in aerial applications of Bti for several years.

DISCUSSION

Snowmelt and spring weather conditions typically contribute to standing pools of water that lend themselves to become ideal mosquito breeding habitat. Control of mosquito larvae in their aquatic habitat is a major focus of the integrated pest management program employed by the Central Mass. Mosquito Control Project (CMMCP). In response, CMMCP has organized an aerial larval control program using rotary aircraft (helicopter) in addition to the standard ground larval control program performed in all member cities and towns. The towns that participate in this program pay for this service under a separate appropriation than the program of mosquito control that is currently offered. This program is targeted at reducing the numbers of two "spring brood" species, *Ochlerotatus abserratus* and *Ochlerotatus excrucians*, in addition to reducing secondary target species *Ochlerotatus canadensis*. The spring brood species greatly contribute to significant mosquito populations experienced by residents in May through June, and *Oc. canadensis* is a concern for the transmission of EEE and WNV.

Although we have identified potential areas of mosquito breeding, we will only target these areas after confirmation is received from field observations (pre-surveillance). All areas will be sampled using established procedures and protocols established in the mosquito control Generic Environmental Impact Report. An average of 1 mosquito per dip over 10 dips will be used as a threshold to determine if an

¹http://www.mass.gov/dph/wmv/mosquito_descriptions_arbo_activity.pdf

²<http://www.epa.gov/pesticides/health/mosquitoes/larvicides4mosquitoes.htm>

application in that area is warranted, and we will have at least 1 dip station per 250 treated acres, with a control site as a monitoring device. Once confirmation in a wetland has been recorded, the area will be designated for treatment.

LARVAL MONITORING

Before any applications are made, recoverable dip stations (RDS) were established so that larval monitoring could be conducted at the same location both pre- and post application. In each town, RDS were placed outside the chosen treatment areas to act as a control site along with several RDS inside the treatment areas for mortality comparison. At each RDS there were 10 dip sites, where field technicians would record the number of mosquito larvae as well as their life stage (instar); then the larvae were returned to the RDS. All dip sites were clearly marked so that they could be accurately located and sampled again after the application. Species identified in the larval stage were *Oc. provocons* (potential vector of WNV), *Oc. abseerratus* and *Oc. canadensis* (potential vector of EEE). All larvae were in the targeted instar range, 2-3rd instar.

SITE SELECTION

Specific wetland types over 1 acre have been outlined on the maps. These wetland types (wooded swamp deciduous, conifer & mixed; shallow marsh; shrub swamp) have been identified as the preferred habitat for the target species. Any sites under 5 acres that we identify as not suitable for this application will be removed for consideration and monitored and treated if necessary as part of our regular ground larval control program.

THE APPLICATION

Weather and mosquito larval instar are the determining factors in choosing the dates of application. Historically we have performed this program during the third week of April. This timeframe has shown to be a consistent time of year when larvae are in the target life stage, the second and third instar. According to the USGS, the water table in March was at normal levels, but rain in April caused them to rise to above normal³. A comment from the USGS website states:

"Ground-water levels were generally above normal (highest 25 percent of levels for April) throughout Massachusetts and Rhode Island. New record-high ground-water levels

for the month of April were measured in 10 wells in Massachusetts and 10 wells in Rhode Island; each of these wells has 10 or more years of monthly measurements."

A majority of this rain in April fell during our typical application week (4.1 inches that week compared to 7.02 inches for the entire month) and caused us to postpone the application until the following week. The aerial larvicide took place over the course of two days, April 23rd for the town of Chelmsford, and April 24th for both Billerica and Boxborough. A landing zone in Chelmsford serves as the base of operations for Chelmsford & Billerica, and we secured permission from Stow Airport to use their facility as a base of operations for Boxborough. Approximately 713 acres were treated in Chelmsford, 557 acres in Billerica, and 562 acres in Boxborough. The Vectobac® material was transported to site prior to each application, and CMMCP staff members were on hand to load the helicopter.

Notifications were placed in the Lowell Sun for Chelmsford & Billerica, and The Beacon for the town of Boxborough for the week of April 19, 2007, as required under 333CMR 13.04:

*"no applications of pesticides by aircraft shall be made unless the following conditions have been met: (a) Notification of the proposed application has been given by the Contracting Entity to the public residing on adjacent lands by publication of a notice in a newspaper of general circulation normally used by the municipality for legal notices not later than two days before the application and no sooner than ten days before application"*⁴.

CONCLUSIONS

In general, the application was a success. Overall numbers show an 86.91% reduction in areas where Bti granules were present post-treatment. Control sites showed a 22.52% increase in larval activity. One deficiency noted in the program this year is the lack of Bti granules present in some of the RDS; this can be a result of irregular wetland shapes as well as the buffer zones pilots will employ around roads, yards and other areas of exclusion. For the 2008 application we may change the location or setup of some of the RDS, and will be sure to notify the pilot of the RDS locations.

³ http://ma.water.usgs.gov/current_cond/cwrc_statements.htm

⁴ http://www.mass.gov/agr/legal/regs/pesticides_regulations_list.htm

ACKNOWLEDGEMENTS

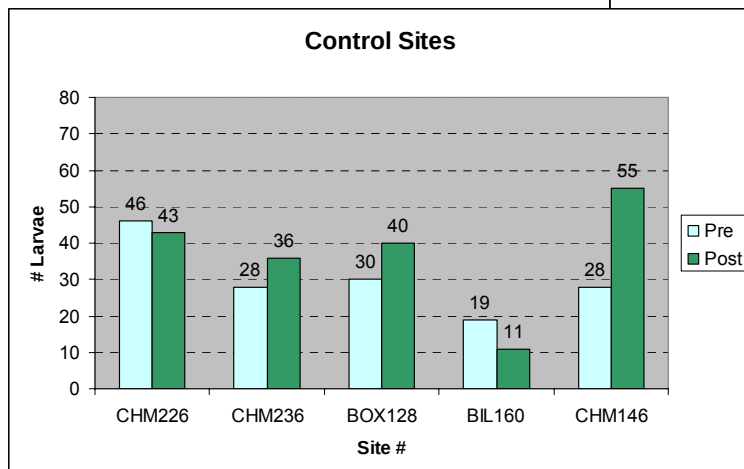
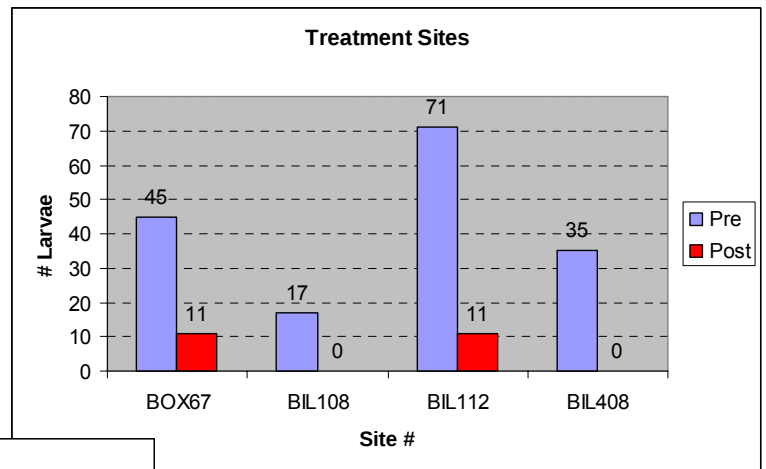
The authors would like to thank the towns of Chelmsford, Billerica and Boxborough; North Fork Helicopters for doing the application; Clarke Mosquito Control Products for supplying

the Bti; the CMMCP Commission, and most importantly the CMMCP staff for pre and post monitoring, wetland delineations, map generation and loading the aircraft.

