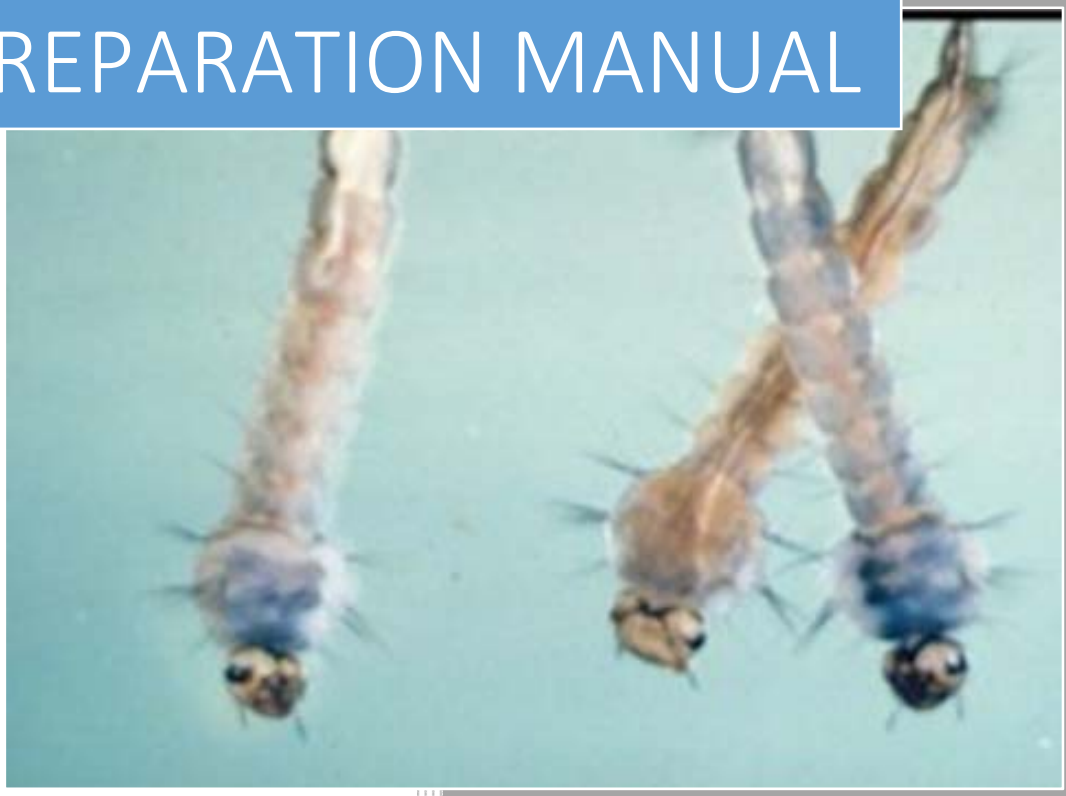
2016

CATCH BASIN APPLICATOR EXAM PREPARATION MANUAL



Massachusetts Pesticide Program

Department of Agricultural Resources

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PERMITTED CATCH BASIN APPLICATOR EXAM PREPARATION MANUAL

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PERMITTED CATCH BASIN APPLICATOR EXAM PREPARATION MANUAL

A STUDY GUIDE FOR STATE AND MUNICIPAL EMPLOYEES

INTRODUCTION

The Massachusetts Department of Agricultural Resources (MDAR) is the lead agency responsible for the implementation of the new Catch Basin Applicator Permit Program (Program). As outlined in Chapter 425 of the Acts of 2014 amended M.G.L. c. 132B, the Massachusetts Pesticide Control Act, only those individuals who are employees of the Commonwealth or its political subdivisions (such as municipal employees) are eligible to participate in this program. All applications done under this Program must be completed under the supervision of an appropriately licensed or certified individual.

The purpose of this permit is to allow state and municipal employees to more readily assist their organizations in the application of MDAR-approved larvicides to catch basins for the control of *Culex* mosquitoes, which are considered the primary vectors of West Nile Virus (WNV). Controlling *Culex* mosquitoes while they are still in their larval stage is an integral part of the Massachusetts Department of Public Health's Arbovirus Surveillance and Response Plan.

Concern about human and environmental health issues has increased dramatically over recent decades, and pesticides have a very high level of concern for the public. This makes it even more important for each applicant for a Catch Basin Applicator Permit to demonstrate his/her competence with respect to the use and handling of the type of pesticides covered by the permit, through a written examination covering the following topics:

- Integrated Pest Management (IPM)
- Mosquito Biology
- WNV
- Catch Basins
- Pesticide Labeling
- Pesticide Hazards and First Aid
- Personal Protective Equipment
- How to read and follow instructions on a pesticide label
- State and Federal Pesticide Laws

INTEGRATED PEST MANAGEMENT (IPM)

IPM is a balanced, tactical approach to pest control. It defines ways to anticipate pest outbreaks and prevent pest damage. IPM uses a wide range of pest control methods (e.g., biological, chemical, cultural, mechanical, and physical) as well as tactics including sanitation and exclusion. The goal of IPM is to prevent pests from reaching damaging levels with the least risk to the environment. When used successfully, IPM can overcome the shortfalls associated with indiscriminate application of pesticides.

In the context of mosquito control, IPM programs are typically defined as sustainable approaches to managing mosquitoes by combining biological, chemical, cultural, mechanical, and physical tools in a way that minimizes impacts to human and environmental health while also minimizing financial costs.

The key components of an IPM approach are:

1. **Identify the pest and understand its biology:** Learn how to properly identify the pest and/or problem and gather specific information needed to understand its biology and its management. For the Permitted Catch Basin Applicator, the pest has been identified as *Culex* mosquitoes, implicated in the transmission of WNV.
2. **Monitor the target pest:** Observe the site of pest activity at regular intervals. Specific steps for monitoring mosquito larvae activity in catch basins are further outlined in this guide in the section titled "Catch Basin Larval Control."
3. **Develop the pest management goal:** Determine when to take action. For the Permitted Catch Basin Applicator, the Massachusetts Department of Public Health maintains the Arbovirus Surveillance and Response Plan, which provides guidance for state agencies and local communities on monitoring methods and a phased response for WNV.
4. **Implement the IPM program:** Once you have selected appropriate methods and have set predetermined thresholds, you can initiate the IPM program. IPM programs are specific to each situation and can be adjusted as you learn more about the pest and the site. Observe all state and federal regulations regarding the methods chosen.

