



Eastern Equine Encephalitis Could Return to New Hampshire this Summer

Alan T. Eaton, PhD, UNH Cooperative Extension Entomology Specialist

Disease description and transmission

Eastern equine encephalitis (EEE) is a mosquito-spread disease of birds, that sometimes is transmitted (via mosquito bite) to horses and people. The risk of serious injury or death is high for those who become sick with the disease.

In 2005, there were 20 human cases of EEE in the United States. New Hampshire led the nation with seven cases and two deaths. Florida had five, Massachusetts four, Alabama two, and South Carolina and Georgia one each. In 2004, New Hampshire had a single human case. Before that, the most recent report of a human case in the Granite State occurred in 1980—the case was not confirmed.

Most of our 47 species of N.H. mosquitoes don't transmit EEE. Those that do, or might, include *Culiseta melanura*, which bites only birds and is the principal species that spreads EEE from bird to bird. *Coquillettidia perturbans*, which bites both birds and mammals, is the principal "bridge vector" (species carrying the disease from birds to humans or horses).

Three other species might also be involved to some degree: *Culex salinarius*, *Culex restuans*, and *Ochlerotatus triseriatus*. (The virus has been found in several other mosquito species, but their ability to transmit the virus has not been proven. *Culex morisitans* is one example).

Getting EEE is a bit like winning the lottery. The chances of it happening are very low, but the consequences can be life-changing. The process of infection works like this:

- 1) A female of *C. perturbans* (or other species that bites both birds and mammals) first must bite a bird infected with EEE (male mosquitoes don't bite).
- 2) The blood of the infected bird contains EEE virus particles, so the mosquito biting the bird draws in the disease-causing virus with her blood meal.
- 3) The mosquito digests her meal for several days, and then lays her eggs. During the time that the meal is being digested and eggs laid, the virus particles move from the insect's gut to her salivary glands.
- 4) After the mosquito lays her eggs (if she is lucky enough to live that long), she seeks another blood meal. This time she finds you.
- 5) She lands, inserts her mouthparts, and injects saliva. Along with her saliva, she injects some of the virus particles. You have just been infected.

Please note: *Mosquitoes that bite EEE- infected humans or equines don't pick up enough virus particles to pass the disease along to the next human (or animal) they bite, which makes humans "dead-end" hosts for EEE.*

According to the Centers for Disease Control and Prevention (CDC), symptoms of EEE in people range from mild flu-like illness to inflammation of the brain, coma, and death. The human death rate is 35 percent, and about 35 percent of people who survive have lasting neurological effects of some type.

People most at risk for contracting EEE are those who younger than 15 or older than 50. EEE is not like the flu virus. You can't pass it to other people by coughing, sneezing, or shaking hands.

We don't fully understand why EEE is cyclic, but some years we have lots of cases, as in 2005. With the disease at a high last season, it seems a good bet that we might have above-average incidence this year. EEE typically arrives in late summer, with the cases usually appearing in mid-August through September. If heavy frost comes late, the EEE disease risk could run into October.

The highest incidence of EEE in New Hampshire occurred in Rockingham County, although southern Merrimack, southern Strafford, and possibly eastern Hillsborough have a slightly elevated risk.

Individuals can reduce their risk of contracting EEE

There are many things people can do to greatly decrease their risk of becoming infected with EEE. Basically, they all work by decreasing the chances of being bitten.

- Use insect repellent when you are outdoors, and/or wear clothing that doesn't expose lots of skin.
- Try to limit time spent outdoors within an hour or so of dusk or dawn in August and September, especially in areas with lots of mosquitoes. During the middle of the day, mosquitoes that transmit EEE aren't very active. An exception is if you walk through thick brush or woods. You disturb the vegetation on which they rest, so they will then fly to you and bite.
- Consider trying the net-like clothing that is stiff enough to stay away from your skin. [Bug Baffler](#) is one example.
- Be sure that sleeping quarters have tight-fitting screens on doors and windows. This includes tents and other camping quarters.
- Limit your activity in areas near freshwater marshes with permanent vegetation, especially cattails.

Repellents (bite-preventing materials)

The term "mosquito repellent" doesn't accurately reflect how these materials work. They don't actually repel mosquitoes. They block the receptors mosquitoes use to detect appropriate hosts for them to bite. Blocking those receptors stops mosquitoes from biting, so a more accurate term might be "bite-preventing materials."

We currently have two effective active ingredients for mosquito repellents:

- **DEET** The name is an acronym for the long technical name: N, N-diethyl-meta-toluamide. Repellents that have higher concentrations of DEET generally last longer and

are more effective (to a point) than those with low concentrations. DEET should never get into mucous membranes (nose, mouth, eyes), and should never be used on infants less than two months old. Officials do not recommend using products containing more than 30 percent DEET on either children or adults. A few people are allergic to it. DEET is greasy and also dissolves some plastics.

- **Picaridin** is the other effective repellent, and it first became available in US products in 2005. It is as effective as DEET, but appears to lack some of DEET's shortcomings. Perhaps as products containing picaridin become more widely used, some shortcomings might appear. DEET was first developed in 1946, so we've been using it a long time.

Research has shown that repellents based on natural oils or herbs are less effective than products based on picaridin or DEET. According to the federal Centers for Disease Prevention and Control, oil of lemon eucalyptus [active ingredient: p-menthane 3,8-diol (PMD)], tested against US mosquitoes "provided protection similar to repellents with low concentrations of DEET." Oil of lemon eucalyptus should not be used on children younger than three years old. Citronella is another natural product with limited repellence to mosquitoes.

Products come as lotions, pump sprays, and wipes. Which product is best? That's for you to decide. Look at the list of active ingredients and their concentrations to help decide which one to buy. Always follow label directions when using repellents.

Spraying mosquito larvae

Spraying to kill mosquito larvae can be very effective, and has minimal environmental or toxicological risk **if the biological agent *Bti* is used**. *Bti* is shorthand for *Bacillus thuringiensis* variety *israelensis*, a natural bacterium that kills certain fly larvae, but not other organisms.

Basically that means that *Bti* kills mosquito larvae (or black fly larvae if used in streams), but doesn't harm fish, mammals, amphibians, reptiles, or other insects (including dragonflies, damselflies, water boatmen, caddisflies, mayflies, and stoneflies).

The mosquito *larvae* must feed on the *Bti* particles. Mosquitoes in their pupal or adult stages won't be killed when the stuff is sprayed into the water. Using *Bti* has several major drawbacks:

- It must be done before EEE cases appear—before we really know what the risk is going to be this year.
- It usually takes more than one treatment to control mosquito larvae for a long time.
- Treating water with pesticides in New Hampshire, even biological pesticides containing *Bti*, requires a special permit from the Pesticide Control Division of the state Department of Agriculture. Getting a permit takes time and effort. Most communities that plan mosquito abatement efforts send in their permit applications in January or February, to be certain that things are ready when work begins in the spring.

There are chemical-based larval control materials, but with *Bti* now available, we shouldn't rely on them for mosquito control because they all kill many other organisms besides mosquito larvae.

Ideally, communities should tie a spraying program to a monitoring program that identifies where and when the human-biting or EEE-transmitting species are abundant. Spraying mosquitoes that aren't involved in disease transmission wastes time and money. But monitoring is expensive too, and requires special training that few New Hampshire pesticide applicators have.

Spraying adult mosquitoes

Spraying mosquitoes may help reduce the risk of being bitten, but it presents a number of problems.

The first is that if we aim to decrease the risk of acquiring EEE, we need to target only the mosquito species that can spread EEE. The vast majority of our 47 species of New Hampshire mosquitoes aren't involved. We could try to kill all mosquitoes, but that would be wasteful and expensive. Also, using chemical insecticides can carry environmental and toxicological risks.

Sampling and identifying larval or adult mosquitoes is a lot of work, requires special training and equipment, takes time, and can be expensive.

Spraying to kill the adults usually requires specialized ultra low-volume spray equipment (and special training), and is difficult or impossible in many areas. The effects last only a few hours.

