STATE OF NEW HAMPSHIRE
DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH SERVICES
BUREAU OF INFECTIOUS DISEASE CONTROL

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TO: New Hampshire Town and City Health Officers

FROM: Abigail Mathewson, State Public Health Veterinarian

DATE: June 28, 2019

SUBJECT: New Hampshire Arboviral Illness Surveillance, Prevention and Response Plan

Please find enclosed the 2019 New Hampshire Arboviral Illness Surveillance, Prevention and Response Plan. This plan provides guidance to communities on operational aspects of Eastern Equine Encephalitis (EEE) virus, West Nile virus (WNV), and Jamestown Canyon Virus (JCV) surveillance, prevention and response. The plan incorporates recommendations and comments from the NH Arboviral Task Force, NH Arboviral Illness Task Force, municipal officials, and the public. The plan is a permanent document and will be updated as needed. Please consider this version current until further notice. Key elements of the plan include:

- Prevention information for the public including mosquito breeding reduction methods and personal protective measures.
- Options for community level mosquito control activities.
- Phased response guidelines to determine mosquito-borne disease risk levels.
- Information on NH mosquito species of concern for EEE and WNV transmission.
- While funding is available, NH DHHS will perform routine mosquito testing. Unless otherwise stated, mosquito testing for WNV and EEE will be separated into two phases for mosquito submissions; phase I (early season) and phase II (mid to end season). Note NH DHHS does not test mosquitoes for JCV. Any batch (group of mosquitoes) size may be submitted, but cannot exceed 50 mosquitoes. Dates pertain to date of collection.

  Phase I – July 1 through July 31, 2019: *Ae. vexans*, *An. crucians,* *An. quadrimaculatus* *Cs. morsitans, Cs. melanura, Cx. pipiens, Cx. restuans, Cx. pipiens/restuans, Cx. salinarius,* *Oc. aurifer,* *Oc. canadensis,* and *Oc. cantator*. Only these species will be tested.

  Phase II – August 1 or first NH EEE or WNV detection (whichever comes first) through October 15, 2018: In addition to the above species, *Ae. cinereus, An. crucians, An. punctipennis, An. walkeri, Cq. perturbans, Cx. salinarius, Oc. japonicus, Oc. triseriatus, Oc. sollicitans, Oc. trivittatus, Oc. taeniorhynchus* and *Ps. ferox.*

We continue to improve upon our State plan and encourage feedback from all parties. Thank you in advance for your assistance in preventing arboviral illness in NH.

STATE OF NEW HAMPSHIRE
ARBOVIRAL ILLNESS
SURVEILLANCE, PREVENTION AND RESPONSE PLAN

June 28, 2019

New Hampshire Department of Health and Human Services
Division of Public Health Services

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I. INTRODUCTION

The Arboviral Illness Surveillance, Prevention and Response plan provides surveillance and phased response guidance for mosquito-borne arboviruses, specifically West Nile virus (WNV) and Eastern Equine Encephalitis (EEE) virus. The purpose of the plan is to provide guidance on operational aspects of surveillance, prevention and response by state and local communities responsible for the control of mosquito-borne disease and encourage proactive preparations for the upcoming year. This plan is the result of analysis and review of surveillance data and response plans for New Hampshire (NH), as well as from other State and Federal entities. The NH Department of Health and Human Services (NH DHHS) will continue to seek advice from its partners and collaborators and modify the plan, as appropriate.

The NH Arboviral Illness Task Force (AITF) was established in 2000 to provide expertise in minimizing risk to NH citizens of being exposed to and infected with mosquito-borne diseases and to develop and improve a statewide coordinated strategy to reduce the risk of EEE and WNV in NH. In 2008, Chapter 73, Laws of 2008 created in law and established membership of the AITF. The AITF or its sub-groups meet and communicate throughout the year, as needed. In 2006, Chapter 284, Laws of 2006 created the Arboviral Task Force (ATF) for the purpose of formally reviewing and streamlining State and local mosquito-borne disease surveillance and control. Information provided from ATF and AITF meetings is contained in this document and aimed to guide proactive community planning and actions to reduce the risk of human disease from EEE virus, WNV, and Jamestown Canyon Virus (JCV). Key objectives contained in this plan provide for the monitoring of trends in EEE virus and WNV in NH, supporting locally-based mosquito plan development and response, providing timely, detailed and summary information on the distribution and intensity of WNV and EEE virus in the environment, laboratory diagnostic testing of WNV and EEE for humans, horses and other animals, and communicating guidelines, advice and support on activities that effectively reduce the risk of disease. This document is open to continual review and evaluation with changes made when there is opportunity for improvement.

A. Contact Information

For questions about this document, please contact:
Bureau of Infectious Disease Control
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Website: http://www.dhhs.nh.gov/dphs/cdcs/arboviral/index.htm

II. DISEASE BACKGROUND

The two main mosquito-borne viruses (also known as arboviruses, for **ar**thropod-**bo**rne viruses) recognized in NH and known to cause human and animal disease are Eastern Equine Encephalitis (EEE) virus with the first recent NH human case identified in 2004; and West Nile virus (WNV) with the first NH human cases in 2003. In 2013, the first case of locally acquired Jamestown Canyon virus (JCV) was identified in NH.

A. Eastern Equine Encephalitis Virus

EEE virus is an alphavirus, present in some passerine (perching song birds) bird species found in fresh-water swamp habitats. The virus is transmitted among wild birds in these areas primarily by *Culiseta melanura*, a mosquito species that feeds almost exclusively on birds. EEE virus has a cycle of natural infection among wild bird populations with occasional infections of humans, animals (most often horses) and large domesticated birds (emus, ostriches, etc). Infected mammals (e.g., humans, horses) do not serve to spread the virus since mosquitoes biting infected mammals do not become infected. Risk of infection in humans is a function of exposure to infectious human-biting mosquitoes. These bridge vectors (i.e., a mosquito species that is indiscriminant and will feed on birds or mammals) are responsible for transferring the EEE virus to humans.

Many people infected with EEE virus will not have symptoms of disease, while others may only experience a mild flu-like illness with fever and headache. However, for people with infection of the central nervous system, a sudden high fever, severe headache, and stiff neck can be followed quickly by seizures, coma, and death. The cost of a single human case of EEE has been estimated to range from $21,000 for mild, transient illness, to as much as $3 million for individuals who suffer permanent neurologic damage. Human cases of EEE occur sporadically in the United States. Historically, clusters of human cases have occurred in sequential cycles of 2-3 years, with a hiatus of numerous years between outbreak and high-risk years. Between 1964 and 2017 (the most recent data available by the Centers for Disease Control and Prevention (CDC)), 324 human cases of EEE were reported in the US, with an average of 7 cases per year. Most of the cases reported were from states in the Gulf Coast, Eastern seaboard and the Great Lakes regions.

Prior to 2004, the most recent EEE activity documented in NH were several equine cases that occurred in 1982. For information on EEE activity documented in NH since 2004, visit http://www.dhhs.nh.gov/dphs/cdcs/arboviral/results.htm

The incidence of EEE infection in humans varies by geographic area. Human EEE disease is more common in areas that support dense populations of passerine birds and have favorable larval habitats for the primary mosquito vector. In NH, these areas consist mainly of large and mature

white cedar and red maple swamps. The majority of EEE human cases in NH have occurred in Rockingham County with cases also occurring in Merrimack, Hillsborough, and Carroll counties.

Additionally, the likelihood of mosquito exposure is a key factor in determining the risk of human EEE infection. The abundance of specific species of mosquitoes at critical periods during the transmission season, in part determined by groundwater levels and the timing of rainfall during the mosquito season, is important in determining the likelihood of mosquito exposure. The use of personal protective measures (avoidance of mosquitoes, use of repellent) by people reduces their risk of exposure and infection.

B. West Nile Virus

WNV is a flavivirus. Similar to EEE, WNV is also maintained in the environment in a cycle that involves birds, with indiscriminant feeding mosquitoes infecting humans and other mammals. WNV causes sporadic disease in humans, and occasionally results in significant outbreaks. Between 1999 and 2017, 48,183 human cases of WNV neuroinvasive disease (West Nile meningitis and West Nile encephalitis) and WNV fever were reported nationwide to the CDC. WNV was first identified in NH in August of 2000. For information on WNV activity documented in NH since 2000, visit http://www.dhhs.nh.gov/dphs/cdcs/arboviral/results.htm.

While symptoms may vary, about one in 150 people infected with WNV will develop severe illness (WNV neuroinvasive disease). Severe symptoms can include high fever, headache, neck stiffness, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, and paralysis. These symptoms may last weeks, and neurological effects may be permanent. Up to 20 percent of the people who become infected will display symptoms of WNV fever, including fever, headache, body aches, and sometimes swollen lymph glands. Symptoms can last for days to months. People over 50 years of age are at a higher risk of developing serious symptoms of WNV.

WNV activity varies from year to year. When there are a high proportion of infected mosquitoes in a relatively small geographic area the risk of transmission of virus to humans will increase.

C. Jamestown Canyon Virus

JCV is a bunyavirus belonging to the California serogroup and circulates in nature in a cycle including deer and various mosquito vectors. The transmission cycle of JCV is still being described, but it is thought that early season mosquitoes, such as *Ochlerotatus* species, play a significant role in transmission of this virus. This species overwinters as eggs, and may be infected when they are laid in the fall by an infected female mosquito.When the eggs hatch after the snow melts in the Spring, they will be able to transmit the virus when they take their first blood meal.

