

Vector-Borne Disease Prevention Plan 2011

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Health Services

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Executive Summary

The 2011 Vector-Borne Disease Prevention Plan focuses on West Nile Virus (WNV) but also addresses two other vector-borne diseases of concern in Ontario: Lyme disease and Eastern equine encephalitis (EEE).

A vector-borne disease is a disease that is transmitted to humans or animals by an insect or other arthropod. In Ontario, WNV and Lyme disease are the two main endemic vector-borne diseases of public health importance as both of these diseases can be acquired within the province. Another vector-borne disease of concern in Ontario is EEE, which is a rare but serious viral disease spread by mosquitoes that can affect people and horses.

Peel Public Health's 2011 Vector-Borne Disease Prevention Plan identifies the activities Peel Public Health intends to carry out in order to comply with Ontario Regulation 199/03 "Control of the West Nile Virus." Under Regulation 199/03, the local Medical Officer of Health (MOH) is required to conduct a risk assessment of the conditions pertaining to West Nile Virus (WNV) in the health unit. The risk assessment identifies the probability of human infection based on WNV surveillance activities as well as other pertinent information elements. Completion of the risk assessment in accordance with the regulation offers guidance to the MOH regarding appropriate WNV reduction activities, and if needed, provides a review of appropriate mosquito reduction activities (i.e. larviciding or adulticiding) and their effectiveness.

Information from past seasons has been used to prepare the WNV prevention component of this plan for 2011. To ensure a coordinated approach in preventing mosquito-borne disease outbreaks in the Region of Peel, Peel Public Health works closely with local area municipalities and conservation authorities, the Ontario Ministry of Health and Long-Term Care (MOHLTC), the Ontario Ministry of the Environment (MOE), Health Canada (HC) and neighbouring public health units.

Peel Public Health's approach to WNV control will emphasize disease prevention in humans and protection of the environment. One of the goals of the Vector-Borne Disease Prevention Plan for 2011 is to minimize the impact of WNV on human health through region-wide surveillance and Integrated Mosquito Management (IMM). This means an emphasis on public education, source reduction and larviciding. If the level of WNV in Peel increases, then education, surveillance, and reduction activities will be intensified. Adult mosquito reduction will only be considered should surveillance findings indicate a significant risk to human health despite the implementation of other measures.

In 2011, Peel Public Health will continue surveillance and education activities (education for the public and medical providers). Peel Public Health will also continue the region-wide effort to reduce mosquito breeding through source reduction and larviciding in the urban, suburban and settlement areas of Peel. Source reduction and larviciding will focus on *Culex pipiens* and *Culex restuans* mosquitoes, the main vectors of WNV in Peel. These two mosquito species breed in water that has been stagnant for more than a week in sites such as catch basins, road side ditches, culverts and artificial containers (abandoned

swimming pools, tires, buckets, etc.). These mosquito habitats will be priority targets for elimination through improved maintenance and for larviciding where stagnant water cannot be removed. Other mosquito habitats such as marshes and natural ponds will only be treated if they are found to be important to local WNV transmission. Surveillance of mosquitoes in both the larval and adult stages provides an early warning of the risk to human health. This information will be used to enhance mosquito reduction and education efforts in high risk areas to interrupt the amplification of WNV before it has a significant impact on human health.

The West Nile Virus component of the Vector-Borne Disease Prevention Plan is consistent with the recommendation from the Centers for Disease Control and Prevention in the United States which states:

To decrease the risk for human WNV infection, the coordinated and phased public health response to detection of WNV activity in an area should include intensified mosquito-control activities that reduce the avian-mosquito amplification cycle. Prevention activities should continue to include: 1) public education programs urging residential source reduction and personal protective measures to reduce mosquito exposure; 2) development of long-term, community-level, integrated mosquito surveillance and control programs; and 3) high-priority emphasis on the control of Culex mosquitoes, especially in urban and suburban areas. (MMWR December 20, 2002. / vol. 51/ No.50).

Lyme disease, like WNV, is included in Ontario Regulations 558/91 and 559/91 making it both a reportable and communicable disease under the *Ontario Health Protection and Promotion Act*.

Lyme disease is an illness caused by the bacterium, *Borrelia burgdorferi*, which can be spread through the bite of a tick. This bacterium is transmitted to ticks when they feed on infected animals. In Ontario, the disease is spread by the black-legged tick (*Ixodes scapularis*) which is sometimes called the deer tick. The risk for exposure to the disease is highest in a small number of areas where this tick species has established populations including parts of southern and eastern Ontario. Studies indicate a small number of black-legged ticks are introduced into widely separated areas of Ontario by migratory birds, posing some risk that individuals in other parts of the province may also be exposed to infected ticks.

To date, an established black-legged tick population has not been identified in the Region of Peel.

There are concerns that changes to the climate, such as warmer seasons, could lead to conditions that are favourable for the establishment of black-legged tick populations in many parts of the province. Therefore, Peel Public Health will continue to examine ticks submitted by Peel residents to identify sites where black-legged ticks are present and conduct active tick surveillance when warranted in 2011.

Eastern equine encephalitis (EEE) is a mosquito-borne viral disease which occurs primarily in the eastern half of the United States where it causes disease in humans and horses. In Ontario, the EEE virus has been implicated with horse illnesses and fatalities. However, there have been no recognized cases of human disease caused by EEE, but human disease has occurred in several states bordering Ontario. EEE has a high mortality rate, and is therefore regarded as one of the most serious mosquito-borne diseases in North America.

The main EEE transmission cycle is between birds and mosquitoes. The most important mosquito species in maintaining the bird-mosquito transmission cycle is *Culiseta melanura*. Adult mosquito surveillance conducted over the last several years has found this species is present in Peel but in very low numbers. Peel Public Health continued to monitor the prevalence and distribution of *Culiseta melanura* using the region-wide WNV adult mosquito trapping network. Two *Culiseta melanura* were collected in Peel traps in 2010; both tested negative for the EEE virus.