Most commonly, a spray truck (ultra low-volume sprayer) is used to target adult mosquitoes; it sprays while driving down public roads. The spray drifts away from the road and controls mosquitoes in a swath that might be only 30 to 100 yards wide. In rural areas, roads are few and far apart, so this spraying only hits a small area of the town. In more urban areas, roads are closer together, so a spray truck going down the roads can cover a higher percentage of the area. Spraying for adult mosquitoes is intended to protect people; you protect more people if you concentrate on areas of high human population or activity.

Sometimes hydraulic sprayers are used to treat vegetation in which mosquitoes rest. In this case, the treatment has slightly longer effect, although it still lasts only a day or two. This is one option if you wish to reduce mosquito problems for a single outdoor event. Sometimes backpack sprayers are used in less-accessible areas, especially for larval spraying.

If a threat from EEE materializes and adult mosquitoes are already flying, then careful treatment can reduce mosquito numbers for a short time. Mosquitoes can fly long distances, though, so they quickly re-invade the sprayed area from outside.

Chemicals used to control adult mosquitoes

The materials we have to control adult mosquitoes are all chemicals. The four most commonly used are all in the synthetic pyrethroid group: Bifenthrin, Permethrin, Resmethrin, and Sumithrin.

- **Bifenthrin** is a broad spectrum insecticide, meaning that it kills many insect species in addition to your target species. Like many others, it is quite toxic to fish. It is photostable (sunlight doesn't break it down), and leaves an active residue for a fairly long time.

- **Permethrin** is a broad-spectrum insecticide. It is fairly persistent, and photostable. It is highly toxic to fish and honeybees, and is in many backyard pesticide products.
- **Resmethrin** is also very toxic to honeybees and fish. It is less persistent than permethrin, and a little more easily broken down in sunlight.
- **Sumithrin** and is similar in persistence and photo-stability as resmethrin.

Sometimes another chemical, **piperonyl butoxide**, is added to a pyrethroid insecticide. Piperonyl butoxide works as a *synergist*, which means that adding it greatly increases the effectiveness of the insecticide. It is quite short-lived.

These pesticides vary in their toxicity, persistence, and effectiveness. These characteristics (plus cost and availability) affect the decision of which product to use in a given situation

The relative toxicity of pesticides is usually measured by a number called the **LD50, the number of milligrams of test chemical required per kilogram of weight in a test animal to cause 50 percent of the test animals to die. **The lower the number, the more acutely toxic the material.** The LD50's given in the examples below are for skin exposure.*

<i>Pesticide</i>	<i>LD50</i>
<i>Bifenthrin</i>	<i>>2000</i>
<i>Permethrin</i>	<i>>4000</i>
<i>Resmethrin</i>	<i>2500</i>
<i>Sumithrin</i>	<i>>10,000</i>
<i>Piperonyl butoxide</i>	<i>7500</i>

Public notice

Spraying public areas requires public notice in advance of treatment, and posting. Citizens not wishing to have their property sprayed can contact local officials.

Officials who plan to spray will also want to identify all beekeepers and certified organic farms in their towns. Honeybee colonies located too close to spray trucks might suffer high losses. Application or drift of pesticides onto certified organic farms could void the farmers' certification, and take 3 years for them to get it back.

Details on public notice, posting, the permit procedures (and filing an emergency permit request, if necessary) are available from the Pesticide Control Division, N.H. Dept of Agriculture, Markets and Food, 271-3550

Source reduction

Source reduction means reducing mosquito numbers by reducing the areas where their larvae can live. Reducing the habitat for mosquito larvae will result in fewer adult mosquitoes.

Predicting mosquito numbers months in advance is nearly impossible. If we have rainy conditions, rainwater will fill countless thousands of vernal pools, marshes, tree holes, and empty containers left outdoors. Because adult female mosquitoes can lay hundreds of eggs apiece, the population can explode during rainy seasons. In seasons with very little rain, the

swamps, marshes, and containers dry up, reducing breeding sites and the subsequent numbers of adult mosquitoes.

When it comes to things like poorly adjusted gutters, old tires or other containers left out in the rain, creating breeding grounds for mosquitoes, source reduction is easy. But things become complicated when we consider natural water bodies such as marshes and other wetlands. If someone insists the vernal pools must be filled in because mosquitoes breed there, then we lose lots more than mosquitoes:

- Wetlands play important roles in keeping streams and rivers flowing, and recharging groundwater.
- They may serve as vital sources of irrigation water for agriculture.
- Wetlands are important for wildlife; some of our threatened or endangered species must have wetlands, or face extinction. Spotted salamander and wood frog are two examples of New Hampshire species that **must** have vernal pools in which to breed.

Reducing water-holding containers around the home (poorly adjusted gutters, bird baths, old tires, and other containers that fill with rain water) isn't an effective tool for managing EEE, since the mosquitoes that cause EEE don't breed in such habitats.

However, reducing water-holding containers around the home will definitely help in reducing the risk of West Nile Virus, another mosquito-borne viral illness, caused by different mosquito species from those that cause EEE. (See below for more information on WNV.)

Introducing predators

Sometimes people want to control mosquitoes by introducing predators. Bats and many birds eat flying insects. Why not put up houses for bats or purple martins to solve the problem? Why not buy dragonfly nymphs? They're predators.

Although putting up houses for birds or bats theoretically might help, these techniques have never been demonstrated to reduce mosquito numbers. Bats and insectivorous birds eat whatever insects are abundant and the correct size for them.

Since catching insects on the wing takes lots of energy, they optimize feeding by going for bigger bites rather than staying with tidbits. If large flying insects—big moths and juicy beetles—abound, the hunters go for them.

Also, predators don't knock the population down far enough to suit humans. When mosquitoes start to get scarce, the predators that eat them must switch to other food to make a living.

If you wish to put up wildlife houses, do it for other reasons, but don't depend on bats and birds to solve mosquito problems.

As for dragonfly larvae, they theoretically might help, but any New Hampshire water body appropriate for dragonflies is already inhabited by an abundance of dragonfly species. That goes for other mosquito larvae predators. We don't need to import them, because they're already here.

Also, the dragonfly species appropriate for a particular body of water vary from site to site. We have roughly 100 species of dragonflies in southern New Hampshire. Who would know which species was which? Where would we go to get them? Finding a commercial source might be very difficult.

Adult dragonflies are also active predators. They feed on flying insects, including mosquitoes. Like bats, they concentrate on whatever prey is abundant, rather than focus on mosquitoes. Plus, nearly all dragonfly species are daytime flyers (two rare ones come out at dusk) while very few mosquitoes are daytime fliers. There is a short period (towards dusk) when dragonfly adults may encounter and eat significant quantities of mosquitoes. Dragonflies don't fly when it rains, and few fly in early morning—it takes a while to warm up for the day.

Dragonflies are among the predators we hope to conserve by avoiding unnecessary chemical pesticide use. *Bti*-based insecticides don't kill dragonflies.

Water gardens

Many people have created water gardens on their property using a large plastic or fiberglass liner as the water container. Introducing water plants into the container creates a mini-wetland right in your yard. Some insect predators eventually find their own way there. Examples include insects such as backswimmers and predaceous diving beetles.

If you have a water garden, please consider adding small fish from the start. Certain species of mosquito will quickly find and breed in your garden. Many species of small fish eagerly eat mosquito larvae, so you may come out even.

Be sure you follow state laws and regulations for introducing fish into your water garden (or backyard pond). See salient information below, or contact the N.H. Department of Fish and Game (Inland Fisheries, 271-2501) for more information.

Importing and Releasing Wildlife (RSA 207:14)

No person shall import, possess, sell, exhibit, or release any live marine species or wildlife, or the eggs or progeny thereof, without first obtaining a permit from the N.H. Fish and Game Department's Executive Director.

Release of Fish (Fis 402.06)

(a) No live fish shall be released in any waters of the state unless they shall be returned into the waters from where taken except as permitted by the executive director under a permit to release.

(b) No person shall have live fish in their possession when leaving the freshwaters of the state, except those species allowed to be possessed and used as live fish for bait or the person is participating in a permitted fishing tournament

Mosquito traps

Until recently, traps worked to collect some specimens and determine species present, but didn't **control** mosquitoes. Now things are somewhat less definitive. Among several brands of mosquito traps now available, some use carbon dioxide as their principal attractant, and others add octenol or other attractants. Some of these newer traps capture many times the number of mosquitoes as their predecessors, and may help reduce mosquito *annoyance*.

But results can vary, and no reports have appeared in the scientific literature that compare traps with other control measures, and measure mosquito numbers or bite counts. So we really don't know how effective they are at reducing the risk of getting bitten, especially by the few critical species that spread EEE. Mosquito traps on the market can be very expensive. You can buy many years' worth of repellent for the cost of one trap.

Electric bug "zappers" are commonly sold, and some promotional literature claims they kill mosquitoes. While these devices may "zap" the occasional mosquito, they don't reduce mosquito *problems*. However, the zappers do kill a large number of harmless insects and many beneficial insects. The ultraviolet light attracts beetles, flies, moths, caddisflies and many other insects, but few pests.

Ultrasonic mosquito repellers similarly have no effect in reducing mosquito problems, and their claims of effectiveness are misleading or false.

Mosquito mobility: a problem in control

A problem in spraying adults, treating larvae, and source reduction is that adult mosquitoes are highly mobile. Some of them live a long time, and can fly quite far from the place where they emerged. Most people who want to "eliminate" mosquitoes by spraying or source reduction will find that much of the mosquito problem comes from neighboring sites as far as a mile away. But that's often why information campaigns try to get as many people as possible to help. When everyone pulls together, the problems can be reduced.

High mobility is another reason larval treatments need to be repeated after a while. New adults fly in and lay their eggs continuously over the summer.

Monitoring the risk of EEE

State and local public health officials have been working on plans to monitor EEE (and West Nile virus) in 2006. Monitoring efforts include:

- adult mosquito trapping and testing
- testing sick or dead birds
- testing sick animals and humans

Testing is expensive, so officials have focused their efforts in the southeast, where the risk is greatest and human populations are high. Public health officials in Manchester and Nashua are among those collaborating on trapping and testing mosquitoes. The traps they use are designed to attract egg-laying or biting mosquitoes and keep the trapped insects in good enough physical condition that they can be identified.

The freshly trapped and identified mosquitoes are placed in groups ("pools") and analyzed by the state labs in groups, to reduce costs. These data tell us when the virus is circulating at significant levels in the mosquito population.

Some communities (Dover, Portsmouth and Keene among them) conducted surveys of catch-basin mosquitoes in storm drain systems last year. Monitoring is planned in several communities this coming year.

Testing dead birds for EEE began in 2005. This monitoring may give us warning during August and September, but it can't help earlier in the season (although bird testing in June and July may provide some early warning for West Nile Virus [see below]).

Bird testing is expensive. To minimize testing bird species that are unlikely to be infected, the state health officials are most interested in crows and ravens that have recently died, and are not likely to have died of other causes (hit by cars, flown into buildings, etc.). Of course, detecting human or horse cases is another indicator of risk, but it gives little if any advance warning.

West Nile Virus

West Nile Virus (WNV) is another bird disease also spread by mosquitoes. But the mosquito species that transmit WNV differ from those that spread EEE. WNV was first recognized in North America in summer 1999.

The risk of catching it seems quite low in New Hampshire, and the infections are usually mild. As with EEE, those most likely to have serious WNV symptoms are older and very young people. Most people who come down with WNV have symptoms so mild they don't visit a physician, and never know they were infected.

Nationwide, the CDC reported 12,819 human WNV cases in 2005. Maine, New Hampshire and Vermont were among the eight states that had no human cases. Massachusetts had six cases and New York 14. The really high numbers of human cases (more than 100) occurred in central and western states.

Peridomestic mosquitoes (species that breed around buildings, homes, human habitats) are strongly implicated in the risk of acquiring WNV, and attention to source reduction around buildings and yards can significantly reduce the risk. This means regularly emptying things that can fill with rainwater (and breed mosquitoes), or placing them under cover, so they don't fill. Water gardens, poorly adjusted gutters, discarded tires, pool covers, and rain barrels are examples of sites that can support high numbers of mosquito larvae. Possible vector species include *Culex pipiens*, *Culex restuans* and several others.

