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Controlling Mosquitoes Around the Home and Yard

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CONTROLLING MOSQUITOES

Around the Home and Yard

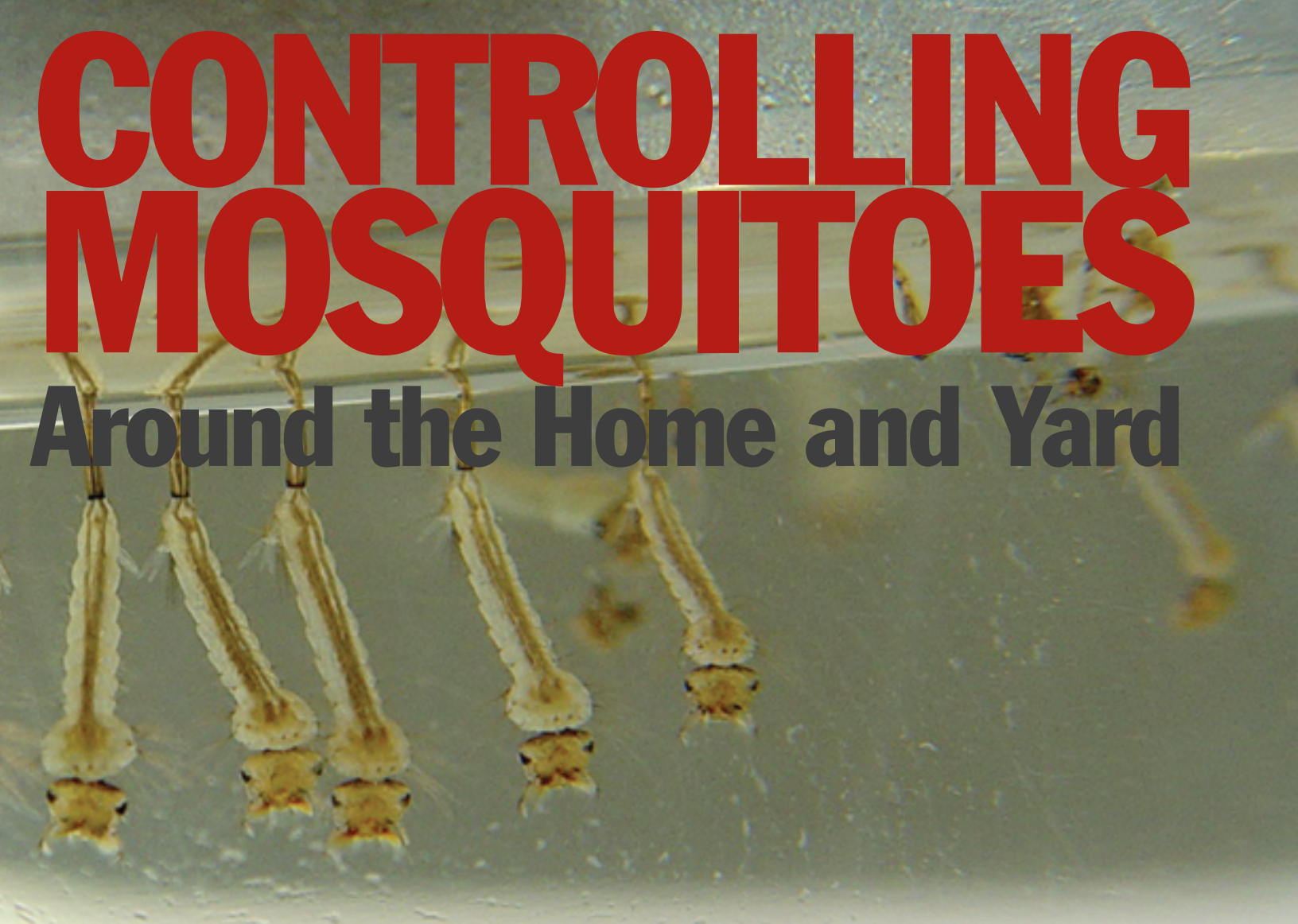


Fig 1. Mosquito larvae (wigglers) and pupa (tumbler, on back page). These juvenile mosquitoes develop while suspended from the water surface. Larvae and pupae are aquatic immature forms of mosquitoes.