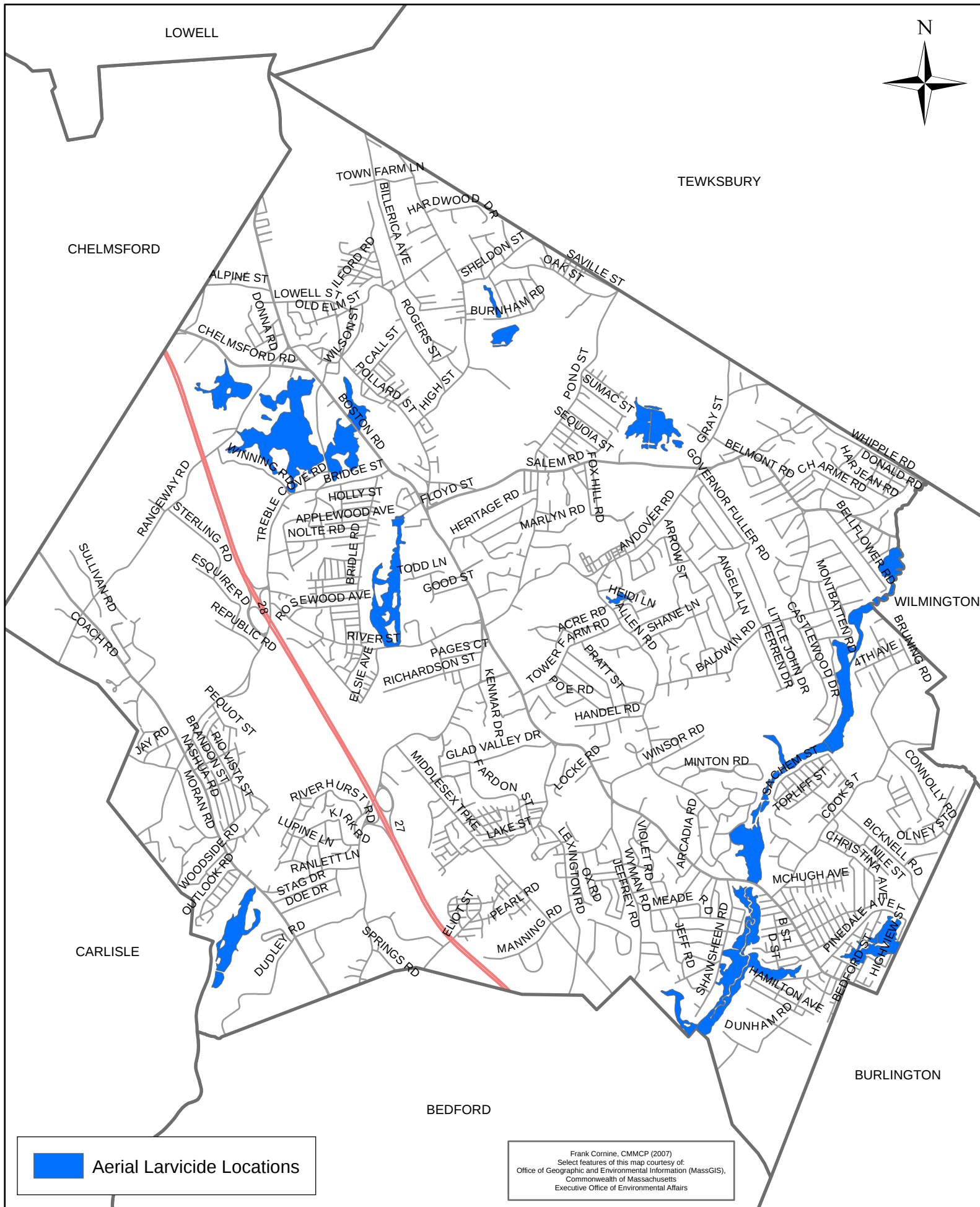
OVERALL RESULTS:

Treatment Sites	24Hr Pre	48Hr Post	Observed Change
BOX67	45	11	- 75.55%
BIL108	17	0	- 100.00%
BIL112	71	11	- 84.51%
BIL408	35	0	- 100.00%
Overall:	168	22	- 86.91%
Control Sites	24Hr Pre	48Hr Post	Observed Change
CHM226	46	43	- 6.52%
CHM236	28	36	+ 28.57%
BOX128	30	40	+ 33.33%
BIL160	19	11	- 42.11%
CHM146	28	55	+ 96.43%
Overall:	151	185	+ 22.52%

Data shown above is from RDS sites where Bti granules were present post-treatment. Control Sites include data from RDS sites where there was no evidence of Bti granules in area during surveys conducted post-treatment.

