



Region of Waterloo
PUBLIC HEALTH

2015 Vector-Borne Disease Annual Report

What's Inside

Executive Summary	1
Introduction	2
Glossary	3
Human Case Surveillance	4
WNV	4
Lyme disease	5
Vector Surveillance and Control	6
WNV	6
Mosquito surveillance	7
Mosquito control	7
Lyme Disease	7
Tick surveillance	7
Public Awareness	8
Conclusion	9
Acknowledgements	9
Appendix	10

Executive Summary

Vector-borne diseases are diseases transmitted by vectors and account for more than 17% of infectious diseases around the world.¹ Vectors are organisms that transfