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# West Nile Virus Prevention Plan 2008

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# Executive Summary

Peel Public Health's 2008 West Nile Virus 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 the 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 this plan for WNV prevention in Peel in 2008. To ensure a coordinated approach in preventing mosquito-borne disease outbreaks in the Region of Peel, Peel Public Health is working 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. The goal of the West Nile Virus Prevention Plan for 2008 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 2008, 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 birds and mosquitoes 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 Prevention Plan 2008 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).*

The West Nile Virus Prevention Plan 2008 includes the following components:

**Public Education and Community Outreach**

Peel Public Health will continue to maintain public awareness of mosquito-borne disease, risk, surveillance and prevention through the media, the WNV website (www.peel-bugbite.ca), and advertising in local publications. Educational materials will be sent to special groups: long-term care facilities, child care centres, garden centres, parks and recreation departments, physicians, golf courses and horticultural societies. Educational materials will also be sent to various seniors' groups in all three municipalities (e.g., Mississauga Seniors' Centre, Brampton Senior Citizen Council). Weekly status updates will be widely distributed and posted on the website. Peel Public Health will ensure that all public notification requirements for larviciding and adulticiding (if needed) are met. Accurate and timely information on these mosquito reduction activities will be provided to the public, including application schedules, location of the interventions, type of pesticides being used and how to reduce exposure.

**Human Surveillance**

A system for detecting mosquito-borne diseases among humans will include active monitoring for suspected cases of viral encephalitis and aseptic meningitis in local hospitals from July to September. Health care providers play a critical role in the detection, prevention and clinical management of mosquito-borne diseases. A late spring edition of Peel Public Health's medical information letter, Health Professionals Update, focusing on WNV will be distributed to health care providers in the Region of Peel with subsequent updates as needed.

## Host (Dead Bird) Surveillance

Peel Public Health will monitor infection and illness in birds, focusing on crow and blue jay deaths. Reports of dead birds will be received from the public six days a week (Monday to Saturday) from early May to the end of September. Viral testing of a limited number of crows and blue jays will be performed by the Canadian Cooperative Wildlife Health Centre (CCWHC) in Guelph in 2008.

## Mosquito Surveillance

Peel Public Health will monitor mosquitoes across the Region by collecting larvae and adult mosquitoes to determine the distribution, density and species. Adult mosquito traps will be located in each Regional ward in Mississauga, Brampton and Caledon. Adult mosquitoes will be collected weekly from mid-June to the end of September. The adult mosquitoes will be shipped to the mosquito laboratory service provider for counting, identification and viral testing. Seasonal field staff 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. Mosquito surveillance data will be used in decision-making about public education and mosquito reduction activities.

## Pesticide Effects Surveillance

Peel Public Health does not anticipate adverse human health effects from the mosquito reduction measures in this plan. However, health care professionals will be informed about potential health effects of pesticide exposure and the need to report pesticide-related illness to Peel Public Health. Surveillance for any adverse effects of pesticide exposure due to either larviciding or adulticiding will be conducted. In addition, Peel Public Health will work with other agencies to monitor possible ecosystem effects from pesticide use.

## Larval Mosquito Reduction

Peel Public Health will reduce mosquito breeding sites by identifying and referring priority stagnant water sites to the local municipalities for remediation and by the application of larvicide to sites on municipal property that cannot be emptied or drained. There will be an emphasis on *Culex* species (the main vectors of WNV in Peel) and their breeding sites located in urban and suburban settings. Through a public information campaign, Peel Public Health will urge residents to reduce breeding sites around their homes.

Peel Public Health and other Regional and area municipal departments will respond collaboratively to public concerns about significant areas of artificial

stagnant water lasting longer than a week between May 15 to August 31.These sites will be individually assessed by Peel Public Health for their significance as breeding sites and dealt with through land owner education, or enforcement of property standards by-laws or public health legislation as appropriate to the circumstances. Small accumulations of stagnant water, such as in a birdbath or children's toys left outside, will be dealt with by education alone.

These activities will be augmented with the application of larvicide to priority breeding sites where water cannot be eliminated, including roadside catch basins in the Cities of Brampton and Mississauga, and in towns, villages and rural subdivisions of the Town of Caledon. As in previous years, the Medical officer of Health will issue an order to each local municipality ordering them to assist in and facilitate the application of larvicides to municipal roadside catch basins. Larval surveillance data collected this year will be used to develop plans for mosquito reduction efforts in 2009.