   In this step, the Permitted Catch Basin Applicator would select the particular larvicide product for use. Selecting the treatment with the least risk has been simplified for the Permitted Catch Basin Applicator, since only MDAR-approved mosquito larvicides are eligible for use. MDAR-approved mosquito larvicide products include dry formulations labeled for application to catch basins or storm drains with labeling that does **NOT** include the signal words **WARNING** or **DANGER**. The labeling for such MDAR-approved larvicide products may include the signal word **CAUTION** or may not require a signal word under U.S. EPA requirements.
5. **Record and evaluate results:** It is extremely important to record and evaluate the results of each pest management effort. Some control methods, especially nonchemical ones, are slow to yield measurable results. Other methods may be ineffective or even harmful to natural enemies. In this step, the IPM specialist works to objectively evaluate how well the strategies worked so that s/he will be better prepared to control the specific pest(s) again.

IPM: Cultural and Physical Controls

There are many cultural and physical controls that can be implemented with respect to managing mosquito populations or the risks associated with mosquito-borne disease. For example, use of personal repellents and avoidance of mosquitoes are key elements in public education campaigns. The following is a partial list of activities that can help manage or reduce mosquito populations as part of an IPM plan.

- Repair or install screens on doors and windows
- Keep doors and windows closed
- Clean up yard clutter, which is often associated with creating habitat for mosquito breeding and larval development;
- Keep gutters clean; clogged gutters hold water and leaves, creating ideal mosquito habitat
- Empty any containers around public, commercial, and residential facilities that are holding water, since standing water is ideal mosquito breeding habitat.

Five Reasons Why Pesticide Applications May Fail

1. **Incorrect pest identification:** Sometimes a pesticide application fails because the pest was not identified correctly. Being able to accurately identify pests requires patience, practice, and the understanding of when to seek assistance from an expert. For example, knowing the difference between the larval and pupal stage of a mosquito is key when determining whether it is appropriate to apply an MDAR-approved larvicide to a catch basin; larvicides are effective on larvae but not on pupae.
2. **Incorrect dosage:** Make sure that you have applied the correct pesticide at the correct dosage, according to label instructions.
3. **Poor timing of application:** Other applications fail because the pesticide was not applied at the correct time. Understanding mosquito biology and the properties of the approved mosquito larvicide will help the Permitted Catch Basin Applicator know the correct timing for application.
4. **Poor environmental conditions:** In general, the Permitted Catch Basin Applicator should not apply approved mosquito larvicide just before an anticipated major rainstorm. The pesticide may be washed out of catch basin or storm drain and away from the application site.
5. **Pesticide degradation:** Pesticides may degrade when stored. Under some conditions, pesticides can change into a form that is ineffective. This might be due to the age of the product or the pesticide storage conditions. For example, dry granular pesticides stored in wet or very humid conditions will draw moisture. This may cause clumping and possible deactivation of the pesticide prior to application to the targeted catch basin or storm drain.

Pesticide Resistance

Pesticide resistance is the ability of a pest to tolerate a pesticide that once controlled it. Resistance can develop when intensive pesticide use kills susceptible individuals in a population, leaving the resistant ones to reproduce. Initially, higher labeled rates and more frequent applications can be used to control resistant pests, but eventually the pesticide will have little or no effect on the pest population as the resistant population grows.

Continual use of pesticides from the same chemical class increases the likelihood that resistance will develop in a pest population. Frequent applications and greater persistence of the chemical further increase the chances of pesticide resistance. Resistance can also spread through a population much more rapidly in pests that have many generations per year and many offspring per generation, which is the case for a significant number of insect species.

One pest management tactic that will help prevent or delay the occurrence of pesticide resistance is the use of new or altered pesticides. Using new compounds in rotation with older ones with different modes of action will lessen the likelihood of resistance developing in a pest population.

Questions for Self Study - Integrated Pest Management (IPM) and Resistance Management

- What is IPM and how is it implemented?
- What is pesticide resistance and how might the permitted catch basin applicator help to avoid pesticide resistance when treating catch basins with mosquito larvicides?

MOSQUITO BIOLOGY

Mosquitoes are members of the insect order Diptera, the true flies. True flies have only one pair of membranous wings (wings that are thin and mostly transparent), in contrast to bees and wasps, which each have two pairs of wings. Mosquitoes go through complete metamorphosis, a life cycle consisting of 4 stages: egg, larva, pupa and adult.

Mosquito larva

Mosquito pupa

There are approximately 2,500 mosquito species in the world, 52 of which can be found in Massachusetts. Each mosquito species has traits that determine where females lay their eggs, what time of year larvae begin to develop, and whether adult females bite birds, mammals, amphibians or reptiles. The presence of a particular species is dependent on the type of habitat available nearby. Examples of mosquito habitat include freshwater marshes, intermittently flooded wetlands, river flood plains, and salt marshes. There are also some mosquito species that prefer to breed in stagnant (still) water, and can reproduce in almost any container that can hold stagnant water for at least a week, including catch basins, storm drains, rimless tires, neglected swimming pools, rain barrels, or even plastic toys.

The species of mosquito found in an area can vary depending on what time of year it is, and is also temperature-dependent. There are early spring, late spring, summer and mid-summer species, and some mosquito species have several generations each summer, while some will produce only one generation per year. Most mosquito species are active primarily at dusk and dawn, though some will be active all night while others are active primarily during the day. While some mosquito species are indiscriminate about what they bite, most are selective. Some species feed primarily on human and other mammals, while others primarily bite birds or amphibians and reptiles.

Depending on the species, a gravid female mosquito will lay her eggs on the water surface or on moist surfaces within a wetland. Some mosquito species lay single eggs, such as floodwater mosquito species that lay their eggs one at a time on moist areas of a flood plain, where they stay until a large rain event inundates the area and causes the larvae to emerge. Salt marsh mosquito species will lay their eggs singly in moist areas of a salt marsh. The eggs then hatch when the highest tides of the month inundate the area where the eggs have been laid. Other mosquitoes such as *Culex pipiens* and *Culex restuans* will lay several eggs at once and stick them together, forming a raft that contains 100 to 200 eggs and floats on the surface of the water. These egg rafts can be found in catch basins or other type of water-holding containers such as rain barrels or neglected swimming pools.

