State of Vermont
Arbovirus Surveillance and Response Plan

Revised June 2024

VERMONT
AGENCY OF AGRICULTURE, FOOD & MARKETS
DEPARTMENT OF HEALTH

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Introduction to the 2024 Revision

The 2024 Vermont Arbovirus Surveillance and Response Plan is based on the Centers for Disease Control and Prevention (CDC)'s *West Nile Virus in the United States: Guidelines for Surveillance, Prevention, and Control*. This plan was originally created in 2003 and has been reviewed and updated periodically.

The current Plan is a revised version of the 2022 plan, which outlines mosquito-borne arbovirus education, surveillance, and guidance for the state's response to Eastern equine encephalitis virus (EEEV), West Nile virus (WNV), and Jamestown Canyon virus (JCV) detections in Vermont. This revision includes updates based on recent local and national surveillance data, surveillance activities for JCV, and *Aedes albopictus* surveillance.

This plan is based on the most up-to-date scientific information available and incorporates guidelines from the CDC and the recommendations of the Vermont Agency of Agriculture, Food & Markets (VAAFM) and the Vermont Department of Health (VDH).

This current version has been reviewed by the State Epidemiologist for Infectious Disease, State Public Health Veterinarian, and Agency of Agriculture Environmental Surveillance Program Director.

Background Information on Eastern Equine Encephalitis Virus

Eastern equine encephalitis virus (EEEV) is a member of the genus *Alphavirus*, family *Togaviridae*. The virus is maintained in nature through avian hosts and *Culiseta melanura* mosquitoes located primarily in freshwater, hardwood swamps. *Culiseta melanura* mostly bite birds and are not considered a primary vector for human infection. Mosquito species that bite both birds and mammals are considered "bridge" vectors and allow transmission of EEEV to mammals. Mosquito species from the genera *Aedes*, *Ochlerotatus*, *Coquillettidia*, and *Culex* are all potential bridge vectors.

In humans, an infection with EEEV can vary from asymptomatic to severe illness. People who become ill with an EEEV infection either have systemic or encephalitic disease. Symptoms of a systemic illness include the abrupt onset of fever, chills, fatigue, arthralgia, and myalgia, which lasts 1–2 weeks. Those with encephalitic disease may have fever, headache, irritability, vomiting, diarrhea, convulsions, and other symptoms; approximately one third of people with encephalitis from EEEV infection die and about half of those who survive have some degree of permanent neurologic damage.

EEEV infection causes a severe neurologic disease in horses and other equids. Mortality in unvaccinated horses approaches 90%. Signs in horses include fever, depression, anorexia, ataxia, limb weakness or paralysis, blindness, irritability, and sudden death. EEEV can also cause serious illness in emus and other ratites, and clinical manifestation of hemorrhagic gastroenteritis predominates. Alpacas and llamas are also susceptible to EEEV.

The virus is well established in North America, and outbreaks in horses were recorded as early as 1831. Human cases are relatively uncommon, with an annual average of 11 cases reported nationally during 2010–2019 (range, 4–38). Most EEEV activity has occurred in the Atlantic, Gulf Coast, and Great Lakes states, and most human cases were reported in Florida, Georgia, North Carolina, New York, Massachusetts, and Michigan.

The first evidence of EEEV in Vermont was identified through a 2010 deer and moose serosurvey. Approximately 10% of the deer and moose sampled had evidence of prior exposure to EEEV. These seropositive cervids were distributed widely throughout the state, with no evidence of clustering in particular regions.

The first known outbreak of EEE in Vermont occurred in 2011 on an emu farm in Rutland County. Nineteen of 93 emus died over a 10-day period from hemorrhagic gastroenteritis. Two additional birds became ill but survived for an overall attack rate of 22.6% (21 of 93 birds). EEEV infection was laboratory-confirmed in one emu. Phylogenetic analysis revealed that the isolated virus was most closely related to a 2001 strain from Florida.

The highest level of EEEV activity in Vermont occurred during the following year, in 2012. Ten mosquito pools – groups of up to 50 mosquitoes of the same species collected from the same location on the same date – from Addison and Rutland Counties tested positive for the virus during July–September of 2012. Two horses from these same counties also tested positive for EEEV and two residents of Rutland County died of the disease. In 2013, a follow-up serosurvey was conducted in humans from three towns (Brandon, Whiting, and Sudbury) chosen based on the residence of the two human cases and EEEV activity in mosquitoes – all samples were negative for EEEV antibodies suggesting seroprevalence in humans is low.