Reports of human illness are rare, although JCV is known to be widely distributed throughout North America. Since JCV became a nationally reportable illness in 2004, an average of 3 human cases have been reported per year. It is thought that many people infected with JCV do not develop any illness. Typically, JCV will cause a mild, febrile illness, although neuroinvasive disease (meningitis or encephalitis) has been reported. It is not known how JCV activity varies year to year in NH's mosquito or deer populations. Because JCV is transmitted to humans through the bite of an infected mosquito, the use of personal protective measures (avoidance of mosquitoes, use of repellent) can reduce risk of exposure and infection.

The NH PHL does not currently test mosquitoes for JCV, however, NH DHHS is exploring opportunities to conduct JCV mosquito and deer surveillance as funding becomes available.

III. PROGRAM GOALS

Timely and accurate information provided by the NH DHHS may offer an early warning of increased risk of WNV and EEE virus infection of humans or animals. Based on surveillance information, actions to reduce risk can be implemented as needed.

NH DHHS Specific Program Priorities.

1. Active involvement in and maintenance of the NH Arboviral Illness Task Force to provide expertise in proactively minimizing the risk to NH citizens of being exposed to and infected with mosquito-borne diseases.
2. Testing humans, mosquitoes, horses, and other animals to identify EEE virus and WNV.
3. Tracking trends in incidence of EEE virus and WNV infections by geographic area.
4. Estimating virus infection rates in mosquitoes.
5. Stratifying areas as a function of their relative risk of human disease.
6. Conducting surveillance for human and non-human disease.
7. Advising human and animal medical practitioners on the appropriate procedures for detecting and identifying infections and disease caused by mosquito-borne viruses.
8. Recommending measures to reduce disease transmission.
9. Providing information to the public on mosquito-borne disease and disease risk, and how to take precautions to reduce the risk of infection.
10. Providing timely information to communities to assist in developing and implementing local mosquito control and response plans.
11. Providing technical assistance to communities following identification of arboviral activity.
12. Participating in the national Arbovirus surveillance network coordinated by the CDC.

A main goal of the NH DHHS is to provide information that will guide planning and actions to reduce the risk of human disease from EEE virus, WNV ad JCV. The main objectives are to monitor trends in EEE virus, WNV and JCV in NH; provide timely, detailed and summary

information on the distribution and intensity of WNV and EEE virus in the environment; perform laboratory diagnosis of WNV and EEE cases in humans, horses, other mammals, and domesticated birds (e.g., emus); communicate effectively with officials and the public; provide technical assistance to each community; provide guidelines, advice and support on the activities that effectively reduce risk of disease; and provide information on the safety and potential adverse effects of proposed prevention interventions.

The NH DHHS works cooperatively with other state agencies, federal agencies, local communities and selected interest groups to identify and support the use of risk reduction and disease prevention methods that are specific to the cause of the diseases, that use the least intrusive and most appropriate prevention methods, and that support planning and practices that reduce the use of pesticides.

IV. PREVENTION AND CONTROL

Ultimately, the key to reducing the risk of arboviral disease is education and outreach to the public regarding the need for mosquito-bite prevention and explaining how they can protect themselves from diseases such as EEE, WNV, and JCV. The emergent public health threat posed by arbovirus illness requires a vigilant outreach effort. As the State public health entity, DHHS will continue to take a lead role in providing public education efforts to promote prevention, working with our partners to maximize the opportunity to make our citizens aware of the dangers posed by mosquito-borne illness. This will include working with the media, local communities, businesses and special populations such as schools, the homeless and others who spend considerable time outdoors, such as those that hunt and fish.

The NH DHHS will provide information to the public and communities to guide planning and actions to reduce the risk of human disease from EEE virus, WNV, and JCV. Individuals can take a number of simple steps that will greatly reduce the risk of mosquito-borne viruses to them, their families, and their communities. Choosing to wear protective clothing (e.g., long pants, long-sleeve shirts), using effective mosquito repellants, and minimizing opportunities for mosquitoes to breed are all important ways individuals can help prevent the spread of WNV, EEE and JCV in NH. Community efforts, such as public education, mosquito surveillance, and chemical control aimed at mosquito larvae (larvicide) and adult mosquitoes (adulticide) may be necessary to decrease the local risk of EEE virus, WNV and JCV.

The Arboviral Task Force (ATF) filed a final report on November 1, 2007. Contained in the report are 27 recommendations aimed at improving state and local arboviral disease surveillance and control in NH. Where applicable, ATF recommendations are implemented in this plan. The complete final report, including the list of ATF findings and recommendations is available at: http://www.dhhs.nh.gov/dphs/cdcs/arboviral/taskforce.htm.

A. Prevention Through Knowledge

The goal of all mosquito-borne virus public information activities is to provide NH's citizens with helpful, accurate and specific advice and information so they can approach this problem with the appropriate level of caution. Information on the following topics have been distributed by NH DHHS in print, through various websites, and through media activities:

- West Nile virus general information
- Eastern Equine Encephalitis general information
- Jamestown Canyon Virus general information
- Health risks to humans and domestic animals from arboviral illnesses
- Personal protection from mosquitoes
- Special information for the homeless population
- Special information for schools, camps and daycare facilities
- How to minimize mosquito breeding opportunities in the backyard
- Mosquito biology
- Pesticide options for communities to use in mosquito control activities

1. Printed Materials: Fact sheets, information cards, and posters on reducing arboviral disease risk are available for citizens and the media by visiting the NH DHHS website at: http://www.dhhs.nh.gov/dphs/cdcs/arboviral/publications.htm.

Educational materials produced by other State agencies are also available on this site. Additional fact sheets and other printed materials are developed, and existing fact sheets are amended, as new information warrants.

2. Cable Access TV Materials: The NH DHHS has available informational videos and slide shows that may be broadcast on cable access TV stations. Information contained in these materials address the transmission cycles of arboviral diseases as well as listing prevention measures that may be taken to reduce the risk of infection. Requests for these materials may be made by calling the NH DHHS Infectious Disease Investigation Section at 603-271-4496.

3. WNV & EEE Website: The NH DHHS website (http://www.dhhs.nh.gov/dphs/cdcs/arboviral/index.htm) serves as a central source for up-to-date, accurate, WNV and EEE information. Information provided on the site includes general background information and regular updates on surveillance and laboratory analysis. Links to other mosquito-borne virus informational websites, including community health departments, and state and federal agency sites are included.

4. Community Education Programs: Prior to and during the surveillance season, AITF partners conduct trainings for WNV, EEE, and JCV, including programs for municipal officials, their employees, and local health officers. Training addresses the arboviral illness transmission cycle, prevention measures, and response strategies. Additional presentations are made to interested

community groups on mosquito-borne disease, disease risk, and how to take precautions to reduce the risk of infection.

B. Prevention Action Steps

1. Preventing Mosquito Breeding Opportunities: By reducing their exposure to mosquitoes around their homes and by eliminating mosquito breeding grounds, NH citizens can greatly reduce their risk of mosquito-borne virus exposure. Many species of mosquitoes lay their eggs in standing water. Weeds, tall grass, and bushes may provide resting areas for the mosquitoes that are most often associated with WNV. Fresh water swamps and coastal areas provide larval habitat for the mosquito species commonly associated with EEE.

The NH DHHS under guidance from the ATF and AITF recommends citizens take the following steps to reduce opportunities for mosquito breeding:

a. Eliminate standing water around residential and commercial areas by discarding outdoor artificial containers such as tin cans, plastic containers, or similar water-holding containers.
b. Do not attempt to drain or alter natural water bodies for mosquito control, since the management of ponds, marshlands, and wetlands is regulated under existing state law and administrative rule. Alteration may require the approval of state and possibly federal agencies. Contact the NH Departments of Environmental Services and Fish and Game for further information. Additionally, the UNH Cooperative Extension Service, the Natural Resources Conservation Service, and Conservation Districts are available to assist communities in evaluating potential standing water hazards.
c. Remove all discarded tires from your property. The used tire is the most common site for mosquito breeding in the United States.
d. Dispose of or drill holes in the bottom of containers left outdoors, such as recycling containers or flowerpots. Drainage holes on the sides of containers will still allow enough water for mosquitoes to breed. Do not overlook containers that have become overgrown by aquatic vegetation.
e. Mow grass and weeds as short as possible and thin shrubs to allow air circulation through plants.
f. Make sure roof gutters drain properly. Clean clogged gutters in the spring and fall and as often as necessary to eliminate standing water.
g. Tightly screen “rain barrels” to ensure mosquitoes can’t deposit eggs in or on water.
h. Clean and chlorinate swimming pools, outdoor saunas and hot tubs. If not in use, keep empty and covered. Do not allow these covers to collect standing water.
i. Aerate ornamental pools or stock them with fish. Water gardens become major mosquito producers if they are allowed to stagnate.
j. Turn over wheelbarrows and plastic wading pools when not in use. Both provide breeding sites for domestic mosquitoes.
k. Change water in birdbaths at least twice weekly.

l. Remind or help neighbors to eliminate mosquito breeding sites on their property.
m. Consult with local mosquito control companies for additional solutions to decrease mosquito-breeding activity in nearby areas. Products are available that can be used to reduce mosquito populations (see Mosquito Control Activities below).

2. Personal Protective Measures: Citizens can take simple steps to protect themselves from mosquito bites. Such steps are critical in reducing the risk of WNV, EEE, and JCV infections. The NH DHHS under guidance from the ATF and AITF recommends that citizens take the following steps to protect themselves, particularly from June to October, when mosquitoes are most active:

a. If outside during evening, nighttime and dawn hours, or at any time mosquitoes are actively biting, children and adults should wear protective clothing such as long pants, long-sleeved shirts, and socks.
b. If outside during evening, nighttime and dawn hours, or at any time mosquitoes are actively biting, consider the use of an effective insect repellent.
c. Repellents containing DEET (N, N-diethyl-methyl-meta-toluamide) have been proven effective. No more than 30% DEET should be used on adults or children.
    i. The American Academy of Pediatrics (AAP) Committee on Environmental Health has updated their recommendation for use of DEET products on children, citing: "Insect repellents containing DEET with a concentration of 10% appear to be as safe as products with a concentration of 30% when used according to the directions on the product labels."
    ii. AAP recommends that repellents with DEET should not be used on infants less than 2 months old.
d. Repellents containing Picaridin (KBR3023), oil of lemon eucalyptus (a plant based repellent) or IR3535 provide protection similar to repellents with low concentrations of DEET. Oil of lemon eucalyptus should not be used on children under the age of three years.
e. Always use repellents according to manufacturer's directions.
f. Do not allow young children to apply repellent themselves.
g. Do not apply repellent directly to children. Apply to your own hands and then put it on the child's skin.
h. Infants and children should be protected by placing mosquito nets over strollers in the evening, nighttime and dawn hours or at any time mosquitoes are actively biting.
i. The length of time a repellent is effective varies with ingredient and concentration. Avoid prolonged or excessive use of repellents. Use sparingly to cover exposed skin and clothing.
j. Wash all treated skin and clothing after returning indoors.
k. Store repellent out of reach of children.

l. For additional information about chemicals contained in repellents, visit the National Pesticide Information Center (NPIC) website at http://npic.orst.edu/ingred/ptype/repel.html#use.
m. Make sure that doors and windows have tight-fitting screens. Repair or replace all screens in your home that have tears or holes.
n. Vitamin B, ultrasonic devices, incense and bug zappers have not been shown to be effective in preventing mosquito bites.

3. Mosquito Control Activities: The objective of public health mosquito control is to prevent transmission of mosquito-borne disease to humans. Reduction of nuisance mosquito species is not a goal of Public Health-based mosquito control. Local communities make the final decision regarding mosquito control activities in NH. Communities are responsible for developing, maintaining, and financing (partial funding may be available – see below) local mosquito control programs. The NH DHHS, Department of Agriculture, Department of Environmental Services and the Fish and Game Department are available to provide guidance and recommendations to assist municipalities in plan development and when faced with response decisions.

All discussion regarding pesticide applications made under this plan will be in accordance with the principles of Integrated Pest Management (IPM). IPM is a sustainable approach to managing mosquitoes by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks. IPM involves preventive control and suppressive control, including:

a. Source reduction (remove, cover, drain, fill) of larval habitats that are not environmentally sensitive or protected
b. Biological control (the use of natural enemies such as mosquito fish, etc.)
c. Mechanical control (the use of barriers such as screens to prevent the movement of mosquitoes)
d. Chemical control (the use of manufactured chemical products [pesticides] that act against mosquitoes)

Chemical control can be further divided into the application of products aimed at mosquito larvae (larvicide) and those aimed at adult mosquitoes (adulticide). Larvicide involves the application of chemicals or natural bacteria to surface waters (such as ponds or in storm drains) to kill mosquito larvae. Larviciding is a proactive measure that can be useful in reducing the risk of mosquito-borne disease throughout the season. The intent of a larvicide program is to control generations of targeted mosquito species before they reach the adult stage, when they are able to transmit diseases such as WNV, EEE, and JCV. In NH, larvicide programs typically begin in early spring and continue throughout the season. Adulticide involves the application of fine “mists” of pesticide over a relatively broad area to bring about the rapid knockdown of adult mosquitoes. Adulticiding occurs in response to current surveillance activity. Adulticiding can quickly reduce existing, biting adult mosquitoes throughout a spray area, but its effects are

relatively short lived, raising the possibility of repeat applications. In addition, adulticide spray sites are most likely to be areas of high human population density. In NH, adulticiding occurs in late summer and early fall when infected adult mosquitoes are detected. Comprehensive mosquito control programs may utilize both control methods, larviciding and adulticiding, if indicated by surveillance data.

Pesticides may pose their own risk to the health of humans, animals, plants, and the environment. Thus pesticides are only one component of a coordinated effort to control mosquitoes. Pesticide treatments and other IPM strategies may be appropriate in certain situations, while each strategy alone may not be adequate.

IPM dictates that control efforts should be tied to thresholds. This means simply that a certain defined risk needs to exist before particular control methods are recommended. Different responses may be made as different levels of risk are identified. These levels of risk are discussed under the Phased Response section of this plan. In an ideal IPM program, non-chemical methods should be employed to keep pest levels below the risk level that might trigger a pesticide response, meaning that pesticides are a last, rather than first response to a WNV, EEE and JCV problem.

The use of pesticides in NH is governed by state law and by the Administrative Rules of the Pesticide Control Board, Chapters Pes 100-1100. These statutes and rules require people applying pesticides, other than homeowners on their own property, hold licenses issued by the NH Department of Agriculture, Markets and Food. In certain circumstances, special permits are required in addition to licenses, examples being any larviciding treatments made to surface water or for adulticiding treatments within a public watershed, or along a public roadway. The Division of Pesticide Control at the Department of Agriculture, Markets and Food, in consultation with other interested state agencies, issues these special permits after all such agencies have reviewed the proposed treatment program.

Although certain pesticide products are available for sale in the marketplace to control mosquito larvae, application of these products to any surface waters in NH is governed through permits obtained from the Department of Agriculture, Markets and Food, Division of Pesticide Control. Questions regarding how to apply for such special permits should be directed to the NH Department of Agriculture, Division of Pesticide Control at 271-3550.

Pesticide Control on State-owned Lands

Effective June 27, 2008, RSA 142-A established a mosquito control policy for all NH state agencies with land management responsibilities. This policy is meant to guide land management agencies through the process of determining whether or not to allow the control of larval and/or adult mosquitoes on state-owned land for the purpose of reducing the risk of EEE, WNV and JCV. The policy may be viewed at:
http://www.gencourt.state.nh.us/legislation/2008/HB1468.html

Permit Requests for the Application of Pesticides

Permit applications and a listing of the current NH licensed pesticide applicators certified to control mosquitoes can be requested from the Division of Pesticide Control (271-3550). Successful applications require in-depth knowledge of the community's planned pesticide use for mosquito control. Communities may require the assistance of a licensed pesticide applicator to complete the application. In order to allow time for permit processing, applications should be completed and submitted to the division for approval prior to February of the year in which mosquito control is anticipated. Communities should allow 120 days for processing.

In the event an EEE or WNV threat has been identified, the Commissioner of Agriculture may declare a Public Health Emergency and instruct the Director of the Division of Pesticide Control to commence the expedited special permit process – that is, provide an application form and other pertinent information to the appropriate town official(s) through the local health officer. The special permit will be issued with the greatest possible speed, preferably within seventy-two (72) hours.

Financial Reimbursement for Mosquito Control

Effective July 1, 2006, RSA 141-C:25 established a mosquito control fund in the NH DHHS to assist cities, towns, and mosquito control districts by providing funding to offset mosquito control activities. During passage of the State Fiscal Year 2012-2013 budget, this program was unfunded. The passage of the State Fiscal Year 2019-2020 budget again did not include any funds for this program. As such no reimbursement funds will be awarded in calendar year 2018. Funding for the program beyond State Fiscal Year 2021 will be contingent upon decision making during the next budget cycle.

Suggested Options for Mosquito Control Activities

Once a community has identified the need for an organized response to a mosquito-borne disease problem, it is necessary to decide on the type of response and the magnitude of the effort. These decisions will be impacted by a variety of considerations, such as the severity of the problem, the financial resources of the community, public perceptions and attitudes, and the availability of technical expertise. Listed below are suggested options for local mosquito control programs. It is important to remember mosquito control is a year-round activity; many of these activities can be performed during the "off season." Communities interested in developing or enhancing their mosquito control programs should review the documents:
"Public Health Confronts the Mosquito – Developing Sustainable State and Local Mosquito Control Programs"
(http://www.astho.org/Programs/Environmental-Health/Natural-Environment/confrontsmosquito/) and "Before The Swarm: Guidelines for the Emergency Management of Mosquito-Borne Disease Outbreaks"

(http://www.astho.org/Programs/Environmental-Health/Natural-Environment/Before-the-Swarm/).

a. Institute a public information program emphasizing personal responsibility, ways in which people can prevent mosquito breeding, and how they can reduce the risk of being bitten by observing personal protection measures.
   i. Obtain public information brochures and other materials by visiting the CDC's website at: http://www.cdc.gov/ncidod/dvbid/westnile/education.htm or the NH DHHS website at: http://www.dhhs.nh.gov/dphs/cdcs/arboviral/index.htm. These materials can be reproduced at a minimal cost.
   ii. Educational materials may be distributed with community mailings, aired on local cable access stations, or posted on local websites.
   iii. Identify community activities for targeted public education (e.g. summer festivals, fairs, or sporting events). Public gatherings during which people are at increased risk of mosquito bites should be identified.
   iv. Schools can be an excellent means of educating the public on mosquito-borne illness and risk reduction. The following website has teaching materials for the K-12 grades:
      - Science News for Kids
        http://www.sciencenewsforkids.org/articles/20040811/Feature1.asp
   v. Create and deliver informational programs for selected community groups. Citizen action groups can be an extremely effective resource to spread information about mosquito control and personal protection.

b. Stay up-to-date on statewide and regional virus activity and recommendations by visiting http://www.dhhs.nh.gov/dphs/cdcs/arboviral/index.htm and reading disseminating emails and faxes.

c. Contact insect repellent manufacturers to determine the availability of community or municipal discounts for bulk purchases of repellent products.

