

City of Linden

Mosquito Control Program

2026

The City of Linden has contracted APM Mosquito Control (APM) to provide this service for 2026. APM Mosquito Control is located in Flint, Michigan, and specializes in municipal and community-wide mosquito management programs. APM was established in 1986 and has over 30 years of experience in integrated mosquito management. This information is being provided to the community as insight to APM's approach for an effective integrated mosquito control program for City of Linden property owners and residents. This information also explains how property owners and residents can assist in this plan.

INTEGRATED MOSQUITO MANAGEMENT

This is a process, consisting of the balanced use of environmentally compatible and economically feasible products, to reduce mosquito populations to a tolerable level. APM develops and implements comprehensive integrated mosquito control programs. The basis of every APM control program is biological larval control. All potential mosquito larval habitats are surveyed, cataloged and mapped. Routine larval surveys are then scheduled to determine where larvae are developing and what actions need to be taken to control them. Adult mosquito populations are also sampled using a network of light traps. These surveillance activities allow APM to plan and implement larval and adult mosquito control applications in a manner consistent with Integrated Mosquito Management (IMM) protocols.

The primary objective of IMM is to prevent the development of mosquito larvae by using biological methods, thus minimizing the need to "fog" for adult mosquitoes. The use of ULV (ultra-low volume) fogging gives good but only temporary results under acceptable weather conditions and is not generally cost effective as a sole means of control. Biological larval control methods take advantage of natural enemies to reduce mosquito populations.

Bti (*Bacillus thuringiensis var. israeliensis*) is a naturally occurring spore and crystal forming soil bacteria. Bti's active ingredient has been shown to be toxic only to mosquitoes, black flies, and closely related species, with no toxic effects on other aquatic organisms. A Bti application in late April to lowland/woodland areas will be the initial step of the City of Linden integrated mosquito control program. Mosquito control activities are limited to specific political boundaries, but unfortunately adult mosquitoes don't obey lines on a map. Thus, any program that hopes to have effective control must contend with local larval development and invading migratory adults.

Nature has provided no successful alternative to chemical insecticides for controlling adult mosquitoes. The controlled application of ULV insecticides using modern technology and equipment can effectively reduce adult mosquitoes utilizing extremely small amounts of insecticide. Perm X UL 4-4 or Kontrol 4+4 is applied via truck and or off-road vehicle-mounted equipment at **1-3** ounces per acre. Perm X and Kontrol are man-made synthetic pyrethroids, which offers excellent effectiveness against adult mosquitoes, low mammalian toxicity, low odor, and rapid biodegradability.

THE MOSQUITO STORY

Mosquitoes (Order Diptera, Family Culicidae) are some of the most adaptable and successful insects on earth and are found in some extraordinary places. Virtually any natural or man-made collection of water can support mosquito production. Mosquitoes can be distinguished easily from other flies by the fact that they have both a long, piercing proboscis and scales on the veins of their wings. About 55 species are found in Michigan. Only a few of these are important as carriers of disease, but many others are significant nuisances. The two most common mosquito species found in Michigan are *Aedes vexans* and *Culex pipiens*. *Aedes vexans* is known as the floodwater mosquito because it lays its eggs on dry ground in flood prone areas. *Culex pipiens* is an important disease vector, known to spread St. Louis Encephalitis, West Nile Virus, and other encephalitis diseases.

THE MOSQUITO LIFE CYCLE

All mosquito species have two things in common: they must have water for their early stages; and they all undergo the same four-stage life cycle — egg, larva, pupa, and adult.

Mosquito eggs are laid individually or in clusters and are deposited either on the water surface or in flood prone areas. Most mosquitoes exist over winter in the egg stage. If eggs are laid out of water, embryos may lay dormant for several years. Once the egg hatches, the larval stage begins. The larvae of most mosquito species hang suspended at the water surface using an air tube to breathe. The larvae feed on aquatic organisms near the surface. As a defense mechanism, the larvae can dive deeper into the water by swimming in a characteristic “S” motion. Larvae grow quickly and outgrow their exterior covering. Larvae molt four times. Larval stages last between 5 and 14 days depending on temperature and food availability. No feeding occurs in the pupal stage that lasts from 1 ½ to 4 days, after which the pupal skin splits along the back allowing the newly formed adult to slowly emerge and rest on the water surface. Male mosquitoes will emerge first and linger near the breeding site waiting for the females. Mating occurs quickly after emergence due to high mortality. As much as 30% of the adult population can die per day. The female compensates for this by laying large numbers of eggs, usually about 300. Males live about 7 days and feed on plant nectars. Females live about 6 weeks and must take a blood meal to nourish her eggs. She uses carbon dioxide, exhaled chemicals, and temperature patterns to locate her victims. The average female’s flight range is between 1 and 10 miles, but some species have been shown to travel up to 40 miles. After each blood meal the female will oviposit her eggs, completing the life cycle. Several ovipositions per female are possible.