In 2010, the Vector-Borne Disease team enhanced the *Culiseta melanura* monitoring program by conducting a resting site collection pilot project in the Heart Lake Conservation Area in north Brampton. No *Culiseta melanura* were collected in the study.

In 2011, Peel Public Health will expand the EEE viral testing program. Rather than exclusively focusing on testing *Culiseta melanura*, other vector species will be considered for testing. The testing of additional vectors is recommended in the Eastern Equine Encephalitis Surveillance and Management Guidelines that have been recently developed by the MOHLTC. It should be noted that an increase in EEE tests will result in fewer WNV viral tests.

If the virus is found in the mosquito population or if a confirmed case of EEE involving a human or horse occurs, then increased surveillance and public education will commence.

Introduction

Peel Public Health has developed a 2011 Vector-Borne Disease Prevention Plan which focuses on West Nile Virus but also addresses other vector-borne diseases of concern.

In 2008, the Ministry of Health and Long-Term Care (MOHLTC) made the transition from West Nile Virus funding to include all vector-borne diseases. Under this funding structure health units can allocate funds to other vector-borne diseases of public health importance. A vector-borne disease is a disease that is transmitted to humans or animals by an insect or other arthropod. In Ontario, West Nile Virus and Lyme disease are the two main endemic vector-borne diseases of public health importance as both of these diseases can be acquired within the province. Another vector-borne disease of some concern in Ontario is Eastern equine encephalitis (EEE). EEE is a rare but serious viral disease spread by mosquitoes that can affect people and horses. This virus has been detected in Ontario in horses and mosquitoes but to date no human cases have been reported.

West Nile Virus

West Nile Virus (WNV) was named after the West Nile region of Uganda, where it first appeared in 1937. Since then, the disease has spread throughout much of the world including Africa, Europe, the Middle East, Central Asia and North America.

WNV was first detected in North America in 1999 when an outbreak was experienced in New York City. The virus has since become established across most of the continent. The method of importation of the WNV into North America is unknown, but likely arrived via an infected bird or mosquito.

WNV was first detected in Peel in birds and mosquitoes in 2001. Locally acquired human illness occurred for the first time in 2002 when 112 residents had laboratory evidence of WNV infection (55 suspect cases, 20 probable cases and 37 confirmed cases, including two deaths). The only two deaths due to WNV infection in the Region of Peel occurred in 2002. There have been no human cases reported in Peel since 2007.

One of the goals of the Vector-Borne Disease Prevention Plan is to minimize the impact of WNV through a regional surveillance program involving humans and mosquitoes (adults and larvae). The surveillance program guides the Integrated Mosquito Management activities, which include mosquito larvae reduction, stagnant water site remediation, and risk communication activities. Surveillance activities continue to indicate that WNV is endemic in Peel and that WNV levels can fluctuate widely from year to year.

West Nile Surveillance Summary for the Region of Peel, 2001-2010

Year	Total		Miss		Bram		Cal		Climate Conditions
	Human Cases	Positive Mosquito Batches	Human Cases	Positive Mosquito Batches	Human Cases	Positive Mosquito Batches	Human Cases	Positive Mosquito Batches	
2001	0	4	0	4	0	0	0	0	hot & dry
2002	112	128	C-34; P-18; S-46	106	C-3; P-2; S-8	22	C-0; P-0; S-1	0	hot & dry
2003	10	24	C-10	16	0	8	0	0	cool
2004	0	4	0	2	0	2	0	0	cool/wet (Jun-Aug)
2005	3	24	C-2	16	C-1	8	0	2	hot/humid
2006	2	14	0	10	C-2	4	0	0	temperature above average
2007	1	3	C-1	1	0	2	0	0	7th warmest on record, dry
2008	0	21	0	11	0	10	0	0	wettest on record
2009	0	4	0	4	0	0	0	0	below normal temperatures, 6th wettest Aug on record
2010	0	14	0	8	0	6	0	0	4th warmest summer on record, wet

C-Confirmed, **P**-Probable, **S**-Suspected

At this point, it is reasonable to assume that the virus has established itself in North America and will return to Peel at some level in 2011. Peel Public Health will continue the human and mosquito surveillance, public education and larval mosquito reduction activities as these are essential WNV program components in a jurisdiction where WNV has been detected in a previous season.

West Nile Virus Plan 2011

Public Education and Community Outreach

Objectives:

- To inform Peel residents about WNV and the measures that they can take to prevent human illness including mosquito breeding site reduction and mosquito personal protective measures.
- To provide clear, accurate and timely communication about the status of WNV in Peel to all target groups.

Background:

Public education in 2011 will be similar to 2010. Peel Public Health will continue raising public awareness of WNV through the media, the updated Vector-Borne Disease (VBD) website (peel-bugbite.ca), community outreach activities and advertising in local publications. The distribution of a WNV mail-out to households is not planned for 2011; however, a WNV mail-out will be considered if surveillance activities identify high levels of WNV activity in the Region of Peel in 2011.

Target groups:

- Peel residents
- Regional Councillors, local municipalities, neighbouring health units, conservation authorities, Regional staff
- Local media
- Local health care providers

Planned Activities:

- Presentations on the West Nile Virus program will be made at Regional and area municipal Councils if requested. Additional presentations to the general public may be conducted if the risk of WNV infection increases.
- A generic WNV brochure will be distributed to the general public through community outreach activities.
- Other WNV educational and promotional materials (fact sheets, fridge magnets, washable tattoos) will be distributed in high-traffic areas in Peel. They will also be shared with the local municipalities and conservation authorities for their information and distribution. Most materials will also be available on the Region of Peel VBD website for downloading.