Mosquitoes emerge from eggs as wingless aquatic larvae. These larvae spend the entire time immersed in water, feeding on vegetative debris, bacteria, algae and microorganisms, and go through four life stages, called instars. As the larvae feed and grow, they will reach a new instar and shed their skins. Larvae move around in the water by wriggling from side to side, in order to feed or to come to the surface to breathe. While some mosquito species spend at least 11 months in the larval stage, others develop much faster, and will reach adulthood in 5 weeks in the cold water that occurs in the spring, or in just a single week in the warmer water that can be found during the summer months.

Once a mosquito passes through all four larval stages (instars), it sheds the skin of its fourth and final instar and emerges as a pupa. Mosquitoes spend 1 to 3 days in this pupal stage, which, like the larval stage, is also aquatic and must come to the water surface to breathe. Mosquitoes do not feed while they are in this stage.

When the adult mosquitoes emerge from the pupal stage, they spend a short time on the water surface drying their wings, and then fly off. Adult mosquitoes will mate, and then the female mosquito will seek a blood meal in order to use the protein in the blood to produce her eggs. Only female mosquitoes seek a blood meal; males do not bite. After the blood is digested, which can take up to 3 days, the female mosquito will lay eggs. After a few more days, the female mosquito will seek another blood meal in order to lay another batch of eggs. This process could be repeated many times but is usually limited by the brief lifespan of a mosquito; while some mosquitoes will live a few months, the average mosquito will live only two to three weeks. Both male and female mosquitoes drink nectar from plants in order to use the sugar from the nectar for energy. Most adult mosquitoes are fragile and have problems maintaining their body moisture, so they spend the hot part of the day in damp shady areas so that they're protected from the sun. These damp shady areas can be in dense vegetation, under a tree canopy, under a porch, or in a storm water catch basin.

Questions for Self Study – Mosquito Biology

- What are the stages of mosquito life cycle?
- What is the life stage of the mosquito that permitted catch basin applicators are seeking to control?
- What is the life stage of the female mosquito that seeks blood?
- Where are mosquito larva found?

MOSQUITOES AND DISEASE TRANSMISSION

Mosquitoes are known to transmit numerous viruses and parasites that cause disease, including WNV, Eastern Equine Encephalitis, Dengue, Chikungunya, Yellow Fever, Malaria and Dog Heartworm. Diseases such as WNV and Eastern Equine Encephalitis (EEE) are actually bird viruses. Mosquitoes pick up the virus by biting an infected bird, then after fully digesting the virus become capable of transmitting it to another bird or to a human or horse. Some mosquito-borne viruses or parasites such as Dengue, Chikungunya, Yellow Fever, Malaria or Zika virus are transmitted by mosquitoes from one person to another. When a mosquito bites a person, it injects a small amount of saliva that keeps the blood from clotting while the mosquito is ingesting the blood (the itching from the mosquito bite is an allergic reaction to the mosquito's saliva). Mosquito-borne viruses and parasites that are ingested by a mosquito when taking a blood meal can then be transmitted in the saliva of the mosquito during a subsequent blood meal.

In some cases only certain mosquito species will transmit a particular virus or parasite. Because birds are a reservoir for WNV, the primary vectors that spread the virus are *Culex* species, bird-biting mosquitoes that occasionally bite people. *Culex pipiens* and *Culex restuans* are the primary vectors that transmit WNV from one bird to another bird. *Culex pipiens,* which occasionally bites mammals, is considered the primary mosquito vector in the northeastern U.S. that transmits WNV from birds to humans. Although many other mosquito species have some capability to transmit WNV, most WNV vector control efforts are directed against *Culex pipiens*. Other mosquito-borne diseases have different primary vectors, for example *Anopheles* mosquitoes are the vectors for Malaria, *Aedes aegypti* transmits Yellow Fever, and both *Aedes aegypti* and *Aedes albopictus* transmit Dengue and Chikungunya. *Culiseta melanura*, a bird-biting mosquito, spreads EEE in bird populations, while several other common mosquito species are capable of biting a bird infected with EEE and then transmitting the virus to a person or horse.

West Nile Virus (WNV)

WNV is a zoonotic arbovirus (an arthropod-borne virus that can be transmitted from animals to people) that was first identified in Uganda in 1937. WNV was first detected in the U.S. in New York City in 1999, and first found in Massachusetts in July 2000. Between 1999 and 2014, there have been 41,679 confirmed human cases of WNV in the U.S. Of those cases, 18,746 contracted meningitis or encephalitis and 1,753 people have died. Since it is believed that only 20% of people who are exposed to WNV actually contract symptoms (with less than 1% developing serious symptoms), the number of actual cases is assumed to be much higher. WNV symptoms include fever, headaches, muscle pain, nausea and skin rash. People over 50 are considered more susceptible to serious symptoms, with most fatalities occurring in people over 70. Severe symptoms in school-age children are relatively uncommon.

In the northeast U.S., WNV is believed to survive the winter in adult *Culex* mosquitoes. During the late spring and early summer, WNV begins to circulate between infected *Culex* mosquitoes and susceptible birds, with high risk periods likely to develop during July, August and September. High risk areas occur when there is a large number of infected birds and a high number of infected mosquitoes. Most human cases occur in urban and densely populated suburban areas because those areas provide an increased number of water-holding containers that serve as habitat for *Culex pipiens*. These areas also contain an increased amount of shelter where infected adult *Culex* mosquitoes can survive through freezing winter temperatures. Warmer than normal winters are likely to result in increased survival of *Culex* mosquitoes and an earlier start to the WNV cycle. Research also shows that warmer and drier conditions during the summer can lead to an increased number of human WNV cases, since above average temperatures during the summer shorten the development time that it takes mosquitoes to complete their larval and pupal stages, decrease the time between blood meals taken by a female mosquito, and shorten the

incubation period of the virus in the mosquito. Dry weather results in increased organic content of the water in containers, which is also favorable to the development of *Culex pipiens*.