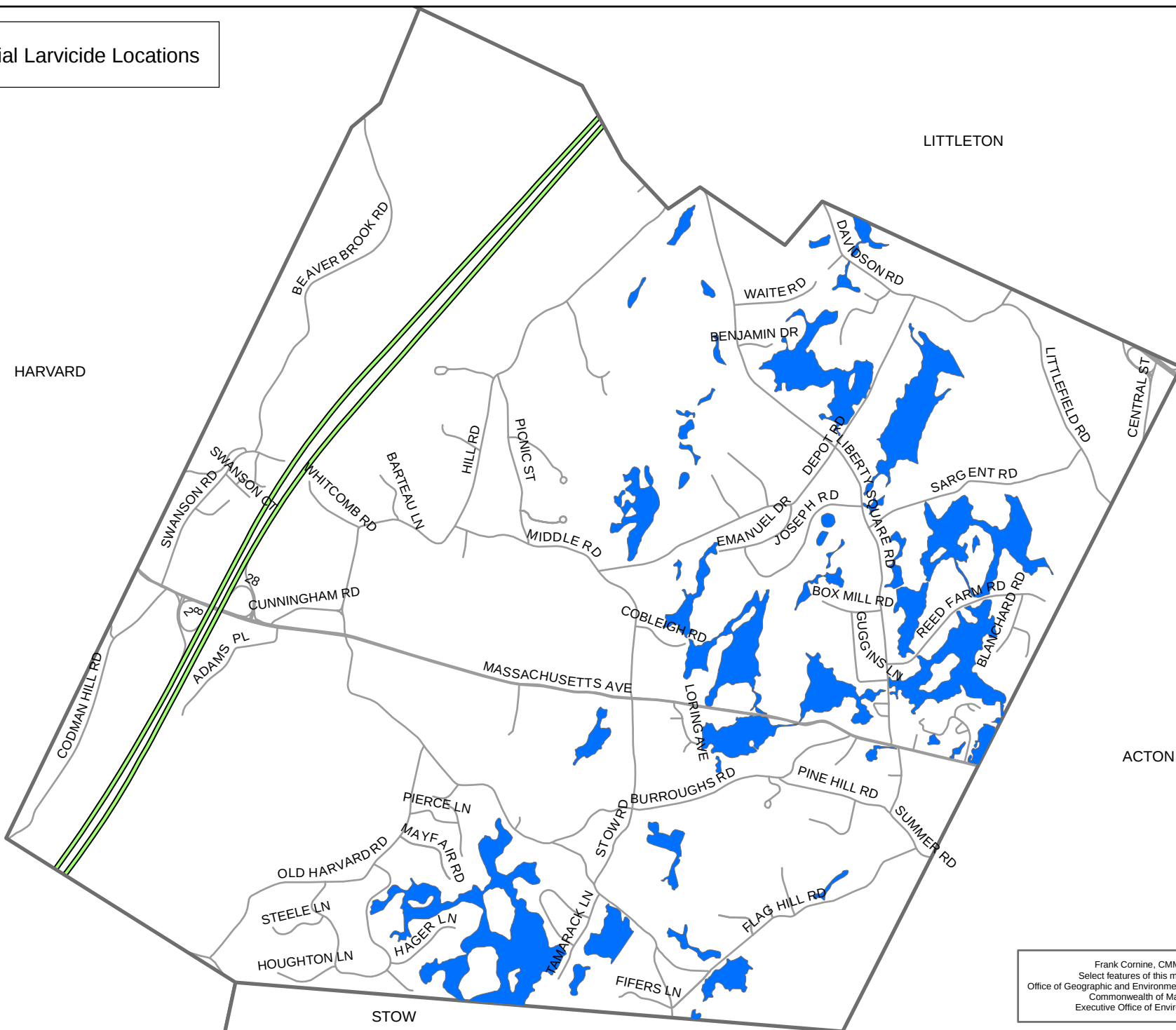


Town of Billerica: Aerial Larvicide Program 2007



Town of Boxborough: Aerial Larvicide Program 2007

 Aerial Larvicide Locations



Frank Corrine, CMMCP (2007)
Select features of this map courtesy of:
Office of Geographic and Environmental Information (MassGIS),
Commonwealth of Massachusetts
Executive Office of Environmental Affairs

Town of Chelmsford: Aerial Larvicide Program 2007