d. Encourage reporting of unusual events such as a large die-off of dead wild birds and sick domestic animals (e.g., horses, alpacas, emus) during the arboviral season.
   i. Reports of unusual events are taken by the NH DHHS Infectious Disease Investigation Section at 603-271-4496.
   ii. **Approved** wild birds may be submitted for WNV and EEE testing.
   iii. Sick domestic animals should be evaluated by their treating veterinarian.

e. Encourage local reporting of suspected areas where mosquitoes may be breeding (larval habitats). Such areas may then be evaluated by mosquito control personnel.

f. Institute community cleanup programs to eliminate larval habitats from backyards, commercial sites and abandoned premises. Efforts may be aimed at removing, covering, or draining such artificial habitats.
   i. Enlist service groups (e.g., Rotary, Lions, 4-H clubs), churches, scouts, and similar programs in the effort to increase community awareness and to support cleanup programs.
   ii. Organize community cleanup days to target specific locations.

g. If needed, develop provisions in the local ordinances to deal with public health nuisances (e.g., unmaintained swimming pools that may serve for mosquito breeding).
   i. Review existing local laws pertaining to public health nuisances.
   ii. Review NH RSA 147:1 for the statutory process for a community to develop and enforce a local ordinance. http://www.gencourt.state.nh.us/rsa/html/NHTOC/NHTOC-X-147.htm.
   iii. Update local ordinances regarding the ability to order mitigation, to levy fines if the owner is non-compliant, and to allow access for surveillance and control activities.
   iv. For technical assistance in developing local health ordinances, call the Local Government Center and speak to one of their attorneys (603-224-7447).

h. Educate and inform the local media.
   i. Identify local newspapers and community bulletins servicing the area.
   ii. Prepare and submit articles describing ways to reduce opportunities for mosquito breeding as well as promote personal protective measures.
   iii. Submit announcements of mosquito control activities taking place in the community.

i. Decide on the mosquito control program format (e.g., in-house, contract, multi-jurisdictional collaborative).
   i. Establish what local resources are available, in particular, knowledge and training of individuals.
   ii. Determine the level of support by the community towards mosquito control efforts.
   iii. Decide which local units of government have the resources and expertise to conduct the program and provide oversight and monitoring.

j. Define the scope of the mosquito control program.
   i. Create a clearly defined statement of services or deliverables, and a clear performance evaluation document.
   ii. Establish what activities will be performed.
   iii. Determine what resources (equipment, staff, insecticides, etc.) will be provided.
   iv. Decide where, when, and how often activities are to occur.

v. Emphasize public education and source reduction, augmented by larval and adult mosquito control, if appropriate.

k. Establish mosquito control program personnel requirements.
   i. Personnel needs will depend on the level of service required.
   ii. Ensure that all staff are appropriately trained and certified or licensed.
   iii. Investigate training opportunities to develop local expertise, such as in mosquito trapping and identification and/or pesticide application.
   iv. Contact the UNH Cooperative Extension at 629-9494 to discuss training sessions.

l. Institute basic mosquito population monitoring to define the problem. Monitoring species, abundance, and virus infection rates in adult mosquitoes provides critical early, predictive data for surveillance and control.
   i. Obtain comprehensive and detailed knowledge of the immediate and surrounding areas to locate and prioritize specific mosquito habitat. Local knowledge/expertise of private, municipal and state-owned lands should complement that provided by contractors.
   ii. Determine environmental limitations/hazards.
   iii. Identify which species of problem mosquitoes are in the local area.
   iv. Become knowledgeable about the biology of these species, including habitat preference, seasonal distribution, flight times, and travel distance. (See Appendix for more information.)
   v. Initiate routine monitoring procedures that include larval and adult counts, identified to species.
   vi. Adequate sampling requires trapping regularly at representative sites throughout a community, and rapid testing of collections of sufficient size to detect low infection rates in the vector population. Minimally, adult mosquito density (number collected per trap night) and infection rate (number of individual mosquitoes estimated containing WNV or EEE per 1,000 specimens tested) should be recorded for each area to provide a basis for tracking mosquito density and virus incidence.
   vii. Submit approved mosquitoes for virus testing to the NH Public Health Laboratories in accordance with established laboratory submission protocols.

m. Consider coordinating mosquito control efforts with neighboring jurisdictions.
   i. Identify surrounding contiguous communities with previous experience in mosquito control activities.
   ii. Identify shared areas of known larval habitat.
   iii. Arrange for a meeting with local health officers, town officials, and selectmen to discuss possible collaborative mosquito control efforts.
   iv. Identify each com munity's available resources and level of expertise.
   v. Develop and implement a cooperative plan of action for mosquito control activities.

vi. Develop a mosquito control district to assist in regional mosquito surveillance, control, and pesticide permit acquisition. Establishing a mosquito control district may reduce time, effort, and costs for communities involved, as well as provide a greater reduction of risk than can be attained by individual communities.
vii. Contact the Division of Pesticide Control (603-271-3550) for additional information regarding mosquito control districts.

n. Build risk maps to assign priorities to areas within the community, highlighting locations of high-risk populations (e.g., senior citizens) and where individuals congregate when mosquitoes are biting (e.g., parks, fields). Local census or other community data may be useful in building these maps, thereby allowing the community to prioritize resources if needed.

o. Build larval habitat maps of important mosquito species. These maps will aid in deciding where to concentrate mosquito collection and control. Mapping and monitoring larval habitats gives early estimates of future adult mosquito densities. Collect and review topographic maps, aerial photography, GIS technology, and local/contracted expertise to evaluate:
   i. Transient waters (e.g., woodland pools, tidal floodwaters).
   ii. Permanent waters (e.g., freshwater swamps, white cedar swamps, red maple swamps, salt marshes).

p. Once these decisions have been made, create a community-specific mosquito control plan.

V. SURVEILLANCE

Arboviral testing available through the Public Health (PHL) and Veterinary Diagnostic Laboratories (VDL) is outlined below. All laboratory test results will be considered in conjunction with clinical symptoms and epidemiologic findings. Screening tests for WNV, EEE, SLE, Zika, Dengue, and Chikungunya arboviruses are available at the NH PHL. All other testing, including confirmatory testing for these viruses, will be referred to the CDC. A table of available tests for viruses transmitted in NH is listed below.

Sample	West Nile virus (WNV)	Eastern Equine (EEE)	St. Louis (SLE)	Jamestown Canyon (JCV)	Powassan virus (POW)
Human serology (IgM & IgG*)	X	X	X	X**	X**
Human cerebrospinal fluid (IgM)	X	X	X	X**	X**
Bird tissue (PCR)	X***	X***			

Mosquitoes (PCR)	X***	X***			
Non-Human Mammal tissue (PCR)	X	X			
Horse serology (IgM)	X	X			

* = IgG testing is not routinely performed.
** = Testing referred to the CDC.
*** = Only particular specimens will be approved for testing.
RT-PCR = reverse transcriptase polymerase chain reaction
PCR = polymerase chain reaction
Note: The USDA National Veterinary Services Laboratory (NVSL) or CDC Laboratory will be used as a confirmatory reference laboratory for results as needed.

A. Mosquito Surveillance for West Nile virus and Eastern Equine Encephalitis

Mosquitoes are the best early indicator of human risk for arboviral disease. The objective of a mosquito surveillance program is to determine the presence of arboviruses, including WNV and EEE, in mosquito species common to our area. Mosquito surveillance may also help to identify and track new and exotic mosquito species in NH that may pose unique human and veterinary health consequences and mosquito control challenges (e.g., *Aedes albopictus*, a potential vector of Zika, dengue, and chikungunya viruses). An effective program begins by targeting mosquito species considered to be important in transmitting disease among birds (primary vectors) and transmitting disease from birds to humans (bridge vectors). Monitoring mosquito abundance is accomplished through various surveillance methods including but not limited to measuring larvae (dip counts) and adult mosquitoes (use of light/CO2 baited traps, gravid traps, and resting boxes). Results must be evaluated by mosquito species, as each species has unique biological characteristics that should be incorporated into control decisions (see Appendix). The NH DHHS uses a comprehensive and flexible strategy that modifies certain surveillance activities in response to trends in disease risk.

Based on historic and current epidemiology in NH and the United States, NH DHHS may test only particular mosquito species for EEE virus and WNV. Testing decisions will be based on the most current knowledge and are intended to ensure a rapid, robust surveillance system. Such decisions will be announced to Health Officers and mosquito contractors well in advance. Regardless of testing decisions, communities financing mosquito surveillance are encouraged to utilize surveillance from July 1 through mid-October in order to evaluate the relative abundance of particular mosquito species. Mosquito larvae and adult abundance, arboviral testing results, and coverage of mosquito surveillance efforts play a critical decision-making role in overall need, scope, and method of control.

Activities for mosquito surveillance consist of routine and rapid response surveillance.

1. Routine Mosquito Surveillance: The NH DHHS is the lead agency responsible for mosquito surveillance activities. Activities include:

a. Coordinating efforts for appropriate placement of traps, collection, packaging and transport of mosquito specimens from communities that develop their own mosquito surveillance programs.
b. Providing laboratory services for communities that submit mosquitoes for testing and informing municipalities of the results of those tests.
c. Notifying municipal and other agency representatives within 24 hours of receiving results of positive virus testing or a confirmed case of mosquito-borne diseases.

Mosquitoes must be collected, frozen, sorted, packed in dry ice and sent to the NH DHHS Public Health Laboratories on a routine, consistent, and timely basis. Mosquito collection, processing, and transportation must be performed in a manner to preserve the cold-chain and prolong virus viability. Mosquitoes must be grouped by species, gender (only females should be submitted for testing), site, and date of collection into a "batch" of 1-50 individual mosquitoes of the same species. In order to ensure testing results are accurate, only mosquitoes trapped in a method approved by NH DHHS will be tested (e.g., light/CO2, gravid traps, BG traps, resting boxes). Mosquitoes trapped using other methods such as Mosquito Magnets are not acceptable for testing.