MOSQUITOES AND PUBLIC HEALTH

Mosquitoes can spread disease only when they bite. During feeding, the female pierces her victim’s skin with her proboscis, injects her saliva, which contains an anti-coagulant and then sucks the victim’s blood in. If the victim’s blood contains disease-causing organisms, the mosquito ingests them too. These organisms are then maintained within the mosquito and eventually may be injected into another victim. In this way a mosquito can spread disease from animal to animal, animal to man. In the U. S. there are about six mosquito-borne viruses that can cause acute infections of the central nervous system. Most often this type of infection causes brain and central nervous system inflammation or encephalitis. The most common types found in our area is West Nile Virus (WNV), St. Louis Encephalitis (SLE) and Eastern Equine Encephalitis (EEE). The only common parasite transmitted by mosquitoes is Dog Heart worm. Transmission of Dog Heart worm occurs only through the bite of an infected mosquito and involves a complicated transmission cycle. Mosquitoes and other insects do not transmit HIV or cause AIDS.

Controlling Mosquitoes

- Standing water means mosquitoes. Any standing, stagnant water that remains for 7 to 10 days after a rain can, and usually will, produce mosquitoes.
- Empty all water holding containers in your yard on a regular basis, at least once a week. Tires, children’s

wading pools, rain barrels, buckets, plant pots, birdbaths, and stored boats are common examples of mosquito breeding sites around the yard.

- Leaves and other debris should be removed from eaves troughs and down spouts.
- Ditches and retention basins must be kept free of vegetation and debris to promote rapid drainage.
- Pond edges should be kept clean of cattails and other aquatic vegetation. This is where mosquito larvae develop and mature.
- To reduce the number of adult mosquitoes in your yard, keep your yard mowed as short as is practical.
- Keep all ornamental shrubs and bushes trimmed and pruned to allow airflow and light to penetrate. This is where adult mosquitoes hide during the day.
- Good housekeeping is encouraged. Screens on windows and doors should be well maintained to prevent mosquitoes from entering homes, structures as mosquitoes seek out cooler and shaded areas for resting.

HOW THE PROGRAM WILL WORK

Initial spring larvicide application of bti to Lowland/woodland wet areas during mid-April to mid-May. The mapping, inspecting, and larviciding of mosquito breeding sites in City of Linden along with the development of historical data. This is an ongoing process throughout the mosquito season. The placing of New Jersey Light Traps for adult mosquito monitoring. Traps will be run from June 1st until September 15.

A nighttime ULV application from a truck mounted and or ATV mounted sprayer. This will be provided when light trap counts exceed 20 females and or resident reports of increased adult populations are present.

Description of materials being used for mosquito abatement

1. Vectobac G (2% bacillus thuringiensis israelensis) 5 lb./acre
2. Vectolex FG (7.5 % bacillus spaericus) 5 lb./acre
3. Altosid XR (2.1% Methoprene)
4. Natular XRT & Natular DT tablets (6.25% Spinosad)
5. Demand CS (9.7% Lambda-cyhalothrin)
6. Tempo 10WP (10%Cyfluthrin) .05% - 0.1% solution
7. PermaSease 4-4 (4.6 % permethrin, 4.6 % technical piperonyl butoxide)
8. Kontrol 4+4 (4.6% permethrin, 4.6% technical piperonyl butoxide)

PUBLIC NOTICES

Public notice announcing the mosquito control program will be published in the local newspaper and also be posted at various locations throughout the city. We request that all property owners who are renting or leasing their properties to notify their tenants either by passing this information to them or advising them that this information is available at the City of Linden Hall located at 132 E. Broad St., Linden, MI 48451.

Those who believe that their mosquito population is excessive are to Contact APM via their toll-free number for an onsite inspection and additional treatment if the need is necessary and weather conditions permit. **APM's toll free number is 1-877-276-4714.**

Notice: Property owners and residents who do not wish to be treated by this method of mosquito control are to fill out the following form and submit it to City of Linden, 132 E. Broad St., Linden, MI 48451. These properties will be identified as non-treatment areas. The Mosquito control contractor for 2026 is: APM Mosquito Control, 21240 34 Mile Rd, Armada Michigan 48005. APM's local number is 810-766-9423.

The property owners or residents of City of Linden who prefer that their properties **NOT** be treated for Mosquito control are to notify the City of Linden and or APM as soon as possible using this form with the required information filled out. These notices will be forwarded to APM Mosquito Control so they can place an orange stake to mark and exclude your property from being treated. Those residents that would like to be notified before ULV adulticide applications should contact APM to be put on a call notification list.

We, the following, **DO NOT** want our property treated for mosquito control in 2026.

Name _____

Property address _____

Phone Number _____

**Submit this letter to: City of Linden, 132 E. Broad St., Linden, MI 48451 or to APM Mosquito Control
21240 34 Mile Rd Armada, MI 48005.**