**Adult Mosquito Reduction**

Peel Public Health has developed a contingency plan for the reduction of adult mosquitoes by the application of the pesticide malathion through ground spraying. In the event that a significant risk to human health occurs despite the successful implementation of the other components of this plan, adult mosquito reduction may be conducted. Habitat, weather, time of year, surveillance information and the proximity to human populations will be considered in determining the need for adult mosquito reduction measures. The accuracy, quality and efficacy of the adulticide application will be closely monitored to ensure compliance with Provincial guidelines. The application of the malathion will be undertaken by a service provider contracted by the MOHLTC. If application of adulticides becomes necessary, Peel Public Health will provide advance notice to Regional Council, the public and to health care providers.

## Introduction

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 most recently, 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. Human cases have been reported every year since 2002 with the exception of 2004 when no cases were reported in Peel.

Since 2003, the Region of Peel has had a WNV Prevention Plan. The goal of the plan is to minimize the impact of WNV with a regional surveillance program involving humans, birds 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, 2001-2007

**Human Cases**

| Year | Total | Mississauga | Brampton | Caledon | Climatic Conditions |
|---|---|---|---|---|---|
| **2001** | 0 | 0 | 0 | 0 | hot & dry |
| **2002** | 112 | **C**-34; **P**-18; **S**-46 | **C**-3; **P**-2; **S**-8 | **C**-0; **P**-0; **S**-1 | hot & dry |
| **2003** | 10 | **C** -10 | 0 | 0 | cool |
| **2004** | 0 | 0 | 0 | 0 | cool/wet (Jun-Aug) |
| **2005** | 3 | **C**-2 | **C** - 1 | 0 | hot/humid |
| **2006** | 2 | 0 | **C**-2 | 0 | temperature above average |
| **2007** | 1 | **C**-1 | 0 | 0 | 7th warmest on record; dry |

C - Confirmed; P - Probable; S – Suspected

**Positive Birds**

| Year | Total | Mississauga | Brampton | Caledon | Climatic Conditions |
|---|---|---|---|---|---|
| **2001** | 17 | 14 | 3 | 0 | hot & dry |
| **2002** | 20 | 9 | 5 | 6 | hot & dry |
| **2003** | 12 | 5 | 5 | 2 | cool |
| **2004** | ***17** | 7 | 4 | 6 | cool/wet (Jun-Aug) |
| **2005** | 33 | 18 | 10 | 5 | hot/humid |
| **2006** | 11 | 4 | 4 | 3 | temperature above average |
| **2007** | 2 | 0 | 2 | 0 | 7th warmest on record; dry |

***** Included in the total of 17 +ve birds is one hawk, since hawks are not considered a target bird CCWHC will show Peel had 16 +ve birds

**Positive Mosquito Batches**

| Year | Total | Mississauga | Brampton | Caledon | Comments |
|---|---|---|---|---|---|
| **2001** | 4 | 4 | 0 | 0 | hot & dry |
| **2002** | 128 | 106 | 22 | 0 | hot & dry |
| **2003** | 24 | 16 | 8 | 0 | cool |
| **2004** | 4 | 2 | 2 | 0 | cool/wet(Jun-Aug) |
| **2005** | 24 | 16 | 6 | 2 | hot/humid |
| **2006** | 14 | 10 | 4 | 0 | temperature above average |
| **2007** | 3 | 1 | 2 | 0 | 7th warmest on record; dry |

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 2008. Peel Public Health will continue the 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.

Peel Public Health has worked collaboratively with a number of municipal, provincial and federal partners to develop a plan that meets the specific needs of the Region of Peel. A complete list of the collaborating agencies appears in the Acknowledgement section at the end of this document.

## 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 WNV status in Peel to all target groups.

### Background:

In 2001, Peel Public Health introduced its first WNV public education campaign – Put Mosquitoes Out of Touch. The campaign informed Peel residents about WNV and emphasized personal protection against mosquito bites and habitat reduction. The tactics included a mail-out to over 300,000 households, the development of an information package for public distribution at targeted locations, development of a dedicated WNV website (www.peel-bugbite.ca) and advertisements in local newspapers. The successive campaigns in 2002 and 2003 were built on this original initiative and each year materials and tactics were reviewed, revised and enhanced.

In 2004, Peel Public Health and Communication Services developed a strategy and messages to complement the provincial WNV campaign. The objectives of the communication activities in 2004 included: continued education of residents about WNV, the need to report dead crows and blue jays, the importance of mosquito reduction through the removal of sources of stagnant water on their property and the use of personal protection measures.