Increased EEEV activity also occurred in 2013; 21 mosquito pools from Addison and Rutland Counties tested positive. One positive pool was detected in Chittenden County and two horses tested positive for EEEV in Franklin County, the first time EEEV was detected outside Rutland and Addison Counties. Eight mosquito pools tested positive for EEEV in 2014, followed by one positive pool in 2015. In 2019 there was increased EEEV activity in the northeastern U.S. resulting in more human cases than expected annually, particularly in Massachusetts (n=12), Connecticut (n=4), New Jersey (n=4), and Rhode Island (n=3). And in 2023, EEEV was detected in 14 mosquito pools and one horse from northwestern Vermont. There was also increased EEEV activity in surrounding northeastern states.

EEEV activity in Vermont clusters near acidic, hardwood swamps, most commonly in Addison and northern Rutland Counties. Franklin and Grand Isle Counties are currently considered the highest risk areas of the state given the 14 positive mosquito pools from these counties and the diagnosis of EEEV infection in a horse from Franklin County in 2023.

Eastern Equine Encephalitis Virus Identifications — Vermont, 2011–2023			
Year	**Veterinary**	**Mosquito Pools**	**Humans**

2011	1	0	0
2012	2	10	2
2013	2	23	0
2014	0	8	0
2015	0	1	0
2016	0	0	0
2017	0	0	0
2018	0	0	0
2019	0	0	0
2020	0	0	0
2021	0	0	0
2022	0	0	0
2023	1	14	0
Total	**6**	**56**	**2**

Background Information on West Nile Virus

West Nile virus (WNV) is a Flavivirus from the family *Flaviviridae* that can infect a wide range of vertebrates. Birds are the natural reservoir for WNV. WNV is maintained in nature in a mosquito–bird transmission cycle primarily involving *Culex* mosquitoes, particularly *Culex pipiens* and *Culex restuans.* Many species of birds survive their infections and develop permanent immunity; the virus can even become amplified in some bird species, contributing to the transmission cycle between birds and mosquitos. However, several species become ill and die, particularly corvids such as crows, blue jays, and ravens.

Approximately 80% of humans infected with WNV do not develop symptoms, and 20% experience a febrile illness. Less than 1% develop severe neurologic illness, such as encephalitis or meningitis, which can be fatal in a small percentage of cases. People over 50 years of age and individuals with weakened immune systems are at greatest risk for severe illness.

Like humans, horses infected with WNV can have subclinical infections or mild to severe illness. Approximately one third of horses that develop severe illness die or are euthanized. However, widespread use of a WNV vaccine for horses has greatly reduced the number of

equine cases.

WNV was first detected in the United States in 1999 after being imported from overseas. Since then, it has become the most commonly reported arboviral disease in the United States. The virus was first detected in Vermont in 2000 and has spread to all 14 counties. WNV is considered enzootic and widespread in Vermont, and the risk is considered uniform throughout the state. Active mosquito-based WNV surveillance is conducted June through October every year throughout Vermont, and passive veterinary and human surveillance is conducted year-round. Surveillance for WNV through the testing of dead birds ended in 2011.

West Nile Virus Identifications — Vermont, 2000–2023				
Year	**Veterinary**	**Birds**	**Mosquito Pools**	**Humans**
2000	0	1	0	0
2001	0	0	0	0
2002	5	125	11	1
2003	4	116	0	3
2004	0	9	7	0
2005	2	4	2	0
2006	0	9	0	0
2007	0	3	0	0
2008	0	1	1	0
2009	0	4	12	0
2010	0	1	9	0
2011	0	16	3	1
2012	2	N/A	1	3
2013	1	N/A	28	2
2014	0	N/A	8	0
2015	0	N/A	96	0
2016	0	N/A	19	2

2017	0	N/A	89	3
2018	2	N/A	157	1
2019	0	N/A	5	0
2020	0	N/A	0	0
2021	0	N/A	0	1
2022	7	N/A	0	0
2023	1	N/A	11	0
Total	**24**	**289**	**439**	**17**

Background Information on Jamestown Canyon Virus (JCV)

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 not fully understood, but it is thought that early season mosquitoes, such as *Ochlerotatus* species, play a significant role in the early amplification of the virus within deer populations. These species overwinter 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 are able to transmit the virus when they take their first bloodmeal. Late season amplification as well as transmission to humans is also thought to be connected to certain *Anopheles* mosquitoes, which readily bite mammals, including humans.