FS 923

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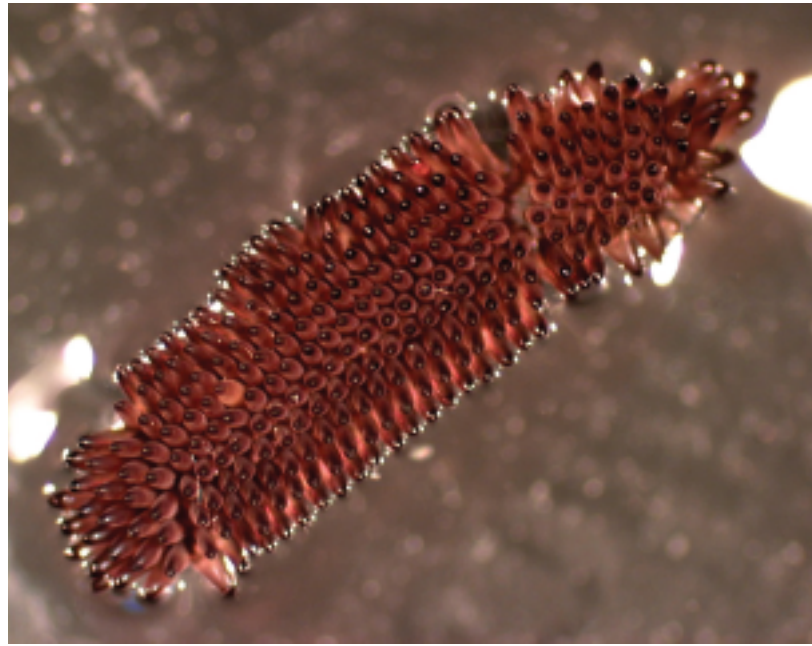
MOSQUITOES

have always been a nuisance in South Dakota, but with the recent spread of West Nile virus, they have also become an important public health concern in both countryside and city. Although the West Nile virus mainly infects birds, it can be transmitted to humans and other animals by certain species of mosquitoes that take blood meals from both birds and humans. The bite from just one infected mosquito is all that is needed to transfer the disease.

In humans, West Nile virus disease symptoms vary from no visible effect to flu-like symptoms, paralysis, or death. All age groups are susceptible, but the elderly and those with weakened immune systems are more likely to experience severe forms of the disease.

Public mosquito control programs have been started in many cities and towns in the state, but they are not available in rural areas. Even the best mosquito control program will only reduce the risk from West Nile virus. Wherever you live, personal protection against mosquito bites is your best approach.

Fig 2. Mosquito egg raft about to hatch into wigglers.



- Use personal insect repellents and avoid times of peak mosquito activity. These are the most effective steps in reducing risk.
- Eliminate standing water, where possible, to reduce mosquito numbers. Consider treating stagnant water that cannot be drained with an approved larvicide.
- Finally, in special instances, consider chemical control of adult mosquitoes. Using chemicals around the home and yard is the least effective and shortest-lasting protection, but when outdoor activities are planned, this approach can be used in combination with the previous methods.

AVOID BEING BITTEN

Female mosquitoes must have a blood meal in order to reproduce. Male mosquitoes feed on plant nectar and do not bite humans.

Mosquitoes spend most of the day in shaded resting areas. Expect to find them in tall grass, near the north walls of buildings, and under decks. At dusk, and again at dawn, hungry females come out and search for the warmth, carbon dioxide, and other scents that warm-blooded animals give off. If possible, avoid outdoor activity during those times.