The 2005-2007 WNV public education campaigns in Peel included a mail-out to over 350,000 households in Peel, advertisements in local papers, and distribution of educational materials to the area municipalities, Region of Peel staff and multicultural groups.

In 2008, Peel Public Health will continue raising public awareness of WNV through the media, the WNV website (www.peel-bugbite.ca), community outreach activities and advertising in local publications. The distribution of a WNV mail-out to households is not planned for 2008; however, the mail out will be considered if surveillance activities identify high levels of WNV activity in the Region of Peel in 2008.

**Target groups:**

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

**Planned Activities:**

- Presentations on the West Nile Virus Prevention Plan 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 (e.g. Peel District School Board Parent Literacy Conference).

- The WNV website (www.peel-bugbite.ca) 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 form will continue to be available.

- The WNV website (www.peel-bugbite.ca) will have a link to the Public Health Agency of Canada travel medicine program website. This will provide WNV information to residents travelling outside of Canada.

- 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 WNV website for downloading.

- Peel's 2008 WNV Prevention Plan will be available on the WNV 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 special groups: long-term care facilities, child care centres, garden centres, parks and recreation departments, physicians, golf courses and horticultural societies.

- Educational materials on WNV will also be sent to various seniors' groups in all three municipalities (e.g., Mississauga Seniors' Centre, Brampton Senior Citizen Council).

- The WNV displays, in conjunction with other educational materials, will be used to educate the public about the issue. 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, Public Works Week Open House, and other high-traffic areas 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 ongoing news releases to the local and specialty media (garden, seniors, parenting), interviews with the MOH and AMOH 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.

- The WNV program will be featured in a Rogers Cable 10 program during the 2008 WNV season.

- To assist partner agencies to respond to public inquiries with consistent information, a series of updated 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 WNV 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 WNV website.

- Communication to Regional employees will consist of regular updates to all Regional staff through Pathways, paycheque inserts (to be considered),

brochures and posters in Regional facilities, departmental meetings and informal discussions.

- A multicultural component of the strategy will include enlisting the help of Peel Public Health's internal contacts from ethnic communities to disseminate WNV key messages through local and GTA ethnic media and through multicultural community centres. Translated WNV fact sheets have been posted on the WNV website. Advertising in the local ethnic media will also be considered.

- 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 to determine the effectiveness of the WNV Prevention Plan.

### Background:

There have been human cases of WNV reported in Peel every year since 2002 with the exception of 2004. There was one human case of WNV reported in Peel in 2007. A female in her late teens living in Mississauga tested positive for WNV in August. It is unclear whether the disease was contracted locally or abroad.

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

Peel Public Health staff will investigate all suspect, 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.

### Planned Activities:

- In June, Peel Public Health will update physicians region-wide 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 suspect, 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 Ministry of Health and Long-Term Care to ensure that surveillance information is standardized and that personal medical information remains confidential.

## Bird Surveillance

**Objective:**

Utilize data on bird mortality associated with WNV as a means of early detection of WNV activity in the Region of Peel in order to predict the risk of human illness.

**Background**:

Bird surveillance is the most sensitive early detection system for the presence of the virus. A WNV positive dead bird has been the first indicator that the virus was present in Peel every year with the exception of 2005 and 2006.

While over 200 North American native bird species have been infected with WNV, the corvid bird family (crows, jays, and ravens) have been found to be most likely to die from the virus. Crows in particular will demonstrate an almost 100% mortality rate once infected with WNV. Consequently, crows continue to be the bird species of choice for most dead bird surveillance programs in Canada and the United States. In addition to crows, blue jays are the other main corvid species found in Peel and have been included in the provincial dead bird surveillance program since 2004, in part due to low crow population levels in some parts of Ontario.

**Planned Activities:**

- Beginning in May, Peel Public Health will ask the public to report the number and location of any dead crows/blue jays to the Customer Contact Centre at 905-799-7700. This service will operate from 8:30 a.m. – 4:30 p.m. Monday to Friday and 10:00 a.m. – 5:00 p.m. on Saturdays and statutory holidays from mid-May to the end of September. Callers after hours will be instructed via a taped message to call back during operating hours.