Testing adult mosquitoes and corvids (crows, jays, ravens—species especially sensitive to WNV) that recently died gives us some warning about the risk of WNV, before human cases appear.

Effects of WNV and EEE on wild bird numbers

Our native birds have co-existed with EEE for thousands of years, plenty of time for them to adapt. Although infected birds may get sick, either the birds don't die or the death rate is too low for us to see changes in bird populations.

West Nile virus is different. It wasn't discovered (probably didn't exist) in North America until 1999, so we are still learning how it interacts with North American wildlife species. Crows and their relatives (jays, ravens) are quite susceptible, and dead WNV-infected crows have been found in many states.

The Audubon Society of New Hampshire recently released results of its 2005 backyard winter bird survey. Crow numbers decreased for the fourth year in a row, to their lowest level in 18 years. Blue jay numbers also declined from last year, but the jay population is affected by the abundance of each year's acorn crops, so a one-year decrease could just reflect a poor acorn crop. Data from the North American Breeding Bird Survey also suggests there might be a drop in crow numbers in the Northeast since WNV appeared.

Managing and communicating risk

Managing risk from these diseases can be very complicated. Most people don't understand the technical details and scientists themselves still have many gaps in their knowledge.

Whatever public officials do—or don't do—may provoke strong public response.

For example, when officials distribute literature informing residents about ways to protect themselves and their family members from mosquito bites, some people just don't regard this as worthwhile or effective. To some people, the sight, noise or smell of a truck passing by spraying insecticide provides the real assurance that "something is being done."

Peter Sandman, a longtime professor of risk communication at Rutgers University, offers public officials these 25 guidelines for good risk communication:

- Don't over-reassure.
- Put reassuring information in subordinate clauses.
- Err on the alarming side.
- Acknowledge uncertainty.
- Share dilemmas.
- Acknowledge opinion diversity.
- Be willing to speculate.
- Don't overdiagnose or overplan for panic.
- Don't aim for zero fear.
- Don't forget emotions other than fear.
- Don't ridicule the public's emotions.
- Legitimize people's fears.
- Tolerate early over-reactions.
- Establish your own humanity.
- Tell people what to expect.
- Offer people things to do.
- Let people choose their own actions.
- Ask more of people.
- Acknowledge errors, deficiencies, and misbehaviors.

- Apologize often for errors, deficiencies, and misbehaviors.
- Be explicit about “anchoring frames.”
- Be explicit about changes in official opinion, prediction, or policy.
- Don’t lie, and don’t tell half-truths.
- Aim for total candor and transparency.
- Be careful with risk comparisons.

For more information, please read [Fear of Fear: The Role of Fear in Preparedness ... and Why It Terrifies Officials](#). For a complete series of crisis communication materials by Sandman and his wife Jody Lanard, a medical doctor, visit their [web site](#).

Integrated pest management

Rather than rely mostly (or only) on pesticides to manage the risk that humans and equines will catch EEE, we recommend an integrated approach that combines several methods. Integrated pest management (IPM) against EEE would combine use of repellents, behavior modification (clothing, time and place of activity, etc), source reduction, and monitoring the appearance and spread (that’s for officials to do) of mosquito populations. Officials might also consider a role for larvicides and/or adulticides. Of course, this strategy also implies a network of good medical care for those who become infected.

Using multiple tactics that complement each other strengthens the overall effectiveness of a program and reduces the risk that the mosquitoes will develop resistance to pesticides or otherwise circumvent our management efforts.

An IPM campaign requires residents themselves to become informed about EEE and shoulder some of the burden of reducing risk by using repellents, dressing to minimize exposed skin and limiting outdoor activity during periods when EEE-carrying mosquitoes are active (around dusk and dawn).

EEE in Domestic Animals

EEE is serious and usually fatal in equines (horses and their relatives). A vaccine is available that gives them almost complete protection, but the vaccine is only approved for use in equine species. Even when mosquitoes bite them, infected equines can’t pass EEE on to other animals, because their blood doesn’t carry a high enough concentration of virus.