If you will be outside at these times, however, wear loose-fitting clothing that covers as much skin as possible and apply mosquito repellents.

Personal mosquito repellents containing the active ingredient DEET are the recommended products for application to the skin. Botanical products are available that have some repellency, but they provide protection for a shorter length of time than products containing DEET. Protectants containing permethrin that are applied only to clothing can be used in combination with DEET or botanical repellents.

(Refer to Extension Service FS 920, Personal Mosquito Repellents, and EXEX 8147, Personal Mosquito Repellents Available in South Dakota, for more details.)

You also need to reduce the chances of mosquitoes getting inside your home. Check windows to ensure that screens are in place and are in good repair. Check the seals around doors. Consider replacing outdoor lighting near entrances with “bug lights.” These lights give off a wavelength of light that is not as attractive to insects as conventional lighting.

REDUCE BREEDING AREAS

Mosquitoes must have water to reproduce. Under ideal conditions they can go from egg to adult in less than 10 days. Just an inch of water in the bottom of a forgotten tin can can be a hatching site for hundreds of mosquitoes.

Drain or dump and refresh water every week or so. Consider checking the following locations:



Larval mosquito control

Non-chemical larval control

If water sources cannot be drained or refreshed, consider covering small containers. Aerating the water or stocking insect-eating fish in backyard ornamental pools or nearby ponds may help. In South Dakota, the recommended fish is the fathead minnow, commonly available as a bait fish.

Removing weeds in and around the pond also may help cut mosquito numbers in some locations. Clearing out the vegetation opens up the water to wave action by wind. Water that is agitated by waves will reduce mosquito larval survival; they will drown since they breathe air by attaching themselves to the water's surface.

Some larval control products are available that produce a thin film over the water surface. These films either prevent the larvae from breathing or reduce the surface tension of the water, causing them to drown.

Larval control pesticides

(Note: for a complete list of all pesticides registered for mosquito control in South Dakota, refer to Extension Extra EXEX 8148.)

The most common products available to homeowners for controlling mosquito larvae contain proteins derived from *Bacillus thuringiensis* subsp *israelensis* or *Bti*. These products are commonly sold as granules or pre-formed blocks (Fig 4) that



Fig 4. Wrigglers feeding on a *Bti* pre-formed block.

release the *Bti* protein when placed in water. The *Bti* protein is toxic only to mosquito wrigglers and the larvae of certain aquatic flies such as midges and black flies. It has no harmful effects on humans, horses, fish, tadpoles, frogs, crustaceans, snails, or other non-target aquatic animals.

Formulations of *Bti* are available that last from as little as 3 days to as long as 30 days. Products containing *Bti* are an excellent choice for stagnant water areas that cannot be drained.

Larval products containing methoprene are also available. These products act as insect growth regulators and prevent the pupae or tumblers from maturing into adult mosquitoes. Both methoprene and *Bti* products become less effective as mosquito larvae mature. The products are ineffective against adult mosquitoes.

Adult mosquito control

Non-chemical adult mosquito control

Carbon dioxide-baited traps

Female mosquitoes looking for a blood meal are attracted to carbon dioxide gas that is exhaled or emitted by their potential human or animal hosts.

Because of this biological fact, carbon dioxide-baited traps have been used by public health workers in monitoring mosquitoes (Fig 5). Numbers and species of mosquitoes caught in such traps are usually compared with historical data and used as a guide or threshold to signal various control operations. Recently, some companies have commercialized carbon dioxide-baited mosquito traps and have made some models available to the general public (Fig 6).

Carbon dioxide-baited traps available for use by homeowners in South Dakota use propane gas as the source of carbon dioxide. The carbon dioxide gas is discharged from the tank as a continuous





Fig 5. Surveillance trap commonly used in public mosquito control programs.



Fig 6. A homeowner carbon dioxide-baited mosquito trap.