- Dead birds (i.e. those meeting the criteria for accessibility, species, and state of preservation) will be picked up for possible testing. Peel Public Health will select dead crow and blue jay specimens for submission to the Canadian Cooperative Wildlife Health Centre (CCWHC) in Guelph. Specimens will be submitted in accordance with the CCWHC criteria. Peel Public Health will post WNV positive bird results on the Regional website www.peel-bugbite.ca.

- Persons reporting birds which are not crows or blue jays, and which are not suitable or required for surveillance purposes, will be advised how to safely dispose of the bird.

- Peel Public Health will use WNV positive bird test results as early indicators of virus activity. Trends in dead crow and blue jay sightings will be monitored as an indicator of potential human health risk.

- Peel Public Health will continue to record sightings of dead birds other than crows or blue jays that are reported through the Customer Contact Centre. This information will be mapped and analyzed to determine if there is significant bird mortality in an area. This information is most useful in the years when the crow population is at low levels.

## 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 will be 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.

Seasonal field staff will survey a range of aquatic habitats for the presence of mosquitoes in the larval stage from early May 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. Since 2004, a stagnant water reporting form has been available on the Peel WNV website to allow the public to make on-line submissions. The on-line stagnant water reporting form will continue to be made available in 2008.

- 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 counted by species and tested for WNV by the mosquito laboratory service provider.

- 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.

- From mid-July to late September, Peel Health will use two types of speciality traps to conduct *Stegomyia albopictus* (Asian tiger mosquito) surveillance. The Encephalitis Vector Surveillance (EVS) and Omni-directional Fay- Prince traps will be used as these traps are designed to be more effective in capturing the day biting *Stegomyia albopictus* than the standard CDC light traps.

## Pesticide Effects Surveillance

### Objective:

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

### Background:

In 2008, selective larviciding to reduce 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 use of larvicides. 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 will continue to work with other agencies to ensure our larviciding program does not negatively impact the ecosystem. Peel will also continue to use larvicide products that have been identified as having the least environmental impact. Peel's 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 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 is recommended which 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 will 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 founding 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, it is also less effective and more difficult to use, 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.

In 2005, the Pest Management Regulatory Agency approved the use of the biological larvicide *Bacillus sphaericus* (Bs) in Canada to control mosquito larvae. The Ministry of Environment permitted 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 2008.

To ensure a coordinated approach when investigating stagnant water complaints Peel Health will continue to work closely with local municipalities. The Region of Peel Mosquito Control Task Force developed standard practises and procedures to formalize complaint investigations. Sites located on public property will be investigated by the Region of Peel West Nile Virus 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 *Baccillus sphaericus* or other methods 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 (wet) | Site by site assessment, with habitat modification or larviciding if significant breeding site |

**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 applicator to treat approximately 90,000 catch basins (roadside storm drains) using the larvicide methoprene with the cooperation of other departments in the Region of Peel, the City of Brampton, the City of 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 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 are objects such as tires, buckets, and unused swimming pools etc. that collect rainwater. Besides other sanitation concerns, they are ideal mosquito breeding sites for certain species due to the lack of predators and may be especially productive when they are in a heavily vegetated area. On public lands there are already programs for waste removal and some 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 2008 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 found a number of roadside ditches that contained vector mosquito larvae in 2007. 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 plans will be considered within existing ditching programs.

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 2007, isolated areas of six storm management ponds received treatment; all the treated ponds were located in Mississauga.

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. And while many mosquitoes are present, the majority 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 2008 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 Rattray Marsh or 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 to provide 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 usual practice by property standards officers. Small sites will be dealt with through education. Significant 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 may consider enhancing natural biological controls in storm water management ponds, such as stocking with fathead minnows, if the Ministry of Natural Resources provides assistance in verifying the site is suitable for biological control.

- 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 90,000 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 2008.

- 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's West Nile Virus Working Group will conduct a weekly risk assessment based on surveillance information to identify the relative risk of human infection in Peel. The West Nile Virus Working Group consists of staff from various programs including environmental health, communications, epidemiology, and communicable disease. 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:

- Dead bird distribution and density – this helps to assess the amount of WNV in an area and its location. A large die-off of crows or blue jays from WNV suggests that human cases may occur in the next few weeks.

- 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, Customer Contact Centre and pertinent municipal and community organizations and the Ontario Regional Poison Control Centre in accordance with MOE requirements.

- Hospitals and the Ontario Regional Poison Control Centre 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.

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- Credit Valley Conservation - Biology, Field Operations, Communications
- Toronto Region Conservation Authority - Environmental Services
- 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