West Nile Virus Vector Control

The Massachusetts Department of Public Health (MDPH) maintains an Arbovirus Surveillance and Response Plan that provides guidance for state agencies and municipalities regarding monitoring methods and a phased response for WNV. In addition to monitoring mosquitoes for the presence of WNV, diagnosing WNV in humans, horses and other mammals, and communicating risk to the public as well as state and local officials, the plan provides recommendations for a phased response depending on the level of risk. The Plan includes recommendations on when to:

- Educate the public about personal protection measures to take against mosquitoes
- Initiate source reduction measures to manage water-holding containers, in order to prevent the development of *Culex* mosquitoes
- Initiate larval control of *Culex* mosquitoes

Questions for Self Study – Mosquitoes and Disease Transmission

- What are a few of the diseases that mosquitoes transmit?
- What is WNV?
- What species of mosquitoes transmit WNV?
- What environmental conditions can lead to an increased number of human WNV cases?
- What role does the MA Department of Public Health play in helping to respond to risks of mosquito borne diseases?

CATCH BASIN LARVAL CONTROL

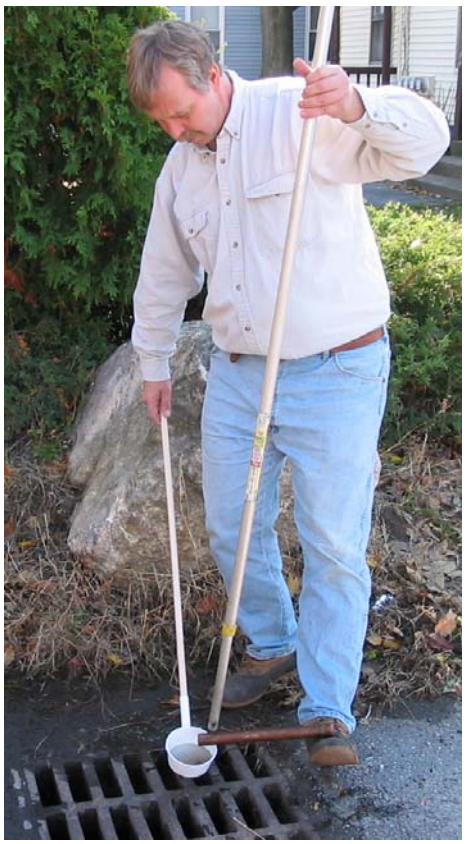
Although there are many types of water-holding containers that provide breeding habitat for *Culex pipiens*, catch basins are likely to be the most abundant habitat in urban and heavily populated suburban areas. As noted in the preceding section, abnormally hot and dry summer weather is the primary condition leading to an increase in human cases of WNV. Catch basins, because of their subterranean location, are more likely to retain water and produce *Culex pipiens* during a hot and dry period than an above ground water-holding container.

The dimensions of a typical catch basin are 4 feet by 4 feet at the bottom, with an outflow pipe that is located 3 feet from the bottom. Although the typical catch basin may be 6.5 feet deep below the surface of the road, its capacity to hold stagnant water is governed by the depth of the outflow pipe. That means a typical catch basin could hold up to 48 cubic feet of stagnant water (a block of water 4x4x3). The organic content of the stagnant water in the catch basin is influenced by the decaying vegetative debris that drains into it. The debris may include plant leaves, buds and flowers, cut grass, windblown pollen and lawn fertilizer. Some catch basins provide better *Culex* habitat because they are situated in close vicinity to trees, shrubs and lawns. Other catch basins, such as those located on a commercial street or parking lot, are less likely to generate mosquitoes because there is little vegetation around, as well as an increased likelihood of runoff from oil or other contaminants. Some catch basins become cracked and are not able to hold water long enough after a rain for mosquitoes to complete their development. Those catch basins that do hold water and are subject to runoff containing vegetative debris can be a continuous source of *Culex* mosquitoes for two to three months each season.

Catch basins in Massachusetts primarily produce two species, *Culex pipiens* and *Culex restuans*. Since both species are involved with WNV, they should both be controlled. Catch basins need to be monitored to determine when larvae are present and when control should be done. Starting larval control applications too early in the season can be a waste of time and product. If some catch basins dry up during drought years, care should be taken not to apply larvicides that only work when larvae are present at the time of application.

There is not an exact threshold to determine at what point mosquito populations have reached a level where catch basins need to be treated. However, a single productive catch basin can produce hundreds or thousands of larvae during the season. Since there can be between 1,000 and 25,000 catch basins in a community, it is unrealistic to sample every catch basin. The sample size should be sufficient to justify spending the time and money to treat the catch basins in a community. A good rule of thumb would be that if 10% of the catch basins that are sampled contain larvae, it is worth treating all the catch basins in the community. In the western suburbs of Boston, surveys have found that larvae usually become common in catch basins between the second and fourth week of June.

There are several methods for monitoring catch basins. Bruce Landers, the former Superintendent of the Suffolk County Mosquito Control Project, constructed a sampling device, now known as the Landers Ladle, which fits between the grates of a catch basin and can draw a sample containing 5 oz. of water from the catch basin.



Mosquito Control Project staff emptying the water from a Landers Ladle into a mosquito dipper.

The Landers Ladle is constructed using:

1. An expandable painter's pole (can be purchased at hardware stores), typically 6 feet long but can be expanded to 12 feet.
2. A one foot length of one inch diameter copper pipe is also needed. One end of this copper pipe should remain open, with a copper cap soldered onto the other end.
3. Two holes are then drilled into the end of both the painter's pole and the open end of the copper pipe. The painter's pole and the copper pipe are then linked, with sufficient space for movement, by connecting two short lengths of coat hanger wire, into the corresponding holes of both the painter's pole and copper pipe.

To use the Landers Ladle, the pipe and the painter's pole should be inserted through the catch basin grate and the copper pipe should be allowed to rest on the bottom of the catch basin for a few seconds. The contraption should then be lifted out of the catch basin, moving the copper pipe carefully past the catch basin grate. The 5 ounces of water inside the copper pipe should then be poured into another container, which can then be checked for the presence of mosquito larvae. An alternative to using the Lander's Ladle would be to lift the grate and then obtain a sample of water with a "mosquito dipper" or a container attached to a pole. However, moving the catch basin grate can be a difficult process without a hoist.