Routine, fixed long-term trap sites provide the best baseline information for detecting trends in mosquito abundance, virus prevalence and estimating the risk of human infection from WNV and EEE. Ideally, there should be several collection attempts at each site each week during the surveillance season. Communities with prior year virus activity should consider implementing their own mosquito collection program by either contracting with a mosquito control company or by obtaining their own traps and becoming proficient in their use and in mosquito identification techniques.

2. Rapid Response Mosquito Surveillance: In the case of an arboviral positive test in humans, other mammals, domesticated birds (e.g., emus), or mosquitoes, state-sponsored activities may include:

a. Evaluating current trap locations based on criteria including habitats conducive to mosquito breeding and bridge vector collection, and level of human use (e.g., schools, parks, athletic fields).
b. Reviewing and determining the need for expanding trapping in the area surrounding the positive identification.
c. Notifying city and town municipal officials within 24 hours of receiving results of positive virus isolation or a confirmed case of a mosquito-borne disease.
d. Provide for short-term mosquito surveillance and laboratory specimen preparation in the absence of a local health department surveillance or local mosquito control program in predetermined selected areas.

e. Coordinating training and lending expertise to local health officials and state personnel involved in mosquito surveillance programs.

B. Avian Surveillance for West Nile virus and Eastern Equine Encephalitis

1. Bird Testing – WNV and EEE: Wild bird testing will not occur on a regular basis. WNV dead bird testing has become less useful for early detection and evaluation of WNV risk. Most birds infected with EEE do not succumb to severe disease and no longer provide useful data for disease surveillance and response in NH.

In some circumstances, dead birds may be tested for WNV and EEE if the situation warrants (e.g., unusual large die-offs without a known cause). The public is being advised to report unusual situations to their local animal control or health officer or to contact NH DHHS Infectious Disease Investigation Section at 603-271-4496. The caller will be informed if the reported birds are to be tested and how to safely handle the dead birds to minimize contact and how to arrange for delivery. Otherwise the caller will be informed of proper disposal procedures for the dead bird.

If testing is approved, it is the responsibility of the local communities to arrange for the transportation of dead birds to the Public Health Laboratories, such as through local animal control officers. Birds must be approved for testing prior to delivery by calling the WNV & EEE information line.

2. Laboratory Testing of Domestic Birds for WNV and EEE: Testing and surveillance of domestic birds (e.g., emus) will follow the procedures listed below for veterinary surveillance.

C. Veterinary Surveillance for West Nile virus and Eastern Equine Encephalitis

Under the auspices of the State Veterinarian, NH Department of Agriculture, Markets & Food, the NH Public Health Laboratories or the NH Veterinary Diagnostic Laboratory may conduct testing of horses and other domestic animals (e.g., llamas, alpacas) that have severe neurological disease suspected of being caused by EEE virus or WNV infection. On an annual basis, a letter from the State Veterinarian, co-signed by the Infectious Disease Investigation Section Chief (NH DHHS), describing the case definition, clinical signs of disease, prevention measures, and reporting process is sent to all licensed veterinarians in the state of NH. This serves as a reminder to investigate and report neurological illness in animals. Parameters for the evaluation and testing of ill animals will include the following:

1. Domestic animals with neurologic signs will initially be referred to private veterinarians for evaluation.
2. Veterinarians wishing clinical consultation or information on encephalitic disease testing procedures should contact the State Veterinarian at the NH Department of Agriculture, Markets and Foods (271-2404) or the NH Veterinary Diagnostic Laboratory (862-2726).

3. Necropsy specimens, such as animal heads, must be sent to the NH Veterinary Diagnostic Laboratory for processing. The NH Veterinary Diagnostic Laboratory will then send tissue samples to the NH Public Health Laboratories for further testing.
4. The State Veterinarian and NH Veterinary Diagnostic Laboratory will assure appropriate collection of specimens for diagnostic testing.
5. Appropriate submission forms must accompany specimens. NH Veterinary Diagnostic Laboratory forms available at: http://nhvdl.unh.edu/tests-fees-formsNH Public Health Laboratories forms available at: http://www.dhhs.nh.gov/dphs/cdcs/arboviral/animals.htm.

Mammals Submitted for Rabies Testing

Unlike an arbovirus, rabies can be transmitted to humans through the bite of an infected animal. It is important that all mammals with neurological symptoms that have had contact with humans, pets, or domestic animals, and that meet guidelines for rabies testing, be submitted for testing in accordance with the NH Public Health Laboratories guidelines. Animals testing positive for rabies will not be tested for WNV and EEE virus.

D. Human Surveillance

1. Passive surveillance: The NH DHHS is the lead agency for the conduct of human case surveillance for arboviral encephalitis, meningitis, and meningoencephalitis. From June 1 until October 31 (and at other times of the year depending on patient travel history), health care providers, emergency rooms and hospitals must report cases of encephalitis or aseptic meningitis that meet the following criteria:

CRITERIA FOR REPORT (i, ii, and iii): In accordance with RSA 141-C:6 and He-P 301, clinicians, hospitals, and laboratories should report **within 24 hours** any patient meeting the following criteria:

a. Any patient with encephalitis or meningitis, who meet criteria a, b, and c below:
   i. Fever ≥ 38. C or 100 F. and
   ii. CNS involvement including altered mental status (altered level of consciousness, confusion, agitation, lethargy) and/or other evidence of cortical involvement (e.g., focal neurologic findings, seizures), and
   iii. Abnormal CSF profile suggesting a viral etiology (a negative bacterial stain and culture) showing pleocytosis with predominance of lymphocytes. Protein levels are elevated. Glucose levels are normal.

b. Guillain-Barre syndrome, especially with atypical features, such as fever, altered mental status, and/or pleocytosis.

Note: Severe neurological disease due to an arboviral infection has occurred in patients of all ages. Year-round transmission is possible in some areas of the country. Therefore, arboviral disease should be considered in persons with unexplained encephalitis and meningitis with consistent travel history.

The NH Public Health Laboratory's normal viral testing protocol for arboviruses includes human serology and cerebrospinal fluid assays for WNV, EEE, and SLE (St. Louis Encephalitis). If requested, the NH PHL will assist in arranging human specimen JCV and Powassan virus (POW) testing at the CDC. Following review of the clinical presentation and laboratory results, Infectious Disease Investigation Section staff will classify the patient as a case or not a case, based on the following criteria:

Confirmed Case

A confirmed case of arboviral encephalitis is defined as a febrile illness associated with neurologic manifestations, ranging from headache to aseptic meningitis or encephalitis, plus at least one of the following laboratory criteria:

- Isolation of an arbovirus from, or demonstration of specific viral antigen or nucleic acid in, tissue, blood, CSF, or other body fluid, OR
- Four-fold or greater change in virus-specific quantitative antibody titers in paired sera, OR
- Virus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in the same or a later specimen, OR
- Virus-specific IgM antibodies in CSF and a negative result for other IgM antibodies in CSF for arboviruses endemic to the region where exposure occurred.

Probable Case

A probable case is defined as a febrile illness associated with neurologic manifestations ranging from headache to aseptic meningitis or encephalitis and the following laboratory criteria:

- Virus-specific IgM antibodies in CSF or serum but with no other testing

Non-Case

A non-case is defined as an illness that does not meet any of the above laboratory criteria, plus:

- A negative test for IgM antibody to an arbovirus (by EIA) in serum or CSF collected 8-21 days after onset of illness; and/or

- A negative test for IgG antibody to an arbovirus (by EIA, HI, or PRNT) in serum collected $\geq$ 22 days after onset of illness.

NH DHHS promotes human surveillance activities by:

- Alerting NH hospitals and clinicians about the importance, criteria, and requirements for reporting, along with instructions for submission of appropriate laboratory specimens (CSF, acute and convalescent sera for arboviral encephalitis).

- Providing NH hospitals, neurologists and infectious disease physicians with clinical and epidemiologic information about human cases of WNV, EEE, JCV and Powassan virus, and criteria for reporting and laboratory testing.

- Contacting the major commercial laboratories to remind them of the requirement to report patients with positive arboviral serology (including SLE). The NH Public Health Laboratories will decide on a case-by-case basis the need for further testing.

All suspect human cases should be reported to the NH DHHS Infectious Disease Investigation Section at 603-271-4496. Disease Control staff will screen reports to determine if the clinical presentation meets the case criteria for arboviral neurological illness. If the case meets surveillance criteria, the hospital or physician will be contacted and requested to submit the appropriate diagnostic specimens for testing. Information regarding laboratory submissions is available at: http://www.dhhs.nh.gov/dphs/cdcs/arboviral/providers.htm. The NH Public Health Laboratories will take responsibility to ensure that appropriate viral testing is completed.

Health care providers will be asked to submit the following specimens for testing (when possible, serum and CSF should be submitted together):

- CSF for testing by IgM-capture ELISA. All spinal fluid submission must be accompanied by a corresponding serum sample.

- Sera, both acute and convalescent, for testing by IgM capture and IgG ELISA.

The NH DHHS and local health department staff will help ensure the collection of convalescent sera on all suspected case-patients with encephalitis of unknown etiology.

2. Enhanced surveillance: If surveillance data indicates a risk of human disease, active surveillance or enhanced passive surveillance may be instituted in high-risk areas. This consists of contacting health care providers and facilities surveying for potential cases. Additionally, death records and other available surveillance systems will be utilized to screen for possible human cases of arboviral encephalitis, meningitis, or meningoencephalitis.

E. Communication of Surveillance Information

1. Routine Information: Arboviral laboratory test results are compiled on a daily basis and information summarized in tabular and map formats to identify areas of virus activity. Testing time varies with test method, test volume, specimen, concentration of virus present and confirmation testing requirements; therefore, new test results may not be available every day.