Many people infected with JCV do not develop any illness, but the proportion of asymptomatic infections among all infections is unknown. In people who develop illness, JCV will cause a mild, febrile illness. Some patients also report respiratory symptoms, such as cough, rhinitis, or pharyngitis. The incubation period for JCV disease is unknown. Neuroinvasive disease (meningitis or encephalitis) has been reported.

It is not known how JCV activity varies year to year in Vermont's mosquito or deer populations. CDC identified JCV antibodies among 29 of 51 (57%) banked deer serum specimens that were collected from Bennington County in 2014, indicating that JCV has been circulating in Vermont since then. No human infections with JCV have been reported in Vermont to date.

In recent years the number of annual JCV cases reported to the CDC by other states has been increasing, although this is thought to be due to increased awareness and testing efforts. For more information about the distribution and incidence of JCV within the United States, visit CDC's JCV Data & Maps website.

Agency Roles

Vermont Department of Public Health (VDH)

VDH is the lead agency for conducting arbovirus surveillance in Vermont, to provide information that will guide prevention education, planning, and activities to reduce the risk for human disease from arbovirus infections. To achieve this, VDH monitors trends in EEEV, WNV, and JCV in Vermont; publishes timely information on EEEV, WNV, and JCV activity at healthvermont.gov, coordinates laboratory diagnosis of arboviral disease cases in humans, horses, and other animals; communicates with officials and the public; provide guidelines, advice, and support on activities that effectively reduce risk for disease; and provides information on the safety, anticipated benefits, and potential adverse effects of proposed prevention interventions. VDH also responds to concerns about the potential for introduction of travel-associated diseases, like dengue, chikungunya, and Zika virus, by monitoring for evidence of introduced and emerging arboviruses and new mosquito vector species in collaboration with vector surveillance colleagues.

Vermont Agency of Agriculture, Food and Markets (VAAFM)

The VAAFM Vector Surveillance Program conducts mosquito surveillance activities statewide in Vermont, working cooperatively with VDH, Mosquito Control Districts, and other agencies. This program's primary goal is to locate and monitor vector (disease-carrying) mosquitoes in the interest of protecting public health, not to control mosquito populations.

The Animal Health Section of VAAFM protects the health and welfare of Vermonters and their livestock and poultry and contributes to the implementation of this plan by supporting partner agencies' response activities and providing animal health expertise when requested. Specifically, the Animal Health Section collaborates with VDH on livestock arbovirus surveillance activities, consults with the Vector Surveillance Program on vector-borne disease impacts of livestock and poultry, and assists with disseminating animal health information to practicing veterinarians throughout Vermont.

Mosquito Control Districts (MCDs)

Two MCDs have formed in Vermont for the purpose of reducing populations of nuisance mosquitoes. The Otter Creek Watershed Insect Control District (OCW) comprises the towns of Brandon, Leicester, Salisbury, Goshen, Proctor, and Pittsford and was formed in 1990. The Lemon Fair Insect Control District (LFICD) was formed in 2006 and consists of the towns of Bridport, Cornwall, and Weybridge.

Town Health Officers (THOs)

THOs are the local health authorities and the primary points of contact within a community for VDH. Surveillance information is communicated to the THO, who may conduct educational outreach, disseminate surveillance and risk assessment information to other community leaders, and undertake other activities based on their community's needs.

Plan of Action

Surveillance findings help inform public health officials about the level of arbovirus activity in the environment and the potential threat to human and animal health. This plan gives flexibility to state and local government to respond to local conditions. The purpose of the State of Vermont Arbovirus Surveillance and Response Plan is to protect public health from an outbreak of WNV, EEEV, or JCV. The plan emphasizes public education about the transmission of these viruses, reduction of mosquito breeding habitats (e.g., water-collecting containers, tarps, tires, etc.), and personal protective measures to prevent or reduce the risk for exposure.

Widespread adult mosquito suppression programs will only be considered as a last resort if surveillance data suggest a significant risk to human health. Decisions for public health action will be informed by available surveillance data and several additional factors, including:

- Current weather conditions;
- Time of year (i.e., how long the transmission risk can be expected to persist until mosquito activity decreases);
- Feasibility of mosquito suppression activities;
- Public input on planned response activities;
- Ecology of the affected areas (e.g., key habitat types);
- The human population at risk (urban versus rural; consideration of the relative risk of pesticide use versus arbovirus infection); and
- Vector species known or believed to be of importance in the treatment area.

The anticipated benefits of using pesticides versus the risk for harm to people and the environment from their use, as well as the factors listed previously, will be considered. If the use of pesticides to control arboviruses is anticipated, steps will be taken to inform the local community and address public concerns.