Treating catch basins can play a very important part in controlling *Culex* mosquitoes. Research conducted in eastern Massachusetts has shown that *Culex* egg rafts can contain at least 100 eggs. Since a catch basin may receive dozens of egg rafts each night during peak season, catch basins are likely to be very good at producing mosquito populations.

Surveys in Massachusetts have found that populations of *Culex* mosquitoes can peak several times between early July and mid-September, depending on rainfall. A reasonable goal would be to endeavor to control *Culex* larval populations from mid-June through September. Long-lived *Culex* mosquitoes can produce multiple generations during a single summer, and each female mosquito can lay 100 to 200 eggs at a time. One strategy to slow the expansion of the population during the summer is to implement catch basin larval control between mid-June and early July, with the goal of reducing the first peak of the *Culex* population.

There are several methods that mosquito control projects and communities have used to apply larvicides, including:

1. Catch basin larviciding, done using one or two people in a pickup truck or a car. Using two people is more costly but allows one person to drive and the other to focus on applying the larvicide to catch basins.
2. Walking the route, which may be efficient in congested urban areas or densely populated suburban areas with significant traffic and on-street parking.
3. Using a bicycle, which can be an efficient way to travel the route and access catch basins in suburban neighborhoods.
4. Using motorbikes with engines that are small enough to not require a motorcycle license, which is an option that some communities in Connecticut have tried.

When assigning catch basin routes, municipalities can be divided into segments using snow plow or trash collection routes. Some mosquito control projects will issue a line marker gun so that a spot of water-soluble paint can be put on each catch basin. This marking prevents someone from accidentally treating the same catch basin twice and allows for the crew or the supervisor to locate any areas where catch basins were missed.

Permitted catch basin applicators that are municipal employees may only be authorized to treat catch basins on public streets, parking lots and cemeteries, unless permissions that may be required by law have been obtained. Municipal employees should check with a supervisor before applying larvicides in privately owned parking lots, industrial parks and in private cemeteries. Since senior citizens are more likely to experience severe symptoms from WNV, treating catch basins in parking lots of public housing for senior citizens should be a priority.

Catch basin applications should be coordinated with catch basin cleaning. Before starting an application, check with the Department of Public Works in the target municipality to ensure that catch basins in the neighborhood are not scheduled for cleaning within two weeks of the scheduled larviciding. If there is an imminent forecast of heavy rains, a catch basin larvicide application should be postponed. A rainstorm dropping two or more inches of rain on the same day as the larvicide application could flush the larvicide out of the catch basin before it has a chance to control mosquitoes.

In recent years, the pesticide products that have been used to control *Culex* mosquito larvae in catch basins have included pesticides with one or a combination of the following active ingredients:

- **Methoprene** controls mosquitoes by mimicking a growth hormone found in the juvenile stage of some insects. When mosquito larvae ingest methoprene, it prevents them from properly completing their development. Since products containing methoprene can be formulated as 21-day granules, 30-day pellets, briquets or water-soluble pouches (WSP) and 150-day briquets, these products can be used as a pre-emergence application or can be used following the emergence of mosquito larvae.
- ***Bacillus sphaericus*** is a microbial product (derived from microorganisms) that works by producing a crystal containing proteins that are toxic to mosquito larvae when ingested. The bacteria then recycle from the body of the dead mosquito larvae to become bio-available yet again for consumption by new larvae in the water of the catch basin. As long as there is a continuous supply of new mosquito larvae in the catch basin, *Bacillus sphaericus* will continue to provide control. *Bacillus sphaericus* should not be applied until mosquitoes have emerged into their larval stage, and is considered relatively specific to mosquito larvae.
- ***Bacillus thuringiensis var. israelensis* (Bti)** is also a microbial product that kills mosquito larvae when ingested. It is frequently combined with *Bacillus sphaericus* or methoprene in catch basin larval control products to either increase the potency of a product or to reduce the chance of resistance developing when *Bacillus sphaericus* is used alone. Bti is the primary larvicide used in Massachusetts to control mosquito larvae in wetlands. It should not be applied until mosquitoes are in the larval stage.

From the perspective of the applicator, products containing one of the active ingredients listed above are typically classified by the EPA as relatively non-toxic. These products are targeted against the larval stage of the mosquito, since larvae must feed in order to develop. Since mosquito pupae don't feed, these products will have no impact on mosquitoes that have already reached the pupal stage. Note that there is the potential for the development of resistance in long-lasting products such as *Bacillus sphaericus* or methoprene. To prevent this from happening, a good strategy would be to change the types of mosquito larvicide products being used in catch basins every few years.

Questions for Self Study – Catch Basin Larval Control

- What is a catch basin?
- How might the permitted catch basin applicator sample for mosquito larvae?
- What are some of the common active ingredients used to control mosquito larvae?
- Do catch basins need to be monitored to determine when larvae are present? And if so, why is that important?
- How might the permitted catch basin applicator determine if it is worth treating catch basins in the community?

PESTICIDE LABELING

Before a pesticide product is approved for sale and use, it undergoes a comprehensive evaluation by the United States Environmental Protection Agency (EPA) to determine its potential as a hazard to human and environmental health. Only after this comprehensive risk assessment is completed are products registered by the EPA for use. This process includes the review and approval of pesticide labeling associated with each product.

Pesticide labeling includes not only the label printed on the container but all other supplemental information received from the manufacturer at the time the product is purchased. As the principal means of communication between the product manufacturer and the end user of the pesticide, the label is reviewed and approved by EPA, which sets the minimal labeling requirements to ensure that adequate, consistent and necessary information is provided to the user.

Under both Federal and Massachusetts State Pesticide Laws, all applicators of pesticides are required to read and follow the product labeling. Under this framework, it is understood that "*the label is the law.*" The product labeling provides critical information, including identification of the chemical ingredients, identification of hazards, required Personal Protective Equipment (PPE), and use directions. Following the product label helps to ensure that the pesticide product will be used in the manner resulting in least risk of adverse impacts to human and environmental health. This is important because all pesticides by their nature are intended to either prevent, destroy, repel, or mitigate a pest, and therefore may be toxic at some exposure level to other living organisms as well. The Permitted Catch Basin Applicator is responsible for reading, understanding and following all warnings, precautions, restrictions and use directions. A proper understanding of the pesticide label will be assessed in the Program examination process.