2. Positive EEE Virus, WNV, and JCV Findings: The NH DHHS ensures the rapid and accurate dissemination of positive test results. Following an EEE or WNV positive mosquito batch, veterinary case, or positive EEE, WNV or JCV human case, all pertinent parties both internal and external to DHHS are concurrently notified.

a. Internal Notification: Following a positive result, the Director of the Division of Public Health Services (DPHS) immediately notifies the Commissioner of DHHS. A member of the Infectious Disease Investigation Section notifies the DHHS Health Officer Liaison. The DHHS Public Information Officer, at the direction of the Commissioner, works with DPHS to issue an appropriate press release. Prior to sending out the press release, DPHS ensures all pertinent parties external to DHHS have been notified.
b. External Notification: External parties include the Departments of Agriculture, Markets & Food, Fish and Game, Environmental Services, Education, Resources and Economic Development, local town officials, and medical professionals. Information is provided by the most efficient means, usually an email, telephone call or fax within 24 hours of confirmation. Other agencies that are involved in surveillance and intervention activities are also provided results by the most efficient means, as determined by the recipient agency. The specific external parties notified varies with the surveillance component that is positive.
    i. Mosquitoes: a member of the Infectious Disease Investigation Section provides positive laboratory test results or other priority reports to the submitter and the designated local Health Officer.
    ii. Veterinary Cases (may include horses, llamas, alpacas, or domesticated birds such as emus): a member of the Bureau of Infectious Disease Control provides positive laboratory results directly to the State Veterinarian, followed by the submitting veterinarian who will, in turn, notify the animal owner. After the submitting veterinarian is notified, the local Health Officer will be informed of the positive results.
    iii. Human Cases: a member of the Bureau of Infectious Disease Control provides positive laboratory results directly to the health care provider of the patient and to the local Health Officer of the patient's residence. Other state and federal agencies are notified as soon as possible.

Local notification will occur individually for the town affected or as a region depending on the significance of the test results. The NH DHHS Community Public Health Development Section (e.g., Health Officer Liaison) will assist in local notification (phone and/or email) if Disease

Investigation staff is unable to make contact with the Health Officer. It is the duty of the local Health Officer to notify all pertinent local officials, including high-level elected and appointed officials and, as warranted, the municipal Emergency Management Director and Animal Control Officer. Unless DHHS is notified otherwise, if the Health Officer is unable to be contacted, notification will be made to the municipal Manager / Administrator or Selectmen.

The public will be informed, but only after the local Health Officer and external parties listed above (1-3) are notified. In addition to press releases, the media and public will be informed of positive results through the DHHS website. NH DHHS will determine the human risk level for the region (as outlined below) and disseminate this information through the measures discussed. The CDC receives timely reports of all positive test results.

3. Media Advisories: The NH DHHS issues media advisories when surveillance information indicates risk of human disease. Media advisories include information on personal protection measures, identify areas of virus activity, and explain activities of the surveillance program.

4. DHHS Website: The NH DHHS informs the media and public of positive tests results, regions of increased disease risk, and other important up-to-date information through its website http://www.dhhs.nh.gov/dphs/cdcs/arboviral/results.htm. Information regarding personal protection measures, general background information, and regular updates on surveillance and laboratory analysis is available at this site. Surveillance information is updated as it becomes available. Maps presenting the geographical distribution of EEE virus, WNV and JCV activity and regional risk are available at this site and updated weekly as new activity occurs. Links to other mosquito-borne virus informational websites, including community health departments, and state and federal agency sites are included.

5. Public Health Alerts: The NH DHHS issues media advisories to alert the public of conditions that may warrant additional precautions to reduce the risk of disease. These alerts are drafted in consultation with local health agents to coordinate local prevention activities. The Health Alert Network (HAN) will be utilized by the NH DHHS to disseminate information to health care providers in the State.

VI. RECOMMENDATIONS FOR A PHASED RESPONSE TO EEE VIRUS, WNV, and JCV SURVEILLANCE DATA

The recommendations provided here are based on current knowledge of risk and appropriateness of available interventions to reduce the risk for human disease. Multiple factors contribute to the risk of mosquito-transmitted human disease. Decisions on risk reduction measures should be made after consideration of all surveillance information for that area at that time.

Recommendations regarding the WNV,EEE, and JCV phased response plan (Table 1 and Table 2) incorporates several components presented in the CDC document "Epidemic/Epizootic West Nile virus in the United States: Guidelines for Surveillance Prevention, and Control", 3rd Revision, 2003, as well as results of analyses of surveillance data collected in NH and throughout the northeastern United States.

Public awareness of what can be done to reduce risk of infection is of utmost importance. The level of EEE virus and WNV activity in mosquitoes and veterinary samples may occasionally present a potential for increased virus transmission to humans. Typically, risk is expected to be relatively low, and the routine precautions taken by individuals may be sufficient to avoid infection. These guidelines take into consideration the complexity of reducing risk of human disease from EEE virus,WNV infection, and JCV and form a framework for decision-making. They are not a set of specific prescriptions.

1. Phased Response: General guidelines are provided for an array of situations that are noted in the Surveillance and Response Plan Tables that follow. Specific situations must be evaluated and options discussed before final decisions on particular actions are made. The assessment of risk from mosquito-borne disease is complex and many factors modify specific risk factors. The NH DHHS works with local public health agencies, community administrators, health officers, and mosquito control contractors to develop the most appropriate prevention activities to reduce the risk of human disease. There is no single indicator that can provide a precise measure of risk, and no single action that can assure prevention of infection.

When recommending the use of mosquito larvicides or adulticides, NH DHHS works to identify and support the use of risk reduction and disease prevention methods that are specific to the cause of disease, that use the least intrusive and most appropriate prevention methods, and that support planning and practices that reduce the use of pesticides. Ultimately, the decision to apply pesticides is left to the community. Communities that would like to consider pesticide use should apply for a pesticide permit well before intended application.

Historical local surveillance data is critical in making informed decisions regarding risk and appropriate actions. Communities are urged to review and enhance local surveillance activities to aid in decision-making and early detection of arboviral activity.

2. NH DHHS Guidance: Throughout the arboviral season, the NH DHHS Arbovirus Program will determine human risk levels as outlined in the phased response tables of this plan. Currently, EEE and WNV mosquito, veterinary and human surveillance data, as well as JCV human surveillance data are analyzed to determine human risk levels. Arboviral risk levels set by the NH DHHS Arbovirus Program refer only to risk posed by mosquito-borne arboviruses and are defined for focal areas. "Focal Areas" may incorporate multiple communities, towns, or cities. Factors considered in the determination of human risk in a focal area include: mosquito habitat, mosquito abundance, current and historic virus activity, timing of recent isolations of virus in mosquitoes, current and predicted weather and seasonal conditions needed to present risk of

human disease. Known/suspected location of exposure is used for human and veterinary cases and not necessarily town of residence. Determined risk levels will be announced to the public, local officials, and state partners through the means listed (i.e., press releases, DHHS website, emails, public health alerts).

Table 1. Guidelines for use of Arboviral Surveillance Data to Determine Arboviral Risk Categories

Risk Category	Probability of Human Illness	West Nile Virus Definition for a Focal Area*	Eastern Equine Encephalitis Virus Definition for a Focal Area*	Jamestown Canyon Virus Definition of a Focal Area*
1	Baseline/No Data	All of the following conditions must be met: Prior Year No activity detected in a community or focal area **Or** Current Year No current surveillance findings indicating WNV activity in the focal area **Or** Mosquito surveillance not conducted in this community or focal area	All of the following conditions must be met: Prior Year No activity detected in a community or focal area **Or** Current Year No current surveillance findings indicating EEE activity in the focal area **Or** Mosquito surveillance not conducted in this community or focal area	All of the following conditions must be met: Prior Year No activity detected in a community or focal area **Or** Current Year No current surveillance findings indicating JCV activity in the focal area
2	Low	Prior Year Virus activity detected in mosquitoes **Or** Current Year Surveillance of mosquitoes collected at a single mosquito trap location testing positive **And** No human or veterinary cases	Prior Year Virus activity detected in mosquitoes **Or** Current Year Virus identified in an enzootic mosquito species (e.g., *Culiseta melanura)* **And** No human or veterinary cases	N/A
3	Moderate	Prior Year Confirmation of human and/or veterinary case(s) **Or** Sustained WNV activity in mosquitoes **Or** Current Year Positive mosquitoes at more than one trap location **And** No human or veterinary cases	Prior Year Confirmation of human and/or veterinary case(s) **Or** Current Year Multiple EEE virus mosquito isolates; or EEE virus isolated in bridge vectors **And** No human or veterinary cases	Prior Year Confirmation of JCV human case(s)
4	High	Current Year Surveillance of sustained or increasing WNV activity in mosquitoes **Or** A single confirmed veterinary or human case	Current Year EEE virus mosquito isolation rates in an enzootic mosquito species (i.e., *Culiseta melanura)* are rising and area of EEE virus activity is spreading **Or** A single confirmed veterinary or human case	Current Year A single confirmed JCV human case
5	Very High	Current Year More than one confirmed WNV human case **Or** More than one confirmed WNV veterinary cases	Current Year More than one confirmed human EEE case **Or** More than one confirmed EEE veterinary cases **Or** Multiple measures indicating very high risk of human infection (e.g., multiple isolations from bridge vectors associated in time and space and veterinary case)	Current Year More than one confirmed JCV human case

* Focal area: May incorporate multiple towns or cities. Designation based on factors including mosquito habitat, current and historic virus activity, timing of current virus activity, current weather and seasonal conditions. Known/suspected location of exposure is used for human and non-human animal cases and not necessarily town of residence.