Components of the Plan

A. Communication

Educating healthcare providers, veterinarians, and the public about arboviral illnesses is a key focus of this plan. Each spring and early summer educational materials will be updated and distributed as appropriate, including news releases, VT-Health Alert Network (HAN) notifications, information on VDH's website, emails, and other methods. Additional educational outreach may be conducted in response to positive surveillance indicators.

Activity	VDH	VAAFM
Maintain educational messages with emphasis on personal protective measures for groups at highest risk for serious illness (e.g., individuals over 50 years of age) and on the importance of reducing artificial mosquito breeding sites	✓	✓
Update VDH's arbovirus web pages as indicated	✓	
Communicate information to the public as needed, including: • minimizing exposure to arbovirus vectors • the importance of public cooperation in reducing mosquito breeding sites • integrated pest management for controlling mosquito populations • preventing mosquito bites • the agencies responsible for mosquito suppression activities • how to protect susceptible animals from illness	✓	✓
Respond to public and media inquiries	✓	✓
Educate healthcare providers about testing and reporting of arboviral diseases in humans	✓	
Educate veterinarians about testing and reporting of arboviral diseases in animals	✓	✓

B. Passive Human Surveillance

Active surveillance for human cases will be considered if surveillance data indicate an increased risk for human illness.

Activity	VDH	VAAFM
Disseminate information about arbovirus surveillance to healthcare providers around the state	✓	
Collect and maintain surveillance data on reported human cases	✓	
Provide information on the number of human cases to the public and local officials	✓	
Report human cases to CDC via ArboNET and Nationally Notifiable	✓	

Diseases Surveillance System (NNDSS)		
Coordinate diagnostic testing in human specimens as appropriate; this includes coordinating submission of serologic samples from commercial or clinical labs for confirmatory testing at a public health laboratory*	✓	

C. Passive Veterinary Surveillance

Activity	VDH	VAAFM
Disseminate information on veterinary surveillance activities to veterinarians throughout the state	✓	✓
Facilitate testing of suspect veterinary cases	✓	✓
Collect surveillance data on arbovirus-infected domestic animals in Vermont	✓	✓
Share veterinary surveillance data with the public and local officials	✓	✓
Report veterinary surveillance data to the CDC via ArboNET	✓	
Encourage veterinarians to speak to their clients about the importance of animal arboviral vaccination programs		✓

D. Adult Mosquito Surveillance

Performing systematic mosquito surveillance provides information about the species present and seasonal population trends. Each year, adult mosquito surveillance begins in mid-June before the expected start of arbovirus season in July; JCV may emerge earlier than WNV and EEEV. Surveillance ends in mid-October unless extended surveillance is indicated due to warm air temperatures or evidence of EEEV.

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*Hospitalized patients who have encephalitis or meningitis of suspected viral origin or Guillain-Barré syndrome should be evaluated for arboviral infection. Patients meeting these criteria may be tested through the Vermont Department of Health Laboratory (VDHL).

VDHL will not provide testing for persons who have milder illness, such as fever or headache. Testing may be pursued by healthcare providers through commercial laboratories.

Specimens submitted to VDHL should be accompanied by a completed Clinical Test Request Form (Micro 220). Date of onset must be included.

All positive IgM test results should be confirmed by neutralizing antibody testing of acute- and convalescent-phase serum specimens at CDC or other public health laboratory.

Areas targeted for mosquito surveillance are selected based on perceived risk (e.g., more densely populated areas, known flooding tendencies), suitable habitat, geographic location, historic detections of vector populations, and accessibility.

A combination of carbon dioxide-baited CDC light traps, gravid traps, and resting boxes are used to collect mosquitoes.

Carbon dioxide-baited CDC light traps primarily collect host-seeking, non-blooded female mosquitoes and are used and serviced as resources permit. Traps are set in the late afternoon or early evening, retrieved the following morning, and operated consistently at productive sites statewide.

Gravid traps are designed to collect mosquitoes seeking oviposition (egg-laying) sites. Following blood feeding, female mosquitoes seek sheltered areas to rest and digest the bloodmeal into eggs. Once eggs have formed, the gravid female seeks a site to lay her eggs. Gravid traps target these sites and are set in the late afternoon or early evening and retrieved the following morning. Gravid traps target the main vectors for WNV.

Resting box traps are set in areas conducive to surveying for the primary vector species for EEEV, *Culiseta melanura.* Ground surveys may also be used to detect other resting populations. Live specimens are collected from resting boxes and are used to test for EEEV and WNV and to determine population densities.