- Peel Public Health's 2011 Vector-Borne Disease Plan will be available on the VBD website as will several fact sheets on topics such as personal protection measures, reduction of mosquito breeding sites, larviciding, and many others. The website will be regularly updated with information on the status of WNV activity in Peel and with the catch basin larviciding schedule. An on-line stagnant water reporting form will continue to be available.
- Educational materials on WNV will be sent to the following groups: long-term care facilities, child care centres, garden centres, golf courses and horticultural societies.
- The VBD displays will be used to educate the public about WNV issues. They will be set up and staffed by Peel Public Health employees in strategic locations such as Regional facilities, the Peel Children's Water Festival and other high-traffic events in Peel.
- Ministry of the Environment regulatory requirements for public notification of the use of larvicides will be met through regular newspaper notices. In areas other than catch basins, a larviciding notice sign will be posted at the site.
- A series of advertisements with key WNV messages will be placed in local newspapers in Mississauga, Brampton and Caledon.
- Media relations activities will include news releases to the local media, interviews with the MOH and AMOH, if requested, and media briefings and/or news conferences, if required.
- Local health care providers will be notified about the status of WNV activity in Peel through a faxed Health Professionals Update. Early in the WNV season, information on WNV signs and symptoms, laboratory diagnosis, treatment, patient counselling and human case reporting to Peel Public Health will be provided. Additional notification will be provided on the status of WNV should the situation progress or change.
- To assist partner agencies to respond to public inquiries with consistent information, a series of WNV Q & A fact sheets will be available for distribution to the offices of Regional and local Councillors, Regional call centres, Brampton, Caledon and Mississauga Animal Services, local municipalities, conservation authorities, hospitals, and other key stakeholders. Fact sheets will also be available on the Region of Peel VBD website.
- WNV weekly updates will be produced for Regional Councillors, local municipalities, neighbouring health units, conservation authorities, the media, and other stakeholders. The update will be widely distributed and will be posted on the Region of Peel VBD website.
- An overview of the 2011 Vector-Borne program including WNV activities will be placed in the spring edition of the Health Services' Councillor Update.

- A contingency communication plan in the event of adulticiding has been developed. It includes tactics such as public meetings, advertising, direct mail, news conferences and briefings, media relations, news releases, website updates to inform the public about adulticiding treatment areas and schedules.
- Peel Public Health will also act as a resource to local occupational health and safety departments if they require assistance in drafting policies and educating employees regarding WNV. Additionally, Peel Public Health will share information about WNV and training with contracted vendors.
- Peel Public Health will hand deliver WNV educational materials to households in the vicinity of a positive mosquito batch or human case. Peel Public Health staff will also be available to conduct stagnant water surveys on residential properties in areas where WNV is detected.

Human Surveillance

Objective:

- To monitor the incidence of WNV in Peel.

Background:

The results of all positive WNV blood tests done by the local hospitals in Peel are reported to Peel Public Health. All WNV blood samples drawn by Peel physicians are sent to the Central Public Health Laboratory in Toronto for testing and results from Peel residents are reported to Peel Public Health.

Peel Public Health staff will investigate all suspected, probable and confirmed WNV cases among residents in Peel. Standardized medical information including demographics, symptoms, risk factors (such as travel history or having received blood products) and test results are entered into the Ministry of Health and Long-Term Care's system called the integrated Public Health Information System (iPHIS). The cases will be mapped onto a Geographic Information System (GIS) according to postal code at a later date.

A human case has not been reported in Peel since 2007.

Planned Activities:

- In June or July, Peel Public Health will distribute a Health Professionals Update to physicians about the importance of immediately reporting all suspected cases of viral encephalitis and viral meningitis. The update will communicate information on how to submit appropriate laboratory samples to determine if the cause is a mosquito-borne virus.
- From June through October, regular WNV updates will be sent to all local hospitals and infectious disease specialists to maintain awareness of human surveillance for encephalitis and meningitis cases. Peel Public Health will communicate the criteria for reporting and submission of appropriate laboratory specimens for WNV testing.
- Beginning in July, Peel Public Health will start enhanced surveillance for WNV encephalitis and viral meningitis through local hospitals and physicians.
- Peel Public Health will ensure active hospital-based surveillance will be implemented when WNV activity is identified in the vector mosquito population.
- Peel Public Health staff will investigate all suspected, probable and confirmed cases of WNV.

- Peel Public Health will maintain a database and map all probable and confirmed cases of WNV.
- Peel Public Health will work closely with the MOHLTC to ensure that surveillance information is standardized and that personal medical information remains confidential.

Mosquito Surveillance

Objective:

- To monitor numbers, species and locations of adult and larval mosquito populations and to detect the presence of WNV.

Background:

The purposes of adult mosquito surveillance programs are to: monitor mosquito populations associated with WNV; to determine the level of WNV activity among these species; and to use this information to make decisions regarding the risk of transmission to humans and the need to implement mosquito control plans.

Adult mosquitoes will be collected weekly from mosquito traps at 31 fixed locations throughout the Region of Peel from mid-June to late September. There are 17 permanent trapping sites in Mississauga, nine in Brampton and five in Caledon. Mosquitoes collected from the traps will be shipped to the mosquito laboratory service provider for counting, species identification and viral testing. The MOHLTC testing allotment is three mosquito batches per trap per week. As a result of having mosquitoes testing positive for EEE in the province in 2009 and 2010, the MOHLTC developed the Eastern Equine Encephalitis Surveillance and Management Guidelines. This document recommends that the viral testing of mosquitoes for EEE be expanded. It should be noted that number of viral tests allotted per trap remains at three; therefore an increase in EEE tests will result in fewer WNV viral tests. The number of EEE and WNV viral tests conducted at each trap site will be determined by Peel Health staff after reviewing the historical mosquito trap data collected since 2001.