**May include horses, llamas, alpacas, or domesticated birds such as emus.

Table 2. Guidelines for Phased Response to Arbovirus Surveillance Data

Risk Category	Probability of Human Illness	Recommended Response for State Agencies and Town Officials	Recommend Response for the Public and Individuals in Affected Areas
1	Baseline /No Data	1. Educational efforts directed to the general public on personal protection and source reduction. 2. Routine human and veterinary surveillance. 3. Assess local ecology for mosquito abundance. 4. Consider larval and adult mosquito monitoring with routine collection and testing of mosquitoes.	1. Repair Screens 2. Dump standing water weekly 3. Wear mosquito repellant when outdoors during peak mosquito hours (from dusk to dawn) 4. Wear long sleeves and long pants when outdoors during peak mosquito hours (from dusk to dawn) 5. Use mosquito netting on baby carriages and playpens when outdoors 6. Arrange neighborhood clean-ups to get rid of mosquito breeding sites 7. Be aware of stagnant water on property (e.g., unused swimming pools) and consult local health officer 8. Clean roof gutters so that rainwater cannot collect in them. 9. Do not attempt to drain or alter natural water bodies such as ponds, marshlands, and wetlands as they are regulated under state law and any alterations may require the approval of state and possibly federal agencies.
2	Low	Incorporates previous category response, plus: 1. Expand community outreach and public education programs focused on risk potential and personal protection, emphasizing source reduction. 2. Assess mosquito populations, monitor larval and adult mosquito abundance, submit samples to PHL for virus testing. 3. Use larvicides at specific sources identified by entomologic survey and targeted at vector species. If appropriate, consider source reduction techniques. If current year activity includes EEE virus isolates in mosquitoes, may consider adulticiding based on current regional epidemiology and surveillance efforts. 4. Enhance human and veterinary surveillance.	
3	Moderate	Incorporates previous category response, plus: 1. Increase larval control, source reduction, and public education emphasizing personal protection measures. 2. Actions to prevent disease may include targeted larviciding, and if current year activity, possibly ground adulticiding targeted at likely bridge vector species. 3. Enhance human surveillance and activities to further quantify epizootic activity.	
4	High	Incorporates previous category response, plus: 1. Intensify public education on personal protection measures a. Utilize multimedia messages including press releases, local newspaper articles, cable channel interviews, etc. b. Actively seek out high-risk populations (nursing homes, schools, etc.) and educate them on personal protection. c. Issue advisory information on adulticide spraying. 2. Consider intensifying larviciding and/or adulticiding control measures as indicated by surveillance. 3. DHHS will confer with local health officials to determine if the risk of disease transmission threatens to cause multiple human cases. If surveillance indicates a continuing risk of human disease and potential for an outbreak, intensified ground-based adult mosquito control may be recommended.	Incorporates previous category response, plus: 1. Avoid areas with heavy mosquito activity 2. Adjust outdoor activity to avoid peak mosquito hours (from dusk to dawn)

5	Very High	Incorporates previous category response, plus: 1. Continued highly intensified public outreach messages through community leaders and the media emphasizing the urgency of personal protection. 2. If risk of outbreak is widespread and covers multiple jurisdictions, DHHS will confer with local health officials and Arboviral Illness Task Force members to discuss the use of intensive mosquito control methods. A State of Emergency may be declared pursuant to RSA 21-P:35. Factors to be considered in making this decision include the cyclical, seasonal and biological conditions needed to present a continuing high risk of EEE human disease. The declaration of an emergency may trigger application of mosquito adulticide. DHHS may define targeted treatment areas for vector control following the declaration of an emergency. 3. Ground-based adulticide applications may be repeated as necessary to achieve adequate control.	Incorporates previous category response, plus: 1. Consider cancelling or rescheduling outdoor gatherings, organized sporting events, etc., during peak mosquito hours

APPENDIX

Biology, Arboviral Activity, and Control Concerns of Selected New Hampshire Mosquito Species

Below is a review of the main products used for mosquito control and descriptions of the principle mosquito species likely responsible for West Nile virus (WNV) and Eastern Equine Encephalitis (EEE) virus transmission in NH. The unique biological features pertinent to control and prevention of each species are discussed. Information was obtained from federal, state, and local publications (see reference list below) and results from the NH and other New England state arboviral testing programs.

A. Control of Mosquitoes in New Hampshire

The decision of which product and method of application to use, will depend on environmental conditions, targeted species, and state/local regulations. For information regarding pesticide rules and regulations, contact the NH Department of Agriculture, Markets & Food, Division of Pesticide Control at 271-3550.

Larviciding. Larviciding is a proactive measure that can be useful in reducing the risk of mosquito-borne disease throughout the season and tends to be more effective at reducing mosquito populations than adulticiding. Larviciding occurs in response to larval mosquito surveillance and habitat identification. The intent of a larvicide program is to control generations of targeted mosquito species before they reach the adult stage, when they are able to transmit diseases such as WNV and EEE. Several materials in various formulations are labeled for mosquito larviciding. Items can be classified as bacteriologic, insect growth regulators, surface films, and organophosphates. Most are effective during particular stages of mosquito development, thus timing of application is important.

(1) Bacteriologic Control: *Bacillus thuringiensis israelensis* (*Bti*) and *Bacillus sphaericus* (*Bs*) are naturally occurring bacteria used as larvicides. When ingested by mosquito larvae, they alter gut permeability killing the larvae. They are believed to pose a minimal risk to non-target species.

(2) Insect Growth Regulators: Methoprene (e.g., Altosid) mimics the action of a mosquito growth-regulating hormone and prevents larvae from maturing into adults. It has low toxicity to birds and fish.

(3) Surface Films: Petroleum derivatives (e.g., Golden Bear Oil) produce a thin film on the surface of the water that prevents the transfer of oxygen causing the mosquito larvae/pupae to drown. Ethoxylated Alcohols (e.g., Agnique) produce a thin surface film, making it difficult for mosquito larvae, pupae, and emerging adult to attach to the water's surface, causing them to

drown. The window of opportunity for use of these agents is limited by the mosquito life cycle, especially when dealing with species that require little or no surface contact for breathing. These agents also prevent the natural transfer of oxygen into the water body. There are potential impacts to non-target species that rest on the water surface.

(4) Organophosphates: Temephos is the only organophosphate with larvicidal use and inhibits nerve signal transmission. Although it presents relatively low risk to birds and terrestrial species, available information suggests that it is more toxic to aquatic invertebrates than alternative larvicides.

Adulticiding. Adulticide involves the application of fine "mists" of pesticide over a relatively broad area to bring about the rapid knockdown of adult mosquitoes. Adulticiding occurs in response to current adult mosquito surveillance activity. Adulticiding can quickly reduce existing, biting adult mosquitoes throughout a spray area, but its effects are relatively short lived, raising the possibility of repeat applications. In addition, adulticide spray sites are most likely areas of high human population density.
Mosquito adulticides are dispersed either by truck-mounted equipment, backpack, or from aircraft. Barrier treatments, using compounds with residual characteristics, may also be used. Adulticides labeled for mosquito control include natural pyrethrins, synthetic pyrethroids, and organophosphates. Insecticide selection and timing of application should be based on the distribution and behavior of the target mosquito species.

- Pyrethrum: A derivative from chrysanthemum flowers that has a relatively low toxicity.
- Synthetic pyrethroids: Synthetic chemical pesticides (e.g. Resmethrin and Sumithrin) that act in a similar manner to pyrethrins. They are relatively low in toxicity. Most break down rapidly in sunlight. Pyrethroids used in mosquito control are typically mixed with a synergist compound, such as Piperonyl Butoxide, which enhances the effectiveness of the active ingredient to kill adult mosquitoes on contact.
- Organophosphates: Organic compounds (e.g., Malathion and Naled) that function as nerve toxins, with the purpose of killing adult mosquitoes. There is potential for acute and chronic risks to freshwater invertebrates and possibly other species.

Pesticides may pose their own risk to the health of humans, animals, plants, and the environment. Thus pesticides are only one component of a coordinated effort to control mosquitoes.

B. NH Mosquito Species of Concern for EEE,WNV, and JCV

There are 47 mosquito species present in NH, however only a few of these are considered to be likely vectors for EEE virus,WNV, and JCV. Given the short history of arboviral surveillance in NH, it is difficult to know the specific role each mosquito species plays in EEE,WNV, and JCV disease transmission. In general, species are identified as vectors based on their local abundance, demonstrated vector competence in the laboratory, and frequent infection with

the virus as documented by arboviral surveillance programs. Based on these criteria, the following species are considered to be vectors of concern for EEE virus and/or WNV and/or JCV in NH or the surrounding region:

- EEE virus: *Aedes vexans*, *Coquillettidia perturbans*, *Culex salinarius*, *Culiseta melanura*, *Culiseta morsitans*, *Ochlerotatus canadensis*, *Ochlerotatus japonicus*, *and Ochlerotatus sollicitans*.
- WNV: *Culex pipiens*, *Culex restuans*, *Culex salinarius*, *Ochlerotatus japonicus*
- JCV: *Aedes vexans, Aedes cinereus, Anopheles punctipennis, Anopheles walkeri, Coquillettidia perturnbans, Culex restuans, Culiseta morsitans, Ochlerotatus sp., Psorophora ferox*

Information pertaining to the biology and specific control concerns for these species is provided below.