Fig 7. Fluorescent and incandescent bug lights.

stream or in bursts or plumes that mimic the exhalations of a farm animal.

Some traps supplement the already attractive carbon dioxide with a chemical called octenol. Octenol mimics gases that are naturally found in the stomach of cattle.

A suction fan then draws the attracted mosquitoes into a container where they die of desiccation.

Carbon dioxide-baited traps can be powered by propane alone or by both propane and electricity. The maximum effective range of each trap varies from one-half to one acre. Traps that run on propane alone and that can cover an acre are typically the most expensive.

Mosquito data collected from Grand Forks, N.D., in 2002 indicated that a certain model of a carbon dioxide-baited trap synergized with octenol (Mosquito Magnet “Liberty”) caught up to 8,000 female mosquitoes per night during peak mosquito season in early July. The number of mosquitoes captured using this particular carbon dioxide-baited trap was about 15 times greater than the number of mosquitoes captured with a standard New Jersey light trap. The New Jersey light trap was not baited but was equipped with a small 25-watt clear light bulb and suction fan to attract and collect mosquitoes.*

Although certain carbon dioxide-baited traps can dispatch thousands of mosquitoes per night and despite good reviews from owners, it must be remembered that there will always be certain mosquito species that will not come to even the best mosquito traps. Mosquito traps will usually identify on their labels which species are not attracted to the trap.

Since all it may take is just a single bite from a single infected mosquito to cause illness, personal repellents and other means of controlling mosquito wrigglers and adults should still be used by homeowners who may also own carbon dioxide-baited traps.

Bug lights

At night, mosquitoes and many other nocturnal insects are attracted to light given off by “white” light from ordinary bulbs. In contrast, yellow light emitted by “bug light” bulbs is about a third less attractive to nocturnal insects.

Although “yellow” light is not completely unattractive to insects, the reduction in mosquitoes and other insects can be substantial. We therefore recommend that lighting fixtures around the home and yard be equipped with bug lights rather than with ordinary white light bulbs. Bug lights are available either in incandescent or fluorescent forms (Fig 7).

Adult mosquito control pesticides

Adult mosquito control is not the most effective way to reduce mosquito numbers. Removing standing water and controlling larvae should still be the primary means of mosquito control around the yard and home.

However, there are occasions when pesticides to control adult mosquitoes may become necessary, especially when mosquito numbers need to be reduced quickly. Adult public mosquito control programs often employ ultra low volume (ULV) applications from specialized equipment that dispenses concentrated pesticides in an aerosol fog. This is impractical for homeowners.

However, portable thermal foggers that use either propane or electricity to convert an insecticide (resmethrin) into a thermal or “hot” fog are available to homeowners for use around the yard and home. Thermal foggers only kill mosquitoes that come in contact with the insecticidal fog, which usually dissipates within hours after fogging.

Another treatment is barrier or residual treatments of mosquito resting areas for short-term reduction of mosquito numbers, especially if you are planning outdoor grilling or a backyard family gathering.

A home barrier treatment generally is an application of a labeled insecticide onto mosquito resting areas around the yard and home with an ordinary household sprayer, hose-end sprayer, or ready-to-use container equipped with a spray gun. The most common insecticides for home use contain the active ingredients bifenthrin, cyfluthrin, deltamethrin, lambda-cyhalothrin, or permethrin. (Refer to Extension Extra, EXEX 8148).

Apply the insecticide to surfaces where mosquitoes will be resting during the day—the north or sheltered sides of board fences, wall siding, eaves, and outbuildings; trees and shrubs; under decks; and in tall grass or weeds. Apply in advance of the planned activity so that the treated surfaces are completely dry before use. Spray objects and structures; just wetting the lawn with insecticide is not effective.



Depending on the insecticide and the weather, outdoor barrier or residual treatments may keep on killing mosquitoes on contact for up to 3 weeks. While this may help reduce the mosquitoes in the treated area, mosquitoes from surrounding areas may still fly in to the treated yard seeking a blood meal.