Animals can adapt to diseases over many generations, so species native to North America are more likely to tolerate infection, while exotic species are more likely to be susceptible. Llamas and alpacas, native to South American, are vulnerable, and there is no vaccine for them. Emus, native to Australia, are also very susceptible, and there is no licensed vaccine for them either.

Cloven-hoofed livestock may be susceptible, but their level of risk is unknown. Some states have discovered whitetail deer infected with EEE, but no one has studied just how serious those infections are. Deer have been here for thousands of years, plenty of time to adapt to the virus.

Birds are vulnerable, including domestic species, though they vary in their susceptibility and in the level of virus that develops in their blood when they get the disease. Ring-necked pheasant is one species that develops a high level of virus in the blood upon infection. This means sick pheasants can serve as a source of virus for mosquitoes to spread the disease further.

During the 1974 EEE outbreak, then-Governor Meldrim Thompson ordered the killing of several thousand ring-necked pheasants being reared by the N.H. Department of Fish & Game. He was concerned that the pheasants could help spread the disease. Ring-necked pheasant is not native to the U.S., so it hasn't had much time to adapt to this disease.

Training in mosquito identification

Learning to distinguish the species of mosquitoes found here (both adults and larvae) is important for anyone attempting to conduct monitoring programs. Texts and keys are available, but self-study can be difficult for people not trained in insect identification and taxonomy. Dr. John Burger of the UNH zoology department offers one-to-two-day mosquito identification training. Contact Burger at 862-1736 for information about the training.

Information sources:

[Centers for Disease Control and Prevention Eastern Equine Encephalitis fact sheet](#)

[Centers for Disease Control and Prevention West Nile Virus fact sheet](#)

[New Hampshire Department of Health and Human Services Fact sheets on EEE and WNV](#)

New Hampshire Division of Health and Human Services Hotline 1-866-273-6453 The hotline is dedicated to EEE/WNV between June 1 and October 31. The rest of the year it becomes the state's dedicated flu hotline. Callers interested in EEE or WNV information between November and June can ask to speak with the arboviral disease coordinator.

[Guidance for Towns and Cities: Response Plans and Funding for Mosquito Control](#)

New Hampshire Department of Agriculture, Markets & Food:

Pesticide Control Division Information on pesticide applicator licensing, permits to apply pesticides to water, and emergency permit requests: 271-3550

Division of Animal Industry Information relating to animal health in New Hampshire: 271-2404

Bureau of Markets: 271-3685. List of certified organic growers in N.H.

University of New Hampshire Cooperative Extension Family, Home and Garden

Information Center Info Line: 1-877-398-4769, Monday-Friday, 9:00 a.m.-2 p.m., (toll free in NH) Info center staff can answer questions or direct callers to expert resources.

Spraying and/or Monitoring Services*:

- **Dragon Mosquito Control, Inc.** (Monitoring and control services) 964-8400
P.O. Box 46, Stratham, N.H. 03885
 - **Municipal Pest Management Services, Inc.** (207) 344-8704
(Monitoring and control services) P.O. Box 316 York, Maine 03909 603-431-0008
 - **ARBORPro Plant Care** Experts 332-9277 10 Lyons Street, Rochester, N.H. 03867
(Spray service, both private property and municipal spraying)
 - **Chrobak Enterprises** 26 Bartlett Rd, Kittery Point, ME 03905 207-439-6730
(Spray services on private lands)
 - **Collins Tree Service** (Spray for events & functions) 485-4761 or 746-4868
P.O. Box 16388 Hooksett, N.H. 03106
 - **EcoTech** P.O. Box 54, Eliot, ME 03903 (207) 451-9451
(Mosquito spraying on private properties, not municipal work.)
- *We've attempted to include all companies involved in mosquito monitoring or control in New Hampshire that wanted to be listed. Inclusion in the list implies no endorsement by UNH Cooperative Extension, nor does exclusion from the list imply any lack of confidence in a company's services.*

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