Seasonal field staff will survey a range of aquatic habitats for the presence of mosquitoes in the larval stage from early June to late September. Breeding sites will be located by referencing historical breeding site data collected in previous years, conducting field surveys and investigating stagnant water complaints. Larval surveillance will also involve the collection and identification of the larvae found at the breeding sites. This information will be used to determine mosquito species distribution, abundance and seasonal occurrence and will assist in guiding larviciding activities.

The risk of mosquito-borne disease depends on both the number of mosquitoes capable of transmitting the virus and the prevalence of the virus among these mosquitoes. Accurate and timely surveillance data on larval and adult mosquitoes will be important for guiding appropriate prevention and reduction activities.

Planned Activities:

- Peel Public Health will continue to work closely with other agencies to collect and map information on potential mosquito-breeding habitats.
- Peel Public Health will regularly inspect priority breeding sites and sites referred for assessment for the presence of larvae.
- Peel Public Health will record and assess all stagnant water complaints reported by the public. Peel Public Health will inspect and monitor the stagnant water reported on public property. Stagnant water reported on private property will continue to be referred to the municipal property standards by-law officers. A stagnant water reporting form is available on the Peel VBD website to allow the public to make on-line submissions.
- From mid-June to late September, Peel Public Health will trap adult mosquitoes at 31 permanent sites throughout the three municipalities. Mosquitoes will be collected using CDC miniature light traps. The trapping season may be lengthened or shortened depending on the weather and the results of surveillance. Adult mosquitoes will be sent to the mosquito laboratory service provider for testing and speciation. The number of WNV viral tests conducted at each trap site will be determined by Peel Public Health staff after reviewing the historical mosquito trap data collected since 2001.
- Peel Public Health will continue to monitor the prevalence and distribution of invasive mosquito species such as *Ochlerotatus japonicus* and *Stegomyia albopictus* (Asian tiger mosquito). These two mosquito species are of concern as they are competent WNV vectors.

Pesticide Effects Surveillance

Objective:

- To identify any unplanned impacts of pesticides used in mosquito control on human or ecosystem health.

Background:

In 2011, selective larviciding to reduce WNV vector mosquito numbers will continue. Results from the Ministry of the Environment pesticide surveillance studies that have been conducted in previous years have not indicated any environmental or health concerns associated with the larvicide products used. It is not expected that larviciding carried out as planned will have any adverse impact on human health, or any significant adverse impact on the environment. Peel Public Health will continue to work with other agencies to ensure our larviciding program does not negatively impact the ecosystem. Peel Public Health will also continue to use larvicide products that have been identified as having the least environmental impact. A contingency plan for adult mosquito reduction will include a plan for spraying of chemical pesticides if required to protect public health. All possible measures will be taken to prevent any adverse impacts of adulticiding on human health.

Planned Activities:

- Peel Public Health will work with other municipalities, conservation authorities and the Ontario Ministry of the Environment to evaluate the impact of pesticide application on the environment, and target and non-target species.
- Peel Public Health will collaborate with hospital emergency rooms and physicians to carry out surveillance for illness potentially associated with pesticide exposure.
- The Environmental Health Customer Contact Centre will track calls related to concerns attributed to pesticides.
- Peel Public Health will conduct field inspections to verify the service provider contracted to conduct larviciding in Peel is applying the larvicides in accordance with Ministry of Environment regulations.

Larval Mosquito Reduction

Objective:

- To reduce the abundance of adult mosquitoes of the *Culex* species through the use of Integrated Mosquito Management (IMM) practices.

Background:

All mosquitoes begin their life in water. This offers an opportunity to reduce the number of mosquitoes in an efficient way before the adult mosquitoes emerge and become widely dispersed.

Although approximately 40 species of mosquitoes are found in Peel, only a few are important in the transmission of WNV. *Culex pipiens* and *Culex restuans* are the most important mosquito species in the transmission of WNV. They are two of the most common mosquitoes found in urban and suburban areas. They breed quickly and use standing or slow-moving water containing decaying organic materials to lay their eggs. Prime breeding sites include roadside catch basins, ditches, discarded tires left outdoors, poorly maintained swimming and wading pools, clogged rain gutters and eaves troughs, containers left outdoors to collect water, and other collections of stagnant water that last for a week or more. Catch basins are an especially important environment since the majority of catch basins inspected in Peel have been found to contain mosquito larvae. This is supported by findings in other nearby jurisdictions.

Breeding of these mosquitoes can be prevented by either eliminating stagnant water (source reduction), changing the environment to be less hospitable for mosquito breeding, or treating the water with larvicide to prevent mosquitoes from developing. Habitat modification can include changing the physical environment such as improving drainage or introducing predators. An Integrated Mosquito Management approach makes use of a range of larval control strategies as appropriate to the situation.

Where *Culex* mosquito breeding cannot be effectively reduced by other means, larvicides will be employed. The larvicides that will be used in the Region of Peel are *Bacillus sphaericus* (Bs), *Bacillus thuringiensis* var. *israelensis* (Bti) and methoprene (Altosid®).

Methoprene is a synthetic insect growth regulator which interferes with the development of mosquito larvae into adults. It has been widely used over a period of many years, and its effectiveness and environmental impact have been extensively studied and documented. It has been investigated and approved by the federal Pest Management Regulatory Agency for mosquito larviciding in Canada. Methoprene has very little non-target species toxicity, and poses no risk to the health of mammals, including humans. It degrades rapidly in water, particularly in the presence of sunlight. Methoprene has a number of features which makes it the preferred larvicide for catch basins. It is highly effective against the mosquitoes found in catch basins (*Culex pipiens* and *Culex restuans*) and

works well in water high in organic material. Sustained release formulations are available so that the application in catch basins will only be necessary every three weeks.

Bti is a biological pesticide which kills mosquito larvae before they develop into adults. Like methoprene, Bti has been extensively used, studied and regulated. It is more selective for mosquito larvae than methoprene, and so has less impact on other insect species. However, this larvicide is not very effective in water bodies with high levels of organic matter, particularly in catch basins. Bti will be used in surface water breeding sites where impacts on species other than mosquitoes are more of a concern.

