VII. STANDARDS FOR MOSQUITO CONTROL

A. Standards for Monitoring and Control: Pesticide applications in an IPM program require monitoring insect populations and comparing data with pre-established thresholds for treatment. In addition, post-treatment evaluation is required to ensure the treatment worked as planned and did not have unintended side-effects.

1. Larval Populations: The primary technique for larval population counts is the dip count. It is hard to standardize dipping technique but, for the purposes of this document, it is assumed that dips are taken in undisturbed pools (the field person is aware that disturbing the water and/or casting a shadow over the water will cause mosquitoes to dive, thereby lowering counts) known by the field personnel to be typical of the breeding area being monitored. For large-scale work, dipping will be done at permanent, marked (or easily located) dip stations. For small sites such as drainage basins and woodland pools, dips will be taken at random throughout the site. Up to twenty dips per site will be taken unless the count for treatment and/or water management is exceeded with a smaller number of dips. Specifics for various types of work are given in Table 17.

a. Larval Identification. Field identification of larvae to genus is desirable. The following genera should be recognizable most of the time: *Aedes, Anopheles, Coquillettidea, Culex, Culiseta, Psorophora,* and *Uranetaenia*. Programs should rear out sufficient numbers of larvae (or identify larvae to species) to allow correlation between adult mosquito species and larval populations. Because there may be situations where treatment will depend on the species (as opposed to the genus) present, programs are encouraged to have a staff member trained in larval (4th instar) identification

b. Pre-control Larval Monitoring. Larval populations are monitored to determine whether or not control is required and, if so, whether short-term or long-term control is preferred. Criteria for water management in salt marshes are given in more detail in Appendix D. Projects should develop their own criteria for freshwater water management work, though some guidelines are given below under standards for physical control.

Table 17. Specifics for monitoring larval (& pupal) populations of mosquitoes for determining control.

	No Treatment	Pesticide Application	Water management	# Sites for large-scale work
Salt Marsh	<1 per 10 dips	1+ per 10 dips	5+ per dip[a]	1 dip station per 250 acres
Freshwater				
Ground	<1 per 5 dips	1+ per 5 dips	Variable	Not applicable
Aerial	<1 per 10 dips	1+ per 10 dips	Not applicable	1 dip station per 250 acres

[a]Numerous additional factors go into determining water management options for OMWM.

c. Post-control or post-alteration monitoring will be conducted as follows:

Treatment Technique	Evaluation Sites	Time Period	Number of Dips
Aerial applications	each dip station	within two business days.	Ten dips
Ground applications	one of every ten sites	within two business days	Ten dips
Water management	each dip station	for two years post-alteration	Three dips

d. Additional Water Management Requirements. Projects have an obligation to ensure that all alterations function as intended without adverse effects on the environment. Post-alteration work for water management (Appendix 4 for OMWM) will also monitor vegetative re-growth, changes in fauna and notes on whether or not the hydrology of the site is as intended.

e. Pre-hatch Work. On occasion, pre-hatch treatment is desirable. In such cases, the project should have historical data that establishes a pattern of breeding at a given site. Pre-treatment work is limited to Category IV larvicides.

2. Adult Populations. No adulticiding program will be conducted on a routine, pre-scheduled basis (i.e. once per week, regardless).

a. Monitoring for Adulticiding

Monitoring Mechanism	Rate to trigger adulticiding
Light traps	Human-biting mosquito counts exceed five per night
Landing counts	Landing count rates exceed one per minute
Complaint calls	When complaint calls exceed two per geographical area (this area will vary but assume approximately one square mile)

b. Considerations for adulticiding. Adulticide applications for mosquito control require particular care as they are generally made with rather broad-spectrum pesticides (for example, resmethrin is of

concern near fish waters) in areas of high human use. Pesticide aerosols, while an effective technique for using small amounts of pesticide to impact large numbers of mosquitoes, also increase concerns over drift into non-target areas such as apiaries and organic farms. As is always the case, reading and following the pesticide label is essential. Also, adulticide operators should have a map of no-treatment zones with them on their routes and they should be aware of variations in weather conditions (high wind) that would affect, or even cancel, a treatment.