A sample label can be downloaded from the "Training Materials" section of the Catch Basin Applicator Permit Program webpage. The typical pesticide label can be broken down into several sections. The "Precautionary Statements" found on the front of the label is presented first, in order to warn the applicator of potential hazards to human and environmental health. This section discusses specific information, such as Personal Protective Equipment (PPE) needed to handle the product in a manner that minimizes exposure to the applicator.

Pesticide labels are designed to inform the applicator of what specific active ingredients are contained within the product and whether there are any known physical or chemical hazards associated with those ingredients. Specific product application restrictions and advisory language follow next. This information, combined with the "Directions for Use" will help the applicator to make proper on-site application decisions. Information is also provided regarding the proper manner to store the product and how to clean and dispose of any wastes in a manner that minimizes risks to both human and environmental health.

The table below shows an example of labeling information you are likely to encounter on a typical pesticide product. The length or number of pages for pesticide labeling can vary widely. Depending upon the nature of the product, its hazards, and the required use instructions, pesticide labeling can range from a single page to several pages. Those products with very brief labels may NOT include all of the sections outlined below. This is most likely to be the case for MDAR-approved dry larvicide formulations, since such products pose low risks to human and environmental health.

Sections of a Pesticide Label

Section of Labeling	Purpose of Information
Precautionary Statements	Describes the potential hazards to people or pets and actions you can take to reduce those hazards, for example, wearing gloves. These statements may also provide extra information about how to protect children or pets.
Signal Word	The signal word indicates the pesticide's potential hazard level to humans, with "CAUTION" being the least harmful, and "DANGER-POISON" the most harmful. On the front of the label you will find one of the following signal words, or no signal word in the case of a product that has extremely low toxicity potential: CAUTION – relatively non-toxic to slightly toxic WARNING – moderately toxic DANGER – highly toxic DANGER-POISON – poisonous at low exposure (marked by a skull and crossbones)
Ingredients Statement	**Active Ingredients** Identifies the ingredient(s) in the product that are known to actively prevent, destroy, repel, or mitigate the pests listed on the label. **Other (Inert) Ingredients** Identifies the percentage of "other ingredients" (sometimes called "inert ingredients") in the product. While the other ingredients do not control the pest, they serve other purposes such as controlling the release of the active ingredients or otherwise affecting how the product performs.
EPA Registration No.	Identifies the specific company to whom the registration belongs and consequently indicates a very specific product formulation on record with the EPA. All pesticide products sold in the United States must be registered with the EPA.
EPA Establishment Number (EPA Est. No.)	Identifies the particular facility where the final phase of production of took place for the product.
First Aid Instructions	Describes what to do first if someone accidentally swallows or breathes the pesticide, or gets it on the skin or in the eyes. Labels may also contain a section labeled "Note to Physicians" which provides doctors with specific medical information.
Environmental Hazards	Describes the potential for harm to wildlife, fish, endangered plants or animals, or whether it may adversely impact wetlands or water resources. Also provides additional information about

	what to do to avoid environmental damage.
Physical or Chemical Hazards	Describes hazards such as corrosiveness or flammability of the product. For example, if the pesticide is flammable the product should not be used or stored near open flames.
Directions for Use	Describes what the pesticide product controls and where, how, and when to use the product. Often, the product manufacturer includes a booklet containing a toll-free number for consumer questions.
Storage and Disposal	Describes how to best store the product and what to do with the unused portion of the product and the empty container.
Warranty Statement	Statement intended to limit a company's liability, or to act as a disclaimer or warranty for the product.
Manufacturer's Address	Provides the name and address, and sometimes phone number, of the manufacturer, or distributor, of the product.
Net Weight/Net Contents Statement	Identifies how much pesticide product is in the product container.

Questions for Self Study – Pesticide Labeling

- What is the pesticide labeling and why is it so important?
- Is the information on the pesticide label organized? And if so, why is that important?
- What are the federal and state agencies primarily responsible for the regulation of pesticides?

PESTICIDE HAZARDS AND FIRST AID

Pesticides are designed to be toxic to living organisms (e.g., plants, insects, rodents, fungi, and bacteria). In many cases, something that is toxic to one species or organism may also be toxic to other species or other organisms. Because of this, pesticides must be used with special care to avoid harming non-targets, including pesticide applicators, handlers, and anyone else exposed to the product.

Though many pesticides are toxic to humans, they vary significantly in the type and level of hazards they present. Pesticides can have both short-term and long-term effects on humans. The signal word on the product label and the information contained in the "Hazards to Humans and Domestic Animals" section of the label indicate the human toxicity concerns and the precautions that you should take to minimize your own risk. Pesticides can pose additional physical and chemical risks if they are explosive and/or combustible. If the product presents either a physical or a chemical hazard, this information is included in the "Precautionary Statements" section. Permitted Catch Basin Applicators should also refer to the Safety Data Sheet (SDS) for more information on toxicity and precautions.

Toxicity, Exposure, and Hazard

Toxicity refers to the ability of a pesticide to cause short-term (acute) or long-term (chronic) injury. It is a measure of the pesticide's capacity to cause injury or illness, a combination of its chemical properties and concentration.

Exposure occurs when pesticides get onto or into the body through the skin (dermal), the lungs (inhalation), the mouth (oral), or by eye contact (ocular). While the Permitted Catch Basin Applicator will only be working with dry formulations, it is important to recognize that other pesticide product formulations differ greatly in their exposure risk. Some routine pesticide-handling procedures present an especially high likelihood of exposure. Examples include handling opened containers, mixing and loading concentrates, working around contaminated application equipment, making spray, mist, or dust applications, cleaning up spills, and reentering a recently treated area before the spray has dried or the dust has settled.