Activity	VDH	VAAFM
Determine favorable sites for mosquito collection depending on target species and pathogen of concern		✔
Identify female mosquitoes to species and separate into pools – groups of 1 to 50 mosquitoes of the same species collected from the same location on the same night		✔
Sort and submit mosquito pools of appropriate species for WNV, EEEV, and JCV testing at VDHL: • To detect EEEV, prioritize *Culiseta melanura* and other *Culiseta* spp. Other suspected bridge vectors may also be tested, including *Aedes* spp., *Ochlerotatus* spp., and *Coquillettidia perturbans*. • To detect WNV, prioritize trapping and testing of *Culex* spp. (e.g., *C. pipiens, C. restuans, C. salinarius*) and suspected secondary vectors of the genus *Aedes* and *Ochlerotatus* (e.g., *A. japonicus*, *O. triseriatus*, *A. trivittatus*, *A. canadensis*, and *A. vexans*) • To detect JCV, conduct early season trapping for known or		✔

suspected JCV vector species, including *Aedes* and *Ochlerotatus* spp.		
Test pools submitted by VAAFM Vector Surveillance Program for WNV, EEEV, and JCV via polymerase chain reaction (PCR)	✔	
Store mosquito pools that were not submitted for testing in case viral testing is later indicated		✔
Maintain records of mosquito trap sites, number, and species of mosquitoes collected by location and date, and arbovirus test results		✔
Coordinate insecticide resistance testing of adult mosquitoes and report results to CDC		✔
Summarize mosquito surveillance data and report to the public and local officials		✔
Summarize and report mosquito-based arboviral surveillance data to the public and local officials. See response section for more details.	✔	
Report mosquito surveillance results to the CDC via ArboNET		✔
Perform surveillance for *Aedes albopictus* and other invasive species of public health interest and report results to VDH and CDC		✔
Conduct enhanced mosquito surveillance in areas where EEEV has been detected		✔

E. *Aedes albopictus* Surveillance

A 2016 CDC survey of the United States for the Asian Tiger Mosquito (*Aedes albopictus*) suggested that this species may have extended into mid-latitude regions of Vermont. Annual surveillance for *Ae. albopictus* was thus undertaken in southern and western Vermont counties since that time.

Ae. albopictus mosquitoes are targeted each year using oviposition traps at 16 sites checked weekly during early July through mid-September. Egg papers are dried and shipped to the Massachusetts Department of Health, where they are reared and identified morphologically at the larval stage. In 2019, *Ae. albopictus* eggs were collected from sites in Windham and Rutland Counties and have been collected in subsequent years. A population has been determined to be established in Windham County, as the species has been detected for several consecutive weeks each season for five years.

F. Larval Mosquito Surveillance

Surveillance activities for immature mosquitoes (larvae and pupae) involve the mapping and characterization of aquatic habitats where mosquitoes breed. Mosquito breeding can occur anywhere there is standing water. Examples include tires, pails, garbage cans, planters, rain gutters, bird baths, storm drains, unchlorinated swimming pools, swimming pool covers, tarps, and puddles. Mosquito breeding can also occur in natural water-filled areas, such as wetlands, temporarily flooded areas, or vernal and ephemeral pools.

Larval mosquito surveillance is generally conducted in towns participating in the Mosquito Control District program, where larval data inform mosquito control and outreach activities.

Activity	VDH	VAAFM
Map and characterize aquatic mosquito breeding habitats		✔
Sample mosquito larvae using standard dipping techniques		✔
Identify larvae to species using larval mosquito identification keys		✔
Maintain records of the number and species of larvae sampled by location and date. Samples will be recorded as the number of larvae per dip.		✔

G. Response

The key to reducing the risk for EEEV, WNV, and JCV infection is educating the public about measures they can take to protect themselves against mosquito bites.

Risk Assessment

Human cases of EEEV and WNV occur primarily in August and September although the specific timing of the peak disease transmission season is affected by mosquito populations, level of virus activity, and weather conditions. Human cases of JCV are most common during June through September. Assessing the risk for human disease is an imprecise science that requires an understanding of the complex ecologic system that supports the virus, knowledge of historical patterns of virus activity, and experience.

A risk assessment and response matrix has been developed to help guide the response to EEEV surveillance indicators (Attachment 1). The risk assessment should be considered a general guide and does not provide certainty of the degree of risk. Predicting the likelihood for human illness has been difficult even in states that have a longer history of surveillance data.

Mosquito surveillance provides the most useful information for risk assessment. Therefore, the EEEV Risk Assessment Response Matrix is best applied in areas where active adult mosquito surveillance is occurring. Risk is assigned to an area based on the prior 2 years of surveillance data, with modifications made as results from the current year become available.

