

Mosquito Control Program – Integrated Pest Management Plan
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Public Health Madison and Dane County's (PHMDC) Mosquito Control Program is based on the following Integrated Pest Management (IPM) Plan in accordance with guidance from the Centers for Disease Control and Prevention (CDC). The purpose of this program is to limit the risk of arboviral diseases, specifically West Nile virus (WNV).

Surveillance and Identification

The surveillance portion of this program targets *Culex* and *Aedes* species of mosquito, identifies and maps important breeding habitats, and documents the need for control. Baseline data on mosquito species composition was originally collected in 2003. Data has been collected since that time through 2013. The following are the surveillance methodologies used in this program.

1. Larval Mosquito Surveillance

Department staff sample water sources located on public lands for the presence of mosquito larvae. Sampling locations are established through review of storm water management data, visual assessments in the field, and citizen complaints. All locations are sampled regularly at least three times during the season depending on water levels. Areas found to produce *Culex* larvae consistently are sampled once per week. Department personnel identify mosquito larvae to species to determine if WNV vectors are present at unacceptable levels. Staff will also monitor private property on a complaint basis as appropriate.

2. Adult Mosquito Surveillance

Department personnel place a total of six adult mosquito traps (light traps) around the metropolitan area to monitor species presence and relative abundance of adult mosquitoes in an area. Light traps baited with carbon dioxide are used to gather general mosquito activity data and monitor adult mosquitoes for WNV infection. *Aedes vexans* and *Ochlerotatus trivittatus* are two potential bridge vectors, species that may bite both bird and human thus transferring the virus between species. All traps are set in the afternoon and allowed to run over night.

3. Virus Surveillance

As financial resources permit, PHMDC will coordinate with the UW Medical Entomology Program to test adult mosquitoes for WNV infection to determine the prevalence of WNV in the mosquito population.

Pest Control Threshold

The object of this program is to minimize the threat of arboviral illness in Dane County. The most prevalent arboviral illness carried by mosquitoes in Dane County is West Nile virus (WNV). Other mosquito borne illnesses, such as LaCrosse Encephalitis and Eastern Equine Encephalitis, may also occur in Dane County but are generally limited to cases related to travel. As a result, this program is currently focused on minimizing the threat of WNV in Dane County.

To effectively control WNV, program efforts are focused on *Culex pipiens* and *Culex restuans*, mosquito species that are known vectors of WNV in Wisconsin. These species are known to primarily only bite birds and are not suspected as a common pathway of infection for humans. However, these mosquitoes will occasionally bite humans or other mammals, thus passing the illness. Control of these species also helps to limit the amplification of WNV in the environment and indirectly reduce the risk of illness in humans.

In areas where large outbreaks of WNV have occurred, bridge vectors have been identified. Bridge vectors are mosquitoes that will bite both birds and humans and have the ability pass WNV from one species to the other. In Dane County, *Aedes vexans* and *Ochlerotatus trivittatus* are potential bridge vectors. These species have been shown to carry WNV in other areas of the country and are known to bite humans. Our program is currently not focusing control on these species because we have yet to find any of these species to be infected with WNV in Dane County. Active control of these species will be necessary when surveillance data demonstrates that these species are carrying WNV in Dane County. Program staff will continue to monitor for other potential bridge vectors.

Mosquito larvae control activities are initiated when surveillance finds three or more WNV vector larvae per dip in a water source. This threshold was based on advice from Phil Pellitteri, University of Wisconsin Entomologist, and is consistent with treatment threshold established in other Wisconsin communities including Milwaukee and LaCrosse.

Mosquito Control Strategies

This program uses the following strategies to control mosquito populations. The strategies are listed in order of preference with highest preference strategies listed first.

1. Source Reduction

Elimination of a water sources is the only permanent method for preventing the breeding of disease carrying mosquitoes. However, there are many acceptable and necessary reasons to allow or promote the existence of water sources. This program tries to balance these issues by working with public works agencies in each municipality to ensure that storm water management systems are operating correctly and to identify systems that need maintenance.