Another biological larvicide that is approved by the Pest Management Regulatory Agency to control mosquito larvae in Canada is *Bacillus sphaericus* (Bs). The Ministry of Environment permits the use of this larvicide in both catch basins and surface water breeding sites. The active ingredients in *Bacillus sphaericus* and *Bti* are naturally occurring soil bacteria. Both products have a similar mode of action; larvae ingest the larvicide, consisting of *Bti* or *Bs* spores and the bacteria damage the gut of the mosquito larvae, causing the larvae to starve to death. *Bacillus sphaericus* provides mosquito control over a period of time, while *Bti*, although fast acting, does will not provide extended control. *Bacillus sphaericus*, unlike *Bti*, is effective in controlling mosquito larvae in high organic environments like catch basins. *Bacillus sphaericus* has been used in Peel to treat catch basins that drain directly into sensitive sites as well as some selected surface water sites since 2005. *Bacillus sphaericus* will continue to be used for these purposes in 2011.

To ensure a coordinated approach when investigating stagnant water complaints Peel Public Health will continue to work closely with staff from the local municipalities. The Region of Peel Mosquito Control Task Force which includes staff from the Region of Peel, local area municipalities and conservation authorities, has developed standard practises and procedures to formalize complaint investigations. Sites located on public property will be investigated by the Region of Peel Vector-Borne Disease team. Stagnant water issues on private property will be addressed by the local by-law enforcement staff under the existing municipal property standard by-laws. In circumstances in which the private property owner does not comply with the municipal by-law orders, Peel Public Health will investigate and, if warranted, issue a notice or order under public health legislation.

The Task Force has endorsed Integrated Mosquito Management as a guiding principle for the control of mosquitoes in Peel. Based on the importance of *Culex pipiens* and *Culex restuans* in transmission of WNV, the Region of Peel Mosquito Control Task Force has identified the following habitats in Peel (in order of priority from highest to lowest in the accompanying table) and recommended control strategies:

Habitat	Recommended Control Strategy
Roadside catch basins in urban and suburban areas	Larvicide with methoprene – use <i>Bacillus sphaericus</i> for those that drain directly into environmentally sensitive areas
Artificial containers on public property	Emphasize to municipal staff and volunteers the importance of removing artificial containers capable of promoting mosquito breeding
Artificial containers on private property	Educational campaign for small breeding sites. Education, enforcement of existing property standards or public health legislation if necessary for significant breeding sites on residential or commercial/industrial properties
Roadside ditches	Site by site assessment – physical alteration if feasible or larvicide if significant mosquito breeding site
Storm water management ponds	Site by site assessment, with habitat modification or larviciding if significant breeding site
Natural areas <ul style="list-style-type: none"> • Swamps and marshes • Creeks and floodplains 	Site by site assessment, with improvement of natural controls. Bti or <i>Bacillus sphaericus</i> will be considered if mosquito breeding is significant and not controlled by other means

Roadside Catch Basins

Roadside catch basins are the major habitat in urban and suburban areas for *Culex pipiens* and *Culex restuans*, the main vectors of WNV. While each catch basin is small in and of itself, collectively they represent a large area of mosquito breeding habitat, free of natural predators.

To mitigate WNV, Peel Public Health will hire a licensed pesticide applicator to treat approximately 92,000 catch basins (roadside storm drains) using the larvicide methoprene with the cooperation of other departments in the Region of Peel, the Cities of Brampton, Mississauga and the Town of Caledon. Treatment of catch basins is a core part of WNV reduction programs in southern Ontario. Since catch basins are designed to hold water and do so for long periods of time, the only option for reducing mosquito numbers in a large number of catch basins is to larvicide. Methoprene is the recommended agent due to its effectiveness against mosquitoes, low anticipated effects on non-target organisms and the availability of formulations that provide sustained control for at least three weeks. Catch basins which drain directly into environmentally sensitive areas such as the Rattray Marsh, Cawthra Park or the Heart Lake wetland complex will be treated with the biological larvicide *Bacillus sphaericus* (Vectolex). Alternatives such as flushing with water or

vacuuming catch basins have been found to be ineffective tools for control as larvae are found within a matter of days after a vacuuming or flushing.

Peel Public Health will ensure the catch basin larviciding program is in compliance with Ministry of the Environment regulations and guidelines.

As was done in previous years, the Medical Officer of Health will issue an Order to each local municipality directing them to assist in and facilitate the application of larvicides to catch basins.

Artificial Containers

Artificial containers such as tires, buckets, and unused swimming pools collect rainwater. Besides other sanitation concerns, they are ideal breeding sites for certain mosquito species due to the lack of predators. They may be especially productive when located in a heavily vegetated area. On public lands, there are already programs for waste removal and some ongoing volunteer programs exist to clean up parks and ravines. Reorientation of these efforts to emphasize removal of garbage that promotes mosquito breeding may be sufficient to significantly reduce this habitat.

A large percentage of the land area in Peel is privately owned. Prime breeding sites here include discarded tires left outdoors, clogged rain gutters, unused swimming pools and plastic wading pools, and pails and barrels containing stagnant water. Every residential and commercial property owner should regularly inspect their property and buildings to determine if conditions are conducive to mosquito breeding and endeavour to eliminate those conditions. The public education campaign in 2011 will continue to highlight the need for Peel property owners to eliminate potential mosquito-breeding sites on private property. Municipal or regional staff will become aware through regular service delivery or by public complaint of significant collections of stagnant water lasting more than a week (e.g. unused swimming pools, large collections of tires or other refuse). Cleanup will be accomplished through property owner education, or failing that, through enforcement of existing property standards by-laws or public health legislation. If required, Peel Public Health will assess for the presence of mosquito larvae. Small accumulations of stagnant water, such as in a birdbath or children's toys left outside, will be dealt with by education alone.