c. Further notes on complaint calls. Because different people complain at different mosquito population levels, program personnel will conduct landing counts and/or place light traps within adulticide zones at intervals throughout the season to determine what mosquito population levels are triggering what levels of complaint calls. Chronic complaint callers should be checked by conducting landing counts and/or hanging light traps at the location of the complainer.

d. Adult Identification. Light trap mosquitoes should be sorted and up to 100 individuals (randomly selected from the larger pool) should be identified, where possible, to species. If trap counts are being used to monitor water management work, species identification (particularly of *Aedes*) is more critical than if traps are being used for adulticide monitoring.

At least ten mosquitoes from each landing count should be identified to species.

Complaint callers should be asked the time of day at which biting occurs.

e. Post-Adulticide Monitoring. Although determining the exact effect of a given adulticide application is difficult, projects should increase their efforts to understand the impact of adulticiding on mosquitoes. Projects should cross-reference complaint calls with adulticide applications and record the number of calls coming in the week before an application and in the following week (this work may be done during the winter for the previous season). In addition, projects should conduct before and after landing counts and/or light-trap counts for ten percent of their adulticide applications. Landing counts should be taken within 48 hours pre- and post-application at the same location both times. Light trap samples should be from the same trap and for the same time period before and after treatment. Where possible, non-treated areas similar to the treated area should be checked to determine population trends outside the spray zone.

Projects should keep a log of complaint calls received post-treatment Such complaints may be of non-target effects such as fish or bird kills, or of human exposure to the treatment. While establishing a link between an adulticide application and a specific problem is very difficult, such complaints may provide insight into the efficacy

of the application or may alert control projects to problems with spray equipment, treatment timing and/or treatment area.

C. Standards for Physical Control. Altering or eliminating mosquito breeding sites range from proper disposal of tires through analyzing drainage systems to creating entire new open marsh water management systems.

All mosquito control programs should create a map of their area of responsibility on which they have roughly demarcated endangered species estimated habitats and significant habitats as listed in the Natural Heritage Atlas. This should be referred to before any maintenance or new work is done and specific maps within the Atlas checked when work is taking place near such an area. Any work with such an area, must go through NHESP.

For this section Physical Control refers specifically to alterations to breeding habitat to prevent mosquitoes from maturing to adulthood. Physical Control is divided further into three types:

Source Elimination: Completely eliminating the breeding site not just the mosquito breeding. Source elimination is generally limited to breeding habitats created by humans in non-wetland areas.

Source Maintenance: Maintaining potential breeding sources in such a way that mosquitoes cannot become a problem.

Source Reduction: Reducing the ability of an area to breed mosquitoes. It differs from source maintenance in that the existing habitat is breeding mosquitoes whereas, if a maintenance program is running as designed, mosquito breeding should not occur. Once a source reduction project is completed, it will, in most cases, require at least some source maintenance in order not to return to being a mosquito-breeding habitat.

Although the three types of Physical Control blend into one another, there is value in recognizing the difference, particularly between maintenance and reduction. Here the critical issue is the need to document mosquito breeding. While unwarranted ditching is not desirable, neither is it desirable to prevent maintenance of existing ditching to the point where mosquito breeding begins in an area that has been mosquito free in the past. It is important to stress that no mosquito-control activity that would result in the permanent loss of true wetland (as opposed to temporarily flooded areas resulting from human mismanagement) can be accepted as a standard practice.