It is difficult to determine an area's risk level based on a single positive surveillance finding. There is some evidence that most human illness occurs in people who live within 5 miles of a hardwood acidic swamp. Therefore, areas within 5 miles of where positive mosquito pools were collected is designated as "potentially at risk."

Because it cannot be determined with certainty that people outside of a 5-mile radius are not at risk, an additional 5-mile area "of concern" is added to the area "potentially at risk." If veterinary or human cases are detected, additional risk areas may be designated depending on the likely location of exposure. Geographic features such as the Green Mountains, which could affect the potential flight range of infected mosquitoes, are also considered. Identified risk areas are updated regularly, documented, and posted on the VDH website.

Areas of the state that have no arbovirus detections are considered at "remote" risk. Nonetheless, residents of those areas should take precautions to prevent mosquito bites and reduce mosquito breeding sites in their communities. The risk for WNV infection is considered ubiquitous throughout the state, based on previous surveillance detections. The extent of the risk for EEEV and JCV infection is not as well understood.

In most cases, response to EEEV, WNV, and JCV surveillance indicators consists of communicating information on preventing mosquito bites, reducing peridomestic exposure, seeking appropriate medical care, and protecting susceptible animals. Increased surveillance may also be recommended in response to EEEV detections. Vector management to suppress mosquito populations may be considered if the risk for human EEEV infection appears to be high.

In general, response to a detection of arbovirus activity includes the following:

Notification and communication in response to detection of WNV or EEEV

Activity	VDH	VAAFM
First positive indicator		
Issue a statewide press release in response to the first positive indicator (e.g., positive mosquito pool, human or veterinary case) of the season	✔	
Positive mosquito		

At a minimum, notify the VDH District Office and the Town Health Officer. Provide standard educational outreach templates for publication in social media or local newsletters.	✔	
Consider additional press releases if there is an increased risk to human and animal health. This depends on the pathogen, species of mosquito found to be positive (i.e., bird-biter vs. mammal-biter), mosquito infection rate, and total positive surveillance indicators.	✔	
Domestic animal arboviral infection		
Notify State Veterinarian, who notifies the attending veterinarian and the veterinary community, if indicated	✔	✔
Notify Town Health Officer, VDH District Office, and the Communications Offices of both VDH and VAAFM	✔	✔
Consider active surveillance for additional veterinary cases	✔	✔
Consider enhanced mosquito surveillance in the area of likely exposure (EEEV only)	✔	✔
Human arboviral infection		
Notify the Commissioner of Health, the Communications offices of VDH and VAAFM, and the local District Office	✔	
Consider a press release or a Health Alert Network (HAN) Health Advisory reminding physicians to consider arboviral infection in their patients who have compatible illness	✔	
Consider enhanced mosquito surveillance (for EEEV only) and enhanced passive or active human surveillance	✔	✔

Vector Management

Larval source reduction in defined areas (usually peridomestic) is the most effective way to prevent transmission of WNV and JCV. The efficacy of larviciding to prevent EEEV is less clear. Adulticiding may be indicated if large numbers of EEEV-infected adult mosquitoes are present; this will be considered on a case-by-case basis. If adulticiding is indicated, the State will consult the Multi-agency Aerial Adulticide Application Plan (Attachment 2) and do the following:

Activity	VDH	VAAFM
Consult with local officials regarding a mosquito suppression project	✓	✓
Assist local officials in conducting informational meetings on proposed mosquito suppression programs. Make public notice at least 24 hours prior to any state-ordered ground-level or aerial spraying of adulticides.	✓	✓
Secure all permits necessary to conduct the appropriate mosquito suppression program		✓
Notify the State Apiculturist of planned adulticiding activities. State Apiculturist will notify beekeepers in the area, directly or indirectly, to the extent possible based on available contact information.		✓
Notify the Vermont chapter of the Northeast Organic Farming Association of Vermont (NOFA)		✓
Notify local healthcare providers, poison control center, and USDA Vermont Rabies Hotline	✓	
Notify the Commissioner of the Vermont Department of Fish & Wildlife		✓
Notify veterinarians and livestock owners and producers using communication channels such as the Vermont Veterinary Medical Association Newsletter, VAAFM Animal Health Newsletter, and other pertinent e-mail distribution lists	✓	✓
Secure pesticide(s), aerial applicator, and/or ground-based ULV machinery and enlist certified pesticide applicators to conduct mosquito suppression programs		✓
Assemble a ground monitoring crew to handle environmental issues (e.g., weather, water, wildlife, livestock, non-target and ecosystem effects, organic farms and other crop lands)		✓
Apply mosquito larvicide or adulticide		✓
Implement surveillance for possible human health effects of exposure to pesticides by collecting reports from poison control and local emergency departments. This information will be used to identify: • Serious, unusual, or repeated acute health effects that show	✓	