Roadside Ditches

Peel Public Health staff found a number of roadside ditches that contained vector mosquito larvae in 2010. Last year, roadside ditches received more larvicide treatments than any other surface water breeding site in Peel. The most effective way to prevent breeding is to eliminate the stagnant water through improved grading and drainage. This can be an expensive venture and should only be undertaken if the site is large and likely to be a problem on a continual basis. Municipal roadside ditches that hold water for longer than seven days in the summer months will be referred to the local roads departments for

assessment and remediation. In the meantime, ditches containing mosquito larvae will be treated with Bti or *Bacillus sphaericus*.

Storm Water Management Ponds

Larval surveillance has revealed that these sites do not support significant numbers of mosquito larvae. If larvae were found in ponds that constantly held water, it was generally only in small isolated areas that were surrounded with heavy vegetation. In ponds that were designed to hold water for only short periods of time, larvae were located in recessed areas that did not drain properly. In 2010, isolated areas of 13 storm management ponds received treatment; 10 in Mississauga and three in Brampton.

As in previous years, storm water management ponds will be monitored for mosquito larvae. If significant mosquito breeding is found at a site despite the use of other measures, Bti or *Bacillus sphaericus* will be used as part of an Integrated Mosquito Management approach.

Natural Areas

Natural areas present special challenges and concerns for mosquito control. Any intervention in these areas must take care not to unnecessarily disrupt the existing ecosystem. Areas of open or flowing water do not make good mosquito breeding habitats. However, areas where there are temporary pools are believed to be the most important. Natural areas such as swamps, marshes, creeks and their floodplains breed mosquitoes of many different species. While many mosquitoes may be present, most are not important vectors of WNV. For example, the large number of *Aedes* mosquitoes that emerge in the spring are thought to play little if any role in WNV transmission. Another difficulty is that many areas of stagnant water that produce mosquitoes are present for only a week or so following a rain.

The approach to mosquito control in natural areas in the Region of Peel for 2011 will involve assessment of breeding sites and larval monitoring to determine numbers and species important to WNV transmission. Response will be based on these assessment results and may involve improving natural controls, altering water flows if it does not damage the natural ecosystem and application of Bti or *Bacillus sphaericus* if other measures are insufficient to control mosquito breeding. In environmentally sensitive areas such as the Rattray Marsh, Cawthra Woods and the Heart Lake wetland complex, Peel Public Health will follow the special process that has been developed by the Ministry of Natural Resources. It involves key provincial and federal agencies making recommendations on how to manage each specific site so as to minimize the impacts on rare and sensitive species present there.

Planned Activities:

- Public education materials will encourage residents and property owners to eliminate mosquito breeding sites on private property.
- Peel Public Health will work with municipal departments and volunteer groups to ensure that existing sanitation and waste removal on public property (including green areas such as parks, cemeteries, golf courses) places emphasis on removing garbage that promotes mosquito breeding (e.g. tires, pails, etc).
- Reports of stagnant water on private property will be assessed as per the usual practice by property standards officers. Small sites will be dealt with through education. Potential breeding sites which are not cleaned up will be assessed by Peel Public Health for mosquito breeding, and if significant, pursued through local property standards by-laws or public health legislation, as appropriate.
- Peel Public Health and other agencies will identify areas of stagnant water associated with surface grading problems, road construction, clogged sewers and catch basins and obstructed waterways that are serving as mosquito-breeding habitat. These areas will be assessed on a site specific basis as they are identified and may be treated with larvicide. Remediation will be performed if possible.
- The larvicide methoprene will be applied to approximately 92,000 roadside catch basins in Brampton, Mississauga, and in the towns, villages and rural subdivisions of Caledon. It is anticipated that this will consist of four applications starting in June and ending in late August. Since 2004, catch basins in green spaces of municipal parks were included in the larviciding program as were catch basins on properties owned and/or managed by the Region of Peel. Applications will continue to be conducted at these locations in 2011.
- Backyard catch basins will be only be treated upon the request of the home owner. A consent form must be signed by the home owner prior to treatment. Methoprene will be the larvicide used to treat backyard catch basins.
- In catch basins draining directly into environmentally sensitive areas, the biological larvicide *Bacillus sphaericus* will be used.
- Peel Public Health, in collaboration with local conservation authorities and parks departments, will monitor natural areas for mosquito larvae. Where possible, natural controls will be enhanced. Larvicide (Bti) and/or *Bacillus sphaericus* will be applied on a site specific basis if sufficient numbers of mosquitoes implicated in the transmission of WNV are found, in compliance with Ministry of the Environment and Ministry of Natural Resources requirements.

Adult Mosquito Reduction

Objective:

- To reduce the abundance of adult mosquitoes in areas of elevated risk to human health from WNV through the judicious use of pesticides.

Background:

The application of chemicals to kill adult mosquitoes by ground or aerial application is called adulticiding. Adulticiding would only be considered in Peel if there was a significant risk to human health. Adulticides are typically applied as an Ultra-Low-Volume (ULV) spray, where small amounts of insecticide are dispersed either by truck-mounted equipment or from fixed-wing or rotary aircraft. For effective adult mosquito reduction, the fine ULV droplets must drift through the habitat and come in contact with flying mosquitoes. Adulticiding is the least efficient mosquito control technique since adult mosquitoes are widely dispersed and the pesticide has to make contact with the mosquito in order to kill it. Nevertheless, targeted adulticiding, based on surveillance data, is an extremely important part of any Integrated Mosquito Management (IMM) program. If an outbreak of WNV in people is occurring or imminent, it means that large numbers of WNV infected adult mosquitoes are likely present. This risk can only be mitigated in the short term through adult mosquito reduction.