1. Source Elimination.

a. Tires. All mosquito-control programs should have a system in place for contacting departments of public works within the project so that the tires can be removed. Where tires are being intentionally stored, projects should attempt to contact the property owner and explain the breeding potential of the tire dump. Projects are not responsible for ensuring compliance with tire-disposal regulations; their sole responsibility is education of property owners and notification of appropriate local authorities.

b. Blocked drainage. In this situation, the assumptions are that the stagnant water would not be present if not for the blockage and that the drainage in question has not been part of an on-going maintenance program (see source maintenance below). In this case, mosquito breeding must be documented within the blocked ditching for mosquito control programs to re-open the ditch (without mosquito breeding the ditch may be re-opened by Highway or Public Works Departments for drainage reasons).

c. Residential problems. Such situations would include pools, refuse dumps, tire tracks, and other localized, man-made problems. As is the case with tire removal, projects can only advise property owners of the breeding potential and/or notify the appropriate authorities of a problem.

d. Drainage basin design. A primary tenet of IPM is to avoid creating pest problems through good planning. Projects are strongly recommended to make available to local agencies the specifications for drainage basin design located in Appendix 5. Projects should evaluate various basin designs for breeding potential and should educate local officials about the problems basins can cause.

2. Source Maintenance

a. Stormwater runoff and ditch maintenance. A primary goal of any mosquito control program is to monitor existing drainage to ensure that it is working as designed. Within existing drainage, any blockage may be removed regardless of mosquito breeding. As an example of the type of guidelines projects should use for this type of work, the standards for the North East Massachusetts Mosquito and Marsh Restoration Project are given in Appendix F.

Record keeping for maintenance purposes should be improved. Projects should maintain at their headquarters a list of all drainage that is monitored and maintained. This list should include location and approximate cross-section and length. Projects should also maintain a record of when and where maintenance was done. In instances where ditching has not been maintained, and no historical documentation of maintenance exists, the projects should request a review of the proposed work by DEP's Water Quality Certification program to ensure compliance.

In the long run, projects should develop priority lists for ditch maintenance based on the potential for mosquito breeding, the proximity of human activity, the ecological cost in reduced wetland benefits from the area being drained, and the relative value or scarcity of the wetlands resource affected. Maintenance should be based on breeding potential and ecological factors.

Drainage basin maintenance is also included within this area. Some basins that do not produce mosquitoes when maintained properly, will become breeding sources if left unmaintained. Projects should conduct yearly checks of drainage basins to ensure that pooling within the basin is not increasing to a point where breeding may occur. In deeper basins, invasion by cattail or emergent grasses might also create breeding habitat.

Basin ownership and maintenance responsibility are often difficult to determine. Mosquito Control Programs need to remind the appropriate authorities that basin maintenance is an important issue and should be monitored by the Building Inspector's office or other responsible agency.

b. Salt-marsh Ditching. It is generally not recommended that the open ditch systems be maintained as is. however, projects will self-determine the need for maintenance of existing ditching versus conversion to OMWM, understanding that conversion is preferred.

c. Waste Disposal. Projects are not responsible for waste disposal but they can and should monitor areas known for problems with either tire dumping and/or improper general waste disposal, particularly where it blocks drainage. The purpose of this work is not to get projects involved in policing dump sites, but rather to get them to move from a passive strategy of treating known tire piles to an active strategy of eliminating such areas and preventing their return.

3. Source Reduction.

a. Open Marsh Water Management. Open Marsh Water Management (OMWM) is the preferred technique for salt-marsh source reduction. When done properly, OMWM can result in virtual elimination of breeding without any loss of wetland. Although each project with salt marsh will develop its own standards, the standards of the North East Massachusetts Mosquito Control and Wetlands Management District are included as Appendix 4 as guidelines for establishing an OMWM system that will comply with all state and federal regulations.

New open tidal ditch systems are not recommended except as an integral part of an OMWM system.

b. Freshwater wetlands. Source reduction in freshwater systems, exclusive of existing drainage networks, does not have an equivalent to OMWM in salt marshes. At this time there can be no standards for water management within freshwater systems except that any such work must be evaluated by the appropriate authorities on a case-by-case basis.