a pattern of association with local or aerial spraying that might warrant further evaluation, including collection of detailed case histories for a subset of reports or review of emergency department records • Unexpected routes of pesticide exposure that might warrant investigation • Frequent problems in responding to concerns and inquiries about pesticide health effects, including knowledge gaps		

Attachment 1. EEE Estimated Risk Assessment and Response Matrix

Risk Category	Definition of Risk Category	Recommended Response	State Response	Local Response
Remote	**Prior 10 Years:** • No human or veterinary cases reported, and • No EEE virus detected in mosquitoes ***AND*** **Current Year:** • No human or veterinary cases reported, and • No EEE virus detected in mosquitoes	**Public messaging:** • Use EPA-registered mosquito repellents • Wear long sleeves and long pants • Repair screens • Remove standing water **State agencies/town officials:** • Disseminate information about personal protection and source reduction • Conduct routine human, mosquito, and veterinary surveillance statewide	• Distribute general prevention messages to the public statewide: VAAFM† Animal Health creates animal health messages and VDH‡ creates human health messages • VDH distributes public health messages, including emails to town officials, VDH District offices, and other state agencies	• Town officials help distribute prevention messages, including posting informational flyers in public places and information on the town website and public forum websites (e.g., Front Porch Forum)

† Vermont Agency of Agriculture, Food & Markets
‡ Vermont Department of Health

Risk Category	Definition of Risk Category	Recommended Response	State Response	Local Response
Low	**Prior 10 Years:** • Human or veterinary cases of EEE or EEE virus detected in mosquitoes ***OR*** **Current Year:** • EEE virus detected in bird-biting mosquitoes at a single trapping site, and • No human or veterinary cases	**State agencies/town officials:** • Focus public education efforts on risk potential, personal protection, and source reduction to at-risk communities[§] • If indicated by entomologic data, use larvicides to target vector species; consider source reduction techniques • Consider supplemental trapping and testing of mosquitoes near EEE virus detection(s)	**Previous category response *AND*:** • Distribute prevention messages to the public in at-risk communities: VAAFM Animal Health creates animal health messages and VDH creates human health messages • VAAFM continues adult mosquito surveillance; considers expansion of mosquito surveillance, as needed	**Previous category response *AND*:** • Town officials in targeted communities disseminate educational messages • Town/local mosquito control district continues larval surveillance and control; increase source reduction if needed; continue any existing adulticiding program

[§] For the purposes of this risk assessment, at-risk communities include the area within 5 miles of a location where EEE virus activity was detected. Because the risk may not be limited to a 5-mile radius, the area between 5 and 10 miles from the location of the EEE activity will be designated as an "area of concern." Areas designated to be at-risk or of concern may be modified if geography would likely mitigate the risk (e.g., Green Mountains).

Risk Category	Definition of Risk Category	Recommended Response	State Response	Local Response
Moderate	**Prior 2 Years:** • Confirmation of human or veterinary case(s) ***OR*** **Current Year:** • Sustained (2 or more weeks) EEE virus identifications in bird-biting mosquitoes at one trap site, **or** • EEE virus identifications in bird-biting mosquitoes collected from multiple trap sites within a community, **or** • EEE virus detected in bridge vector at any single trap site	**State agencies/town officials:** • If indicated by entomologic data, increase larval control, source reduction, and public education, emphasizing personal protection measures • If current year activity, consider larviciding, targeting likely vector species • Consider personal protection measure outreach targeting high-risk populations (e.g., long-term care facilities [LTCFs], schools, camps)	**Previous category response *AND*:** • VDH creates and disseminates prevention messages for high-risk populations, targeting institutions that service high-risk populations	**Previous category response *AND*:** • Town/local mosquito control district considers intensifying larviciding for secondary vector species and ground application of adulticide • Town officials continue to disseminate educational messages in targeted communities