Follow these precautions:

- Before using any pesticide, especially around the home, **READ AND FOLLOW ALL LABEL DIRECTIONS.**
- Do not allow people or pets into the treated area until the restricted entry time has passed.
- Avoid treating locations that are listed as prohibited on the label.
- Be particularly careful not to make applications to areas that may come into contact with food.
- Purchase and use protective clothing such as chemical-resistant gloves.
- Remove and wash clothing used during the application, and shower, using plenty of soap.
- Clean application equipment and store pesticide in its original container, well out of reach of children.

You probably have heard claims for products such as bug zappers, high frequency electronic repellents, Brewers yeast, and citronella. The effectiveness of these products against mosquitoes has not been demonstrated.

WRAP-UP

Mosquitoes have always made our outdoor and recreational activities uncomfortable. Now we know that mosquitoes also are capable of transmitting microorganisms that may cause diseases in humans.

In 2003, for example, a mosquito-borne virus called the West Nile virus caused illness in over a thousand South Dakotans and caused 14 deaths. Over 170 individuals with severe forms of the disease required long periods of time to recover and some have not fully recovered.

South Dakota has 44 known species of mosquitoes. The western encephalitis mosquito *Culex tarsalis* (Fig 8) is perhaps the main vector of West Nile virus and is present in all South Dakota

Fig 8. *Culex tarsalis*. The female can hibernate in the northern U.S., and larvae are produced from early spring until late fall. Characteristic markings are the broad white band on the proboscis (flexible feeding tube) and white bands on the tarsi (outer parts of the legs).

counties. Seven other mosquito species have tested positive for the virus, including the most common mosquito in the state—the inland floodwater mosquito, *Aedes vexans*.

The importance of mosquitoes as a nuisance and as potential vectors of disease-causing microorganisms in South Dakota cannot be overemphasized. Homeowners—city and country—can play a major role in rural and community mosquito control efforts.

- They can reduce the number of potential mosquito breeding sites on their properties, most efficiently by eliminating unnecessary standing water.
- They can treat remaining breeding sites with various larvicides to prevent mosquito wigglers from becoming adult mosquitoes.
- If adult mosquitoes successfully emerge from breeding sites, homeowners can treat their resting areas with barrier or residual sprays and/or thermal fog.
- Homeowners can use yellow bug lights to repel adult mosquitoes or divert the insects to carbon dioxide-baited traps before the insects have the chance to bite humans.

Some mosquitoes will always “get through.” We therefore strongly recommend that South Dakotans who will be outdoors wear a mosquito repellent of their choice, avoid being outdoors around sunset and sunrise, and cover as much skin as possible with appropriate clothing.

South Dakota outdoors is a great place in the summertime. By learning basic mosquito biology and taking simple precautions, we can still safely enjoy it.

For more information:

FS 920, Personal Mosquito Repellents:

<http://agbiopubs.sdstate.edu/articles/FS920.pdf>

EXEX 8147, Personal Mosquito Repellents Available in South Dakota:

<http://agbiopubs.sdstate.edu/articles/EXEX8147.pdf>

EXEX 8148, Pesticides Registered for Mosquito Control in South Dakota:

<http://agbiopubs.sdstate.edu/articles/EXEX8148.pdf>

The use of trade names is for the convenience of readers only and does not constitute an endorsement of these products by the U.S. Department of Agriculture, South Dakota State University, or the South Dakota Cooperative Extension Service. Consult the product label before using. Information provided in this fact sheet is for educational purposes only.

* This data was provided by Dr. Jeff Vaughan, Assistant Professor of Biology, University of North Dakota, Grand Forks. Dr. Vaughan is currently conducting studies on the field performances of carbon dioxide-baited traps in North Dakota.

This publication may be accessed through the web at: <http://agbiopubs.sdstate.edu/articles/FS923.pdf>
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