During the WNV season, Peel Public Health will conduct a weekly risk assessment based on surveillance information to identify the relative risk of human infection in Peel. Prior to any decision to apply adulticides, a number of factors will be considered in the context of mosquito and WNV biology to assess the level of risk to human health:

- Mosquito species distribution, density and trends – to see if mosquito populations are those known to transmit WNV and if they are present at a high or low level.
- The level of WNV present in mosquitoes – the presence of WNV in a high proportion of mosquitoes, especially those known to bite humans, is of greatest concern.
- Density and proximity of human populations to positive findings of WNV.
- The time of year – human cases of WNV typically are greatest in the last two weeks of August and the first two weeks of September. Therefore, indications of high WNV activity prior to this time are of much greater concern than those after it.
- Weather – certain conditions are necessary in order for adulticides to be applied effectively. Some forecasts may predict conditions that would result in a rapid decline in mosquito numbers making adulticiding unnecessary.

- The distribution of human cases in Peel and in other jurisdictions in the current year compared to past experience.

Because of the large number of factors, the decision to adulticide will be made on a case-by-case basis. The MOHLTC will be consulted prior to the initiation of any adulticiding activity. Every effort will be made to target this intervention to specific areas of risk and not an entire city or the entire Region and only when deemed necessary.

Adulticiding would be conducted using a truck-mounted unit. Application by aircraft is not being considered at this time. The adulticiding agent of choice will be Malathion.

Planned Activities:

- Adulticiding decisions will be made on a case-by-case basis according to the level of human risk of WNV.
- If necessary, Peel Public Health would use Malathion for adult mosquito control. Peel Public Health will annually review the availability, health impact and effectiveness information of pesticides. Any product will be applied in compliance with local, provincial and federal laws and regulations.
- The public will be notified of adulticide locations and schedules in advance, which will allow sufficient time to take any necessary precautions to reduce pesticide exposure (see Public Education and Community Outreach).
- Information will be released at least 48 hours in advance through the media, the Peel Public Health website, Environmental Health Customer Contact Centre and pertinent municipal and community organizations and the Ontario Regional Poison Control Centre in accordance with MOE requirements.
- Hospitals will be notified regarding the adulticiding schedule. Information on the pesticide that will be used will be provided to the public, physicians and other health care providers.
- Elected officials will be notified immediately once the Medical Officer of Health has made the decision to adulticide.
- Adult mosquito reduction measures will be scheduled when mosquitoes are active and when weather conditions are conducive to its success.
- Peel Public Health will monitor and assess control activities for any potential environmental and health effects through several measures which may include pre- and post-spray environmental sampling and addressing pesticide exposure complaints received by Peel Public Health.

Lyme disease

Lyme disease was first recognized in the United States in 1975, following an outbreak of juvenile rheumatoid arthritis near the community of Lyme, Connecticut. The first reported case in Canada occurred in 1984.

Lyme disease is passed to humans through the bite of certain types of ticks that are infected with a bacterium called *Borrelia burgdorferi*. In Ontario, the disease is spread by the black-legged tick, sometimes called the deer tick. There are areas in which the bacteria is endemic, meaning the disease is well established and present more or less continually in that region. The endemic areas in Ontario include areas in the southern and eastern parts of the province. It should be noted that ticks can be spread by birds, in particular songbirds that feed off the ground. Because these birds are migratory, there is the potential for new populations of the ticks to spread across the province. Therefore, one does not necessarily have to be in an endemic or high-risk area to be at risk of encountering ticks and the disease.

To date, an established black-legged tick population has not been identified in the region of Peel. In 2010, Peel Public Health did not conduct active tick surveillance but did undertake passive surveillance by examining ticks brought into Peel Public Health offices by the public. Eight tick samples were submitted to Peel Public Health. Specimens associated with human contact were submitted to the Central Public Health Laboratory (CPHL) in Toronto for species confirmation. The three ticks identified as black-legged ticks were sent to the Public Health Agency of Canada's (PHAC) National Microbiology Laboratory in Winnipeg for Lyme disease testing. One lab report was received from PHAC indicating that a tick was positive for *Borrelia burgdorferi*. It should be noted that all the black-legged tick specimens submitted by Peel residents were collected from endemic areas outside of Peel.

Lyme disease is a reportable disease in Ontario. As a result, Peel Public Health staff investigates all potential cases of Lyme disease cases among residents in Peel. To date there has not been a confirmed human case that was locally acquired in Peel. Below is the number of Peel residents that have contracted Lyme disease since 2001.

Lyme disease Cases in the Region of Peel, 2001 - 2010

Year	Cases
2001	1
2002	2
2003	2
2004	3
2005	3
2006	8
2007	5
2008	18
2009	1
2010	2

Lyme disease Surveillance Plan 2011

Every case of Lyme disease must be reported to the local health unit as it is both a reportable and communicable disease under the *Ontario Health Protection and Promotion Act*. Public health inspectors in Peel will investigate every report of Lyme disease received. The standard investigation will include confirming the diagnosis, collecting demographic data, determining location of exposure and investigating possible epidemiological links among cases. This will be accomplished by completing the Ministry of Health and Long-Term Care Lyme Disease Human Case Investigation Report which will be entered into the provincial Outbreak Module of the integrated Public Health Information System (iPHIS).

There are areas in Ontario that are considered high risk for Lyme disease because the bacteria have consistently been found in black-legged ticks from these areas. The endemic areas in Ontario include Long Point Provincial Park, Turkey Point Provincial Park, Rondeau Provincial Park, Point Pelee National Park, Prince Edward Point National Wildlife Area, Wainfleet Bog Conservation Area, and in the St. Lawrence Islands National Park. There are concerns that changes to climatic conditions such as warmer seasons could lead to conditions that are favourable for the establishment of black-legged tick populations in many parts of the province. At this point, Peel Public Health's passive and active tick surveillance activities have not revealed any evidence to indicate that an established population of black-legged ticks is present in Peel.