An additional consideration is wetlands replication, the process by which existing wetlands may be altered and new wetlands created. While mosquito control projects should not be the authors of such work, they will be

involved in monitoring such areas. Further, reclassifying some areas as wetlands replication sites may well alter the extent to which water management work and/or larviciding can or should be done. For this reason, projects should be made aware of all wetlands replication projects. As with drainage basin design, projects should likewise develop a working relationship with town Zoning Boards and Building Inspectors so that mosquito control programs are included in the review process for wetlands restoration, replication or creation projects.

c. Cattail control. In order to prevent increases in *Coquillettidea perturbans*, projects should discourage the creation of deep-water (two feet plus) cattail marshes (Drainage basins) in residential areas. Failing in that, projects should request that such marshes be designed so that water may be drained from the marsh for a period of several weeks in late summer.

D. Standards for Biological Control.

1. Larvivorous fish. OMWM is dependent on native fish immigrating into the newly created ditch and reservoir system. Projects should explore the idea of stocking native fish species in deep-water drainage basins.

2. Other biological control agents. Exclusive of the Bti and *Bacillus sphaericus* products (listed here under pesticides), there are no current biological control agents available for use for mosquito control in Massachusetts other than larvivorous fish. Mosquito control programs in Massachusetts are not research institutions and cannot be expected to develop biological control agents without extensive research support. Should research uncover possible control agents, projects are encouraged to experiment with them.

E. Standards for public notification, public awareness and education.

1. Public Notification.

Projects must comply with regulations for aerial applications of pesticides.

For truck-mounted adulticiding, projects should notify the public through the print media, between March 1st and May 1st of each year, as to the areas that may be treated, the pesticide to be used and a number to contact for more information or to request exclusion from treatment.

All projects should maintain, either at their headquarters or at a designated public library, a copy of this GEIR and copies of the labels and MSDSs of all the pesticides they use. it is further recommended that they include copies of any educational materials they have put out.

2. Public Awareness and Education. As education is a primary aspect of an IPM program, projects are encouraged to develop educational flyers covering such aspects of their work as pesticide use, water

management, and property-owner mosquito control. Flyers may either be developed in-house or be obtained from the state or other agencies. Examples of educational materials may be found in Appendix 7.

3. Staff Development. Aside from the pesticide applicator recertification requirements, programs are urged to provide opportunities for staff to increase their knowledge about mosquitoes, wetland, and mosquito control. Membership in professional organizations, accessing information through university Libraries or the Internet, and developing good working relationships with federal, state and local officials whose tasks overlap that of mosquito control are all good ways to improve the knowledge and performance of staff.

F. Standards for EEE monitoring and DPH liaison.

1. Role of Programs in EEE Surveillance.

The MA DPH in cooperation with the Executive office of Environmental Affairs (EOEA) and the regional mosquito control districts of eastern Massachusetts developed the "Vector Control Plan to Prevent Eastern Equine Encephalitis (1991, currently being revised). This plan outlines and defines policy for vector control of mosquitoes that transmit the EEE virus and provides guidance for the coordination of state, regional, and local efforts during EEE outbreaks, This plan requires the active cooperation of MCDs in the EEE Risk Area. At clearly defined levels of EEE risk, based upon surveillance data collected by DPH, MCDs are asked to assist DPH in assessing vector species abundance levels and control options in their communities. The cooperative efforts of the MCDs working with DPH helps effect targeted, species-specific vector control when warranted. At the Level of EEE Public Health Emergency (see Appendix B), the MCDs work in conjunction with DPH to carry out all phases of the control effort.

2. Standard Operating Procedures during EEE problem.

When surveillance data points to increasing levels of EEE risk, DPH notifies the SRMCB and regional MCD superintendents. The EEE Surveillance Program informs MCD superintendents of isolations of EEE in their districts and the districts, in turn, provide feedback to DPH regarding population and life stage indices for critical mosquito species. At certain defined interim levels of risk as outlined in the "Vector Control Plan," MCDs may be asked to increase their ground control larvicide and/or adulticide applications in response to increased EEE virus activity. The SRMCB is responsible for contracting with appropriate mosquito control applicators in the event that aerial EEE vector control is recommended by DPH.