Risk Category	Definition of Risk Category	Recommended Response	State Response	Local Response
High	**Current Year:** • Confirmed human or veterinary case(s), **or** • Sustained (2 or more weeks) EEE virus identifications in bridge vector at a single trap site, **or** • EEE virus detections in bridge vector collected from multiple trap sites within a community	**Public:** • Avoid areas where mosquitoes are very active • Adjust outdoor activity to avoid peak mosquito hours (dusk until dawn) **State agencies/town officials:** • Intensify public education efforts about personal protection using multimedia messaging • Actively educate high-risk populations (e.g., LTCFs, schools, camps) on personal protection measures • Initiate trapping and testing of vector species in likely exposure area(s) of human and veterinary cases, if not already being done • If EEE virus detection(s) in current year, consider adulticiding** based on current regional epidemiology and	**Previous category response *AND*:** • VDH creates and disseminates prevention messages, including the recommendation to curtail outdoor activities from dusk to dawn • VAAFM considers adding mosquito traps around positive surveillance indicators if not already started • VDH considers declaration of a public health risk • VDH, VAAFM, and town officials decide whether application of adulticide is necessary and determine the extent and best method of treatment (e.g., aerial vs. ground) • If application of adulticide is necessary, VAAFM	**Previous category response *AND*:** • Town officials work with institutions in community to decide whether evening activities should be curtailed • Town officials continue to disseminate educational messages in targeted communities • Town/local mosquito control district considers intensifying ground-based adulticide application around positive indicators and nearby population centers • If application of adulticide is necessary, town officials work with the State to alert their residents about the date(s) and time(s) of application

** The decision to initiate adult mosquito control will depend on the time of year, mosquito population abundance, and proximity of virus activity to at-risk populations. The ability to respond by ground spraying depends on the network of available roads. In many Vermont communities, the density of roads may be insufficient for ground-based application of adulticide to be effective at reducing human risk for illness. To maximize effectiveness, adulticide treatment should be applied twice within 7 days.

		surveillance efforts • If the risk for human illness appears to be ongoing or increasing, intensified ground-based or targeted aerial adulticiding may be recommended	determines which pesticide to use and hires contractor to apply the adulticide; VDH and VAAFM alert the public of date(s) and time(s) of application and recommended precautions	

Attachment 2. Multi-agency Aerial Adulticide Application Plan

1. Determination of Response

When human risk is elevated to a high level of concern as indicated by the Vermont Arbovirus Surveillance and Response Plan, VDH†† determines, in consultation with VAAFM‡‡, whether aerial application is warranted.

2. Characterization of Area of Risk

Once consensus is obtained, VDH and VAAFM characterize the area(s) of risk and delineate the perimeter of the spray area based on mosquito and virus surveillance.

3. Commissioner Certification

The Commissioner of Health issues a "Determination of Significant Public Health Risk Requiring Aerial Application of Pesticide to Protect Public Health."

(Action items 4-6 occur simultaneously.)

4. Determination of Appropriate Pesticide

VAAFM determines the pesticide to be used and confirms selected pesticide for use.

5. Determination of No-Spray Zones

Aerial no-spray zones (mosquito treatment sensitive areas data layers):

- Certified organic farms
- Surface water supply resource areas
- Commercial fish hatcheries/aquaculture
- Commercial apiaries

VAAFM/VDH submits a Notice of Intent to the Vermont Department of Environmental Conservation to obtain National Pollutant Discharge Elimination System Pesticide General Permit (NPDES PGP) coverage within 10 days of the aerial adulticide application, if there is no current valid permit.

6. Exclusion/Inclusion of Priority Habitats

VDH determines, in consultation with VAAFM, if spraying in mosquito treatment-sensitive areas is necessary to protect public health.

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†† Vermont Department of Health
‡‡ Vermont Agency of Agriculture, Food & Markets

If necessary, VDH requests ANR§§ to issue a permit to VAAFM for taking endangered, threatened, or special concern species.

7. Preparation of Final GIS Data

VAAFM coordinates mapping of mosquito treatment-sensitive areas within designated VDH spray areas, using data layers (no-spray zones/buffered areas) chosen by VAAFM and the Northeast Organic Farming Association.

8. Emergency Room and Poison Control Contacts

VDH contacts and provides pesticide illness surveillance guidance to emergency departments, poison control centers, and VDH District Offices.

9. Notification of Date and Time of Application

VAAFM and VDH publicize the locations, dates, and times of aerial spraying. VAAFM posts a map of the aerial spray area to a website and updates this site during spray operations. VDH provides telephone number(s) for public inquiries.

10. Operational Procedures: Aerial Application

VAAFM ensures that contractors are licensed, insured, and experienced and that the aerial application operational procedures comply with Vermont Aviation and Federal Aviation Administration guidelines and standards.

§§ Vermont Agency of Natural Resources