Hazard or risk is the true concern for the applicator. It is the potential or probability for harm (injury, illness, or allergy) to occur because of the combination of the product's innate toxicity and the level of human exposure. Hazard reflects both the pesticide's toxicity and the likelihood that you will be exposed to the product in a particular situation. As a Permitted Catch Basin Applicator, your risk is reduced based on the requirement that only MDAR-approved larvicides can be used. Regardless, you should always reduce the hazard (risk) by taking steps to reduce exposure. Pesticide users need to be concerned with the hazards associated with exposure to the chemical and not exclusively with the toxicity of the pesticide. A good equation to remember is:

Hazard = Toxicity x Exposure

The best way to avoid or reduce the risks when using pesticides is to understand what you are using and how to use it safely in a way that minimizes your exposure. This means reading the label carefully and following instructions. The user's attitude is of utmost importance. If you assume that you know exactly how to use a pesticide without reading the product label or do not bother to take the precautions

indicated on the label, you are more likely to experience excess exposure. Pesticide applicators have a legal and moral obligation to protect their own health as well as that of others when handling pesticides. Besides protecting yourself, you must be aware of other people, wildlife, or pets that may be in or near the treatment area and could be exposed to the pesticide during or after application. Taking adequate precautions and following good safety practices will reduce the chance of exposure from pesticide application.

First Aid for Pesticide Poisoning

Pesticide applicators who experience any unusual or unexplained symptoms within 24 hours of a pesticide exposure should seek medical advice. Since the pesticides that have been approved for use by the Permitted Catch Basin Applicator are classified as relatively non-toxic by the EPA, it is unlikely that applicators will experience any significant acute injury. According to a review of Safety Data Sheets for the MDAR-approved products, mild skin or ocular irritation is possible. If these or any other unexplained symptoms occur and medical advice is sought, the medical professional should be given a copy of the pesticide label or at a minimum the EPA registration number of the product. The EPA label is important because the medical professional needs to know the pesticide ingredients to determine the proper course of treatment. It is a good idea to print extra copies of the pesticide label and place one in your service vehicle and one in the office in case one is needed.

The product label is the primary source of information. Follow the label's specific first aid instructions carefully. Beyond the label, call the American Association of Poison Control Centers (AAPCC) or a physician for additional advice. The AAPCC's poison help line (**800-222-1222**) is available 24 hours a day. First aid is only the first response and is not a substitute for professional medical help.

- If oral or dermal exposure has occurred, the first objective is usually to rinse the exposed area with water to dilute the pesticide and prevent absorption.
- Always have a source of clean water available to rinse exposed areas and dilute the pesticide.
- Never try to give anything by mouth to an unconscious person.
- Do not induce vomiting unless the label tells you to.
- If inhalation exposure has occurred, get the victim to fresh air immediately.
- Become familiar with the proper techniques of artificial respiration.
- If first responders are likely to be directly exposed to a pesticide, be sure they wear appropriate PPE.

In addition to the AAPCC, you can call the National Pesticide Information Center (NPIC). NPIC provides a variety of information about pesticides to anyone in the United States by phone (800-858-7378 or online at http://npic.orst.edu/). Post all emergency numbers near telephones and in service vehicles used by pesticide applicators.

Questions for Self Study – Pesticide Hazards and First Aid

- When thinking about the hazards of pesticides, why should the permitted catch basin applicator consider both the toxicity of the pesticide and amount of exposure to the substance?
- What is the best way to reduce the risks when using pesticide?
- What information should be given to the medical professional or Poison Control Center seeking to assist someone with concerns for pesticide related health concerns?

PERSONAL PROTECTIVE EQUIPMENT (PPE)

The pesticide label prescribes handling precautions, personal protective equipment (PPE), and other safety measures to minimize your exposure while handling pesticides. PPE comprises the clothing and devices you wear to protect your body from contact with pesticides. Wearing PPE can reduce exposure (dermal, inhalation, ocular, or oral) and thereby lower the chances of pesticide injury, illness, or poisoning. PPE, as defined by the EPA, includes coveralls, apron, gloves, footwear, headgear, eyewear, and respirators.

Given the very low risks posed by the dry formulations of mosquito larvicides approved by the MDAR, it's quite possible that the product labeling may not require or recommend any specific PPE. The Permitted Catch Basin Applicator should **Read the Label First** and follow the PPE requirements and precautionary statements found on the product label.

Labels for many of the dry formulations of mosquito larvicides do contain Precautionary Statements indicating that they may cause moderate eye irritation or are harmful if absorbed through the skin. Therefore, Permitted Catch Basin Applicators should avoid contact of the larvicides with eyes, skin or clothing. After handling any of the larvicides, applicators must wash thoroughly with soap and water before eating, drinking, using tobacco and using the toilet. It is also a recommended precautionary measure to remove and wash contaminated clothing before reuse, even if the labeling does not require it.

Protect Yourself from Pesticides

A pesticide label lists the minimum PPE that an applicator must wear. Wearing anything less is illegal and dangerous. All pesticide applicators are responsible for following the pesticide label, including wearing PPE.

PPE requirements are typically listed under the "Precautionary Statements" section of the pesticide label. Always check to see if state regulations are more restrictive than label requirements. When the state is more restrictive than federal pesticide laws, the state law must be followed.

Wearing PPE can reduce the potential for dermal, inhalation, ocular, and oral exposure, thereby lowering the chances of pesticide injury, illness, or poisoning. Consult the pesticide label for the minimum PPE required by law. In order to appropriately select and wear PPE, you must understand both its protections and its limitations. Then determine what protective equipment you need for the pesticide task at hand. Personal protective equipment reduces your exposure to pesticides but does not necessarily eliminate it. Maximize your safety by following certain good work practices when using pesticides.

Questions for Self Study – Personal Protective Equipment

- What is PPE?
- How does the pesticide applicator know what PPE to use when applying a pesticide?

STATUTORY AND REGULATORY REQUIREMENTS FOR PERMITTED CATCH BASIN APPLICATORS

Chapter 425 of the Acts of 2014 amended M.G.L. c. 132B, the Massachusetts Pesticide Control Act, to create a Catch Basin Applicator Permit (Permit), which falls under the jurisdiction of MDAR. This new Permit allows an employee of the Commonwealth or a city or town to use MDAR-approved dry formulation mosquito larvicides in storm drains and catch basins, provided they are working under the supervision of a certified or licensed applicator. [1] In order to obtain a Permit, an applicant must complete an MDAR-approved training course and pass an evaluation that focuses on the use and handling of mosquito larvicides. Once permitted, the individual is required to keep records and ensure that all applications are made in accordance with all applicable state and federal laws.[2]

Pesticide Products Eligible for Use Under the Catch Basin Applicator Permit Program