In 2011, Peel Public Health will continue to examine ticks submitted by Peel residents to identify sites where black-legged ticks are present. If an establishing tick population is identified or there is evidence of a confirmed case of Lyme disease that has been acquired locally, then active surveillance including tick dragging will be undertaken.

Tick specimens that are collected through submissions by the public or through active surveillance will be shipped to the provincial Central Public Health Laboratory (CPHL) for species identification. The CPHL will send the identified ticks to the Public Health Agency of Canada's National Microbiology Laboratory for Lyme disease testing. Only the black-legged tick, *Ixodes scapularis*, will be tested for Lyme disease. Test results will determine the need for enhanced surveillance, increased public education or risk communication activities.

Planned Activities:

- If an established tick population is identified or there is evidence of a confirmed case of Lyme disease that has been acquired locally, then active surveillance including tick dragging will be undertaken.
- An overview of the 2011 Vector-Borne program including Lyme disease surveillance activities will be placed in the spring edition of the Health Services' Councillor Update.

- The 2011 VBD display will include Lyme disease educational materials provided by the MOHLTC. The display will be set up and staffed by Peel Public Health employees in strategic locations such as Regional facilities, the Peel Children's Water Festival, the Peel District School Board Parent Conference and other high-traffic events in Peel.

Eastern Equine Encephalitis (EEE)

Eastern equine encephalitis (EEE) was first recognized in the USA in 1831 when 75 horses died of an encephalitis illness in Massachusetts. In 1938, the first confirmed human cases were identified when 30 children died of encephalitis in north-eastern USA.

EEE is a rare but serious viral disease spread by mosquitoes that can affect people and horses. The mortality rate in humans from EEE is approximately one-third, making it one of the most deadly mosquito-borne diseases in North America. In addition, approximately half of those persons who survive EEE will have mild to severe permanent neurological damage. The disease can be prevented in horses with the use of vaccinations but a human EEE vaccine will not be available in the foreseeable future.

In Ontario, outbreaks of EEE have occurred sporadically among horses, but no human cases have ever been confirmed. The lack of verified human cases of EEE in Ontario is not entirely understood, since human cases have repeatedly been reported in several states bordering the province.

In 2010, three horse cases were reported in the province, two in Simcoe County and one in Bruce County. The first incidence of the virus being found in Ontario mosquitoes occurred in September 2009, when mosquito pools in Wahta Mohawk Territory in the Muskoka region tested positive. In early September 2010, two more mosquito pools from this First Nations community tested positive for EEE. An additional positive EEE mosquito pool was found in the North Bay Parry Sound District Health Unit in mid September.

Many species of mosquitoes can become infected with EEE virus. However, the most important mosquito species in maintaining the bird-mosquito transmission cycle is *Culiseta melanura*. Adult mosquito surveillance conducted over the last several years has found this species is present in Peel but in very low numbers. Two *Culiseta melanura* were collected in Peel traps in 2010; both tested negative for the EEE virus.

Eastern Equine Encephalitis Plan 2011

While not specifically listed as a reportable disease in Ontario, EEE falls under the broader category of Encephalitis, including primary viral in Ontario Regulation 559/91 – Specification of Reportable Diseases. As part of disease surveillance, Peel Public Health staff will investigate any probable or confirmed EEE human cases, record their locations and exposures for analysis. This information will be entered into the provincial Outbreak Module of the integrated Public Health Information System (iPHIS).

In 2011, Peel Public Health will continue to monitor the prevalence and distribution of *Culiseta melanura* by using resting boxes at selected sites. In addition, the EEE viral testing program will be expanded; rather than focusing on only testing *Culiseta melanura*, other vector species such as *Coquillettidia perturbans* and *Aedes vexans* will be considered for testing. The testing of additional vectors is recommended in

the Eastern Equine Encephalitis Surveillance and Management Guidelines that have been recently developed by the MOHLTC. It should be noted that an increase in EEE tests will result in fewer WNV viral tests.

As in previous years, seasonal field staff working in the Vector-Borne Disease program will survey a wide range of aquatic habitats for the presence of mosquitoes in the larval stage from early-May to late September. Larval surveillance is useful in determining the locations and time of year that mosquitoes use specific aquatic habitats. Larval specimens will be identified and counted in our in-house laboratory. This information will be used to determine species composition and population densities. It should be noted that the *Culiseta melanura* larvae are difficult to collect using the standard dipper as they generally develop in dark or low light intensity areas such as holes beneath tree roots and stumps, and the underside of root systems of aquatic plants in fresh-water swamps and marshes containing cool acid water. Some jurisdictions have had success using bilge pumps to reach the habitat where the larvae are found.

Adult and larval mosquito surveillance data will be used in decision-making about EEE public education and mosquito reduction activities. Consistent routine testing and monitoring over a period of years will provide data upon which to revise and refine Peel's EEE surveillance program.

Planned Activities:

- Peel Public Health will continue using resting boxes at selected sites to collect adult *Culiseta melanura*.
- The EEE adult mosquito viral testing program will be expanded; rather than focusing on only testing *Culiseta melanura*, other vector species will be sent for viral testing.
- Peel Public Health will develop an EEE educational flyer. This flyer will be distributed to households in the vicinity of a positive mosquito batch or human case. Peel Public Health staff will also be available to conduct stagnant water surveys on residential properties in areas where EEE is detected.
- An update of the 2011 Vector- Borne program including EEE activities will be placed in the spring edition of the Health Services Councillor Update.

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- Town of Caledon - Property Standards Section, Infrastructure Department, Animal Control Service
- Region of Peel – Environment Transportation and Planning Services
- City of Brampton - Public Relations and Communications, Planning, Design and Development, Works and Transportation, Community Services, Animal Services
- City of Mississauga - Enforcement Division, Community Services, Transportation and Works, Recreation and Parks, Animal Services, Communications