Water sources on private property also are capable of producing significant numbers of WNV vectors. Depending on the vector, private water sources may be more capable of breeding WNV vectors than some ponds and ditches on public property. In addition to education (see below), the program works with Public Health Sanitarians and Building Inspectors to address nuisance conditions on private property that may provide breeding sites for WNV vectors.

Source reduction will be considered as a mosquito control strategy whenever the water source produces mosquito larvae in excess of the treatment threshold of three larvae per dip regardless of mosquito species.

2. Biological Control

In past years, we have worked with the UW Medical Entomology Program to evaluate the effectiveness of biological controls and have found that some water sources in the metropolitan area can benefit from stocking of native fish species (fat head minnow) as a mosquito control tool. These sources typically hold water throughout the mosquito season but are sufficiently separated from natural fish populations to make a stocking program necessary to maintain enough fish to realize mosquito control.

In 2014 we plan to implement a fish stocking control plan in water sources that produce mosquito larvae in excess of the treatment threshold of three larvae per dip and possess the above criteria (hold water throughout the season and separated from natural fish populations). Fish stocking will only be pursued in water sources producing WNV competent vectors. Program staff will continue to provide information to other local agencies and private property owners on supporting natural ecosystems, which limit mosquito production.

3. Chemical Control

Larvicide is applied to water sources when elevated numbers of WNV vector larvae are identified and source control and biological control are not effective or feasible. Past control activities have involved the use of VectoLex (a microbial larvicide). In 2014, the program will work with its vendor to evaluate additional larvae control products. The addition of products with different active ingredients and modes of action will help prevent the development of resistance to any one pesticide. Given the high level of community concern regarding the application of pesticides, alternative larvicide products will need to be highly species specific as well as effective.

Decisions apply larvicide will be based on the age of the larvae and the potential for storm water to flush the water source within 24 hours of application.

4. Adult Mosquito Control

At this time, the Madison metropolitan area is not in favor of community wide pesticide application to control mosquitoes. For this reason, this strategy will be considered only when evidence suggests that an outbreak is in process and that action is needed to reduce the number of disease carrying mosquitoes in a short period of time.

5. Resistance Management

The following actions are taken to help reduce the risk of larvae developing resistance to larvicides.

- Apply larvicide products at the appropriate rate only when monitoring determines that an unacceptable number of *Culex* or *Aedes* larvae are found (current threshold: 3 larvae/dip).
- Apply larvicide in water sources that are found to have high numbers of *Culex* or *Aedes* larvae to avoid unnecessary treatments over large areas.
- Use of pesticides that are only used in the control of insect larvae so that the mosquitoes do not develop resistance to chemicals available for adult mosquito control if adult mosquito control is warranted.
- Alternate of biorational larvicide (targeted larvicides that are innocuous to non-target species and not disruptive of biological control, i.e. VectoLex, and insect growth regulators annually or every other season.
- Establish procedures for increasing use of biological controls to further limit the need for larvicides.

Continuing Education

The Department will ensure that program personnel are competent in mosquito control through the following activities.

- The program coordinator will maintain WI Commercial Pesticide Applicator Certification for Aquatic Pest and Mosquito Control.

- The program coordinator will stay informed of best practices and changes in the field of mosquito control through communication with University of Wisconsin Extension, WI Department of Health Services, Centers for Disease Control and Prevention, and other local health departments.
- The program coordinator will be responsible for ensuring that other program staff are appropriately trained in safe handling of pesticides, effective methods for monitoring larval and adult mosquito populations, identification of larval mosquitoes, appropriate use of equipment, and safe work practices in the field.
- All program staff will attend continuing education seminars and workshops on mosquito control when sessions and funding are available.

Community Outreach

Department staff will continue the following efforts to promote source reduction on private property and to advise residents on the best means of avoiding bites from mosquitoes.

- Maintain informational material in English and Spanish.
- Issue press releases and work with the media to provide information on source reduction and bite prevention on local television, radio, and newspapers.
- Maintain a Department web page to provide this information.
- Participate in community meetings to provide information and answer questions about mosquito control and WNV prevention.