The use of pesticides is governed by M.G.L. c. 132B, which is the exclusive authority in regulating the labeling, distribution, sale, storage, transportation, use, application, and disposal of pesticides within the Commonwealth.[3] All activity involving the use of pesticides must comply with the statutory and regulatory requirements in M.G.L. c. 132B and the regulations promulgated at 333 CMR.[4] Specifically, M.G.L. c. 132B, Section 10 limits the use of pesticides under a Permit to only those approved by MDAR, which products include those dry formulations labeled for application to catch basins or storm drains and with labeling that does NOT include the signal word WARNING or DANGER. The labeling for such MDAR-approved larvicide products may include the signal word CAUTION or not require a signal word under U.S. EPA requirements.[5]

Other pesticides, including those listed below, are NOT eligible for use by those issued a permit under the Catch Basin Applicator Permit Program:

- Any liquid mosquito larvicides
- Any mosquito larvicide with labeling that includes the signal word WARNING or DANGER
- Any pesticides labeled for control of adult mosquitoes
- Any mosquito larvicide that is not MDAR-approved

Sites or Locations Eligible for Treatment Under the Catch Basin Applicator Permit Program

The only sites or locations eligible for treatment under the Catch Basin Applicator Permit Program are catch basins and storm drains. Other sites, including those listed below are **NOT** eligible for application by those issued a permit under the Catch Basin Applicator Permit Program:

- Drainage easements
- Lakes
- Marshes
- Neglected swimming pools
- Ponds

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[1] Chapter 425 of the Acts of 2014; *see also*, M.G.L. c. 132B, Section 2
[2] M.G.L. c. 132B, Section 10
[3] M.G.L. c. 132B, Section 1
[4] *See*, M.G.L. c. 132B, Sections 6 and 6A
[5] M.G.L. c. 132B, Section 6A; *see also*, Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 40 C.F.R. § 150 et seq.

- Rain barrels
- Rimless tires
- Swamps
- Vernal pools
- Any other wetland site NOT specifically described as a catch basin or storm drain under this Program[6]

Required Supervision by License or Certified Applicators

When performing the duties related to the application of MDAR-approved mosquito larvicides to catch basins or storm drains, individuals issued a Permit by MDAR under the Catch Basin Applicator Permit Program must be supervised by an individual who maintains either a valid Massachusetts Pesticide Applicator (Core) License or a valid Massachusetts Pesticide Commercial Certification Credential issued by MDAR.[7]

Record Keeping Requirements

Each Permitted Catch Basin Applicator, under the Catch Basin Applicator Permit Program, is required to maintain true and accurate records of any larvicide application.[8] Such records must identify the following:

- The name of the applicator
- The name of the city, town or political subdivision, and the location therein, where catch basins were treated
- The date of the application
- The method of the application
- The total amount of larvicide applied per day
- The pesticide brand name and EPA Registration Number for the product(s) applied

Such records of larvicide applications should be kept by the Permitted Catch Basin Applicator or their respective organization and maintained for a period of at least three years from the date of application, and shall be made available to appropriate MDAR officials upon a reasonable demand.

Protection of Children and Families from Harmful Pesticides[9]

As part of its mandate, the MDAR actively promotes the implementation of IPM techniques and works to establish those standards, requirements and procedures necessary to minimize the risk of unreasonable adverse effects on human health and the environment regarding the use of pesticides within a school, daycare center, or school-age child care program facility[10].

To help communicate important information about pesticide use to staff members and parents of attending children, most pesticide applications occurring within a school, daycare center or school-age child care program facility require what is defined as “standard written notification.” The following exemption to the requirements of standard written notification was written into the Massachusetts Pesticide Law and corresponding regulations.

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[6] 333 CMR 12.00 et seq.; *see also*, 310 CMR 10.00 et seq.
[7] M.G.L. c. 132B, Section 2
[8] M.G.L. c. 132B, Section 10
[9] M.G.L. c. 132B, Sections 6C-6J; *see also*, 333 CMR 14.00 et seq.
[10] M.G.L. c. 132, Section 2; see definitions for "Child care center" and "School age child care program"

Mosquito control larvicides that are classified as category IV pesticides by the United States Environmental Protection Agency, as applied by mosquito control projects and districts under M.G.L. c. 252 or other state law, are exempt from the Standard Written Notification requirements. [11]

Any larvicide used on school property must be included in the school's outdoor Integrated Pest Management Plan PRIOR to the application. The applicator should review the plan prior to the application to ensure that the school has updated their plan to include product name and EPA Registration Number.

Given the specific criteria for "MDAR-approved mosquito larvicides," such products are indeed classified as category IV pesticides by the EPA and consequently their application to catch basins or storm drains on the grounds of a school, daycare center or school age child care program facility **by employees of mosquito control projects and districts** are *exempt* from the requirements of Standard Written Notification. However, those individuals who are not employees of mosquito control projects and districts who are making a catch basin larvicide application are NOT exempt from the Standard Written Notification requirements and must comply with the law.[12]

Prior to making any applications of MDAR-approved larvicides to catch basins or storm drains on the grounds of a school, daycare center, or school age child care program facility, all Permitted Catch Basin Applicators must be sure that the school has included the necessary information as part of the written components of the school's outdoor IPM Plan and that only eligible products listed in the IPM Plan are used.[13]

In addition, the Permitted Catch Basin Applicator must provide a copy of such larvicide application records to the school.[14] At that point, the school shall be responsible for maintaining such records on-site. State law requires that a written or electronic record of all larvicide applications made at a school, day care center or school age child care program in the commonwealth shall be maintained on site for a period of not less than five years, and shall be made available to the public upon request pursuant to the criteria established by the law.

Questions for Self Study – Statutory and Regulatory Requirements for Permitted Catch Basin Applicators

- Who may become a permitted catch basin applicator?
- What types of pesticides are eligible for use by the permitted catch basin applicator?
- What site (where) may be treated by the "permitted catch basin applicator"?
- What sites (where) may NOT be treated by the permitted catch basin applicator?
- Who must supervise the permitted catch basin applicator?
- What are the record keeping requirements for Permitted Catch Basin Applicators?

[11] *See*, M.G.L. c. 132B ; *see also*, 333 CMR 14.00
[12] M.G.L. c. 132B, Section 6C; *see also*, 333 CMR 14.09
[13] M.G.L. c. 132B, Sections 6E and 6G
[14] M.GL. c. 132B, Section 6I