Aedes vexans

Larval habitat**:** A floodwater species found in a wide variety of temporary freshwater pools and depression areas (e.g., flooded fields, retention ponds, roadside puddles). There are several generations per year.
Overwintering stage**:** Egg.
Host preference: Mammals. Adults are aggressive human biters. This species will also feed on birds.
Biting times: Dusk to dawn; may also bite during the day.
Flight range: 1-5 miles; some sources cite flight ranges > 15 miles.
Virus isolation in NH: EEE. WNV isolations have been found in other northeastern states.
NH surveillance: Collected in all counties except Coos County. EEE-positive batches collected in mid-July and mid-September in Rockingham County and early September in Hillsborough County.
Control concerns: Thought to be an important bridge vector (able to transmit virus from a bird to a mammal) of EEE and possibly WNV. At warm temperatures (i.e., 77F), larval development is rapid, 4-6 days, followed by a short pupal stage (2 days); this process is longer at cooler temperatures. Hence, the window for effective larval/pupal control is narrow.

Anopheles crucians

Larval habitat**:** Sphagnum bogs, acidic swamps, and ponds. There are several generations a year.
Overwintering stage**:** Larva.
Host preference: Mammals. Are aggressive human biters, both indoors and outdoors.
Biting times: Dusk to dawn
Flight range: <1 mile; but may be capable of longer flights
Virus isolation in NH: None.
NH surveillance: Previously not submitted for testing in NH.

Control concerns: This species is thought to be a bridge vector for EEE and possibly WNV.

Coquillettidia perturbans

Larval Habitat: Permanent bodies of water with muddy substrates and abundant emergent vegetation (e.g., cattails). This species has only one generation per year.
Overwintering stage: Larvae.
Host preference: Birds and mammals. This species readily enters houses and bites humans.
Biting times: Adults readily bite humans in the early morning, at dusk, and in the evening. Adults rest in shaded vegetation during the day and will bite if disturbed.
Flight range: 1-5 miles.
Virus isolation in NH: EEE, WNV.
NH Surveillance: Collected in all counties except Coos County. EEE-positive batches have been collected between the beginning of August and mid-September in Hillsborough County and between mid-August and mid-September in Rockingham County. A WNV-positive batch was collected in mid-September in Merrimack County.
Control concerns: This species is an important bridge vector of EEE. Larvae and pupae obtain air by attaching themselves to the roots and stems of emergent plants. When disturbed, they detach and burrow in the mud making them difficult to monitor and control. Larvicides, such as *Bti* and Temephos, might not satisfactorily control this species.

Culex pipiens

Larval habitat: Artificial containers (e.g., catch basins, flower pots, discarded tires) and stagnant, temporary pools with a high organic content. There are several generations per year.
Overwintering stage: Adults overwinter in damp, protected human-made structures.
Host preference: Birds and occasionally mammals.
Biting times: From dusk to dawn. Adults can be found during the day in dark, damp shelters.
Flight range: ¼ - ½ mile.
Virus isolation in NH: EEE, WNV.
NH surveillance: Collected in all counties except Coos County. EEE-positive batches have been collected in Rockingham County in mid-August and early September. WNV-positive batches have been collected between late August and mid-September in Hillsborough County and in mid-August in Rockingham County.
Control concerns: This species is an important primary vector for WNV, amplifying WNV in the bird population.

Culex restuans

Larval habitat: Natural and artificial containers (e.g., tree holes, catch basins), woodland and temporary pools. There are several generations per year.
Overwintering stage: Adults overwinter in well-protected natural and manmade enclosures.
Host preference: Birds and occasionally mammals, including humans.

Biting times: Dusk to dawn.
Flight range: 1-2 miles.
Virus isolation in NH: WNV. EEE isolations have been found in other northeastern states.
NH surveillance: Collected in all counties except Coos County. WNV-positive batches collected at the end of August and in mid-September in Hillsborough County.
Control concerns: This species is an important primary vector for WNV, amplifying WNV in the bird population.

Culex salinarius

Larval habitat: Brackish salt marshes and freshwater wetlands; occasionally collected from artificial containers (e.g., catch basins, discarded tires). There are several generations per year.
Overwintering stage: Adults overwinter in natural and man-made structures.
Host preference: Birds, mammals, reptiles, and amphibians. Adults readily attack humans, often entering houses.
Biting times: Dusk to dawn. Adults can be found during the day in cool, shaded sites.
Flight range: ¼ - 5 miles.
Virus isolation in NH: EEE, WNV.
NH surveillance: Collected in all counties except Belknap, Coos, Grafton, and Sullivan counties. EEE-positive batch collected mid-August in Hillsborough County.
Control concerns: This species is thought to be a bridge vector for EEE and possibly WNV.

Culiseta melanura

Larval habitat: Underground aquatic crypts or sheltered bodies of water among tree roots in acidic Red maple and Atlantic White Cedar swamps. There are several generations per year.
Overwintering stage: Larvae.
Host preference: Almost exclusively birds, rarely mammals (humans).
Biting times: Dusk to dawn.
Flight range: Sources vary from ½ - 5 miles.
Virus isolation in NH: EEE, WNV.
NH surveillance: Collected from all counties except Coos and Sullivan counties. EEE-positive batches have been collected mid-September in Carroll, Cheshire, Hillsborough, Merrimack, and Strafford counties, and between early August and late September in Rockingham County. A WNV-positive batch was collected mid-August in Rockingham County.
Control concerns: *Culiseta melanura* is an important primary vector for EEE, amplifying EEE in the bird population. There may be multiple adult emergence peaks during the season, depending on temperature and rainfall conditions. Crypts where larvae develop are not interconnected and often have only small openings making them difficult to treat.

Culiseta morsitans

Larval habitat: Permanent and semi-permanent bogs, swamps, tree root cavities, and boggy margins of lakes. One generation per year.
Overwintering stage: Egg.
Host preference: Almost exclusively birds, rarely mammals (humans).
Virus isolation in NH: EEE. WNV isolations have been found in other northeastern states.
NH surveillance: Collected from all counties except Cheshire and Coos counties. EEE-positive batches collected between mid-July and the end of September in Rockingham County, mid-August to the end of September in Hillsborough and Merrimack counties, and the end of September in Cheshire County.
Control concerns: This species can be an important primary vector for EEE, amplifying EEE in the bird population.

Ochlerotatus canadensis

Larval habitat: Temporary leaf-lined woodland pools, drainage ditches, and freshwater swamps. It has one large generation in late spring, and then a partial second generation in late summer, depending on the amount of rainfall.
Overwintering stage: Egg.
Host preference: Mammals, birds, reptiles, and amphibians. Adults readily bite humans.
Biting times: Dusk to dawn. Adults rest in shaded areas during the day and will bite if disturbed.
Flight range: Up to ¼ mile.
Virus isolation in NH: EEE, WNV.
NH surveillance: Collected from all counties except Coos County. EEE-positive batches collected mid-August in Strafford County, mid-September in Hillsborough County, and between mid-August and mid-September in Rockingham County. A WNV-positive batch collected mid-September in Merrimack County.
Control concerns: Possibly a bridge vector for EEE, especially during intense viral activity. Control of this species is difficult because the water bodies in which it breeds are isolated from each other.

Ochlerotatus cantator

Larval habitat: Temporary brackish and freshwater pools. Edges of coastal salt marshes.
Overwintering stage: Egg.
Host preference: Mammals and birds.
Biting times: Dusk to dawn. Adults rest in shaded areas during the day and will bite if disturbed.
Flight range: Up to ¼ mile.
Virus isolation in NH: EEE, WNV, JCV.
NH surveillance: Collected from Rockingham and Strafford counties.

Ochlerotatus japonicus

Larval habitat: Natural and artificial containers including tree holes, catch basins, bird baths, and discarded tires. There are several generations per year.
Overwintering stage: Egg.
Host preference: Birds and mammals.
Biting times: Dusk through dawn and during the day.
Flight range: Less than 1 mile.
Virus isolation in NH: WNV. EEE isolations have been found in other northeastern states.
NH surveillance: Collected from all counties except Carroll and Coos counties. WNV-positive batches collected in early September in Hillsborough and Cheshire counties.
Control concerns: This species may be a bridge vector of EEE and WNV. As this species is relatively new to NH and New England, better guidance will be provided pending accumulation of more information about its role in EEE and WNV transmission.

Ochlerotatus sollicitans

Larval habitat: Temporary saline pools in coastal salt marshes. There are several generations per year.
Overwintering stage: Egg.
Host preference: Almost exclusively mammals, rarely birds.
Biting times: Dusk to dawn and during the day. Adults rest on vegetation during the day but will bite if disturbed.
Flight range: 5-40 miles.
Virus isolation in NH: No EEE or WNV isolations in NH. EEE and WNV isolations have been found in other northeastern states.
NH surveillance: Collected from Hillsborough, Rockingham, and Strafford counties.
Control concerns: This species may be a bridge vector for EEE.

Ochlerotatus taeniorhynchus

Larval habitat: High-tide salt marsh pools in coastal regions. There are several generations per year.
Overwintering stage: Egg.
Host preference: Mammals and birds. Are aggressive human biters.
Biting times: Dusk through dawn and during the day.
Flight range: 5-40 miles.
Virus isolation in NH: No EEE or WNV isolations in NH. EEE and WNV isolations have been found in other states.
NH surveillance: Collected from Rockingham county.
Control concerns: This species may be a bridge vector for EEE and WNV.

Ochlerotatus trivittatus

Larval habitat: Temporary woodland pools and floodwater depressions. There are several generations per year.
Overwintering stage: Egg.
Host preference: Mammals and occasionally birds, reptiles and amphibians.
Biting times: Dusk through dawn and during the day.
Flight range: Up to 1 mile.
Virus isolation in NH: No EEE or WNV isolations in NH. EEE and WNV isolations have been found in other states.
NH surveillance: Collected from Cheshire and Hillsborough counties.
Control concerns: This species may be a bridge vector for WNV.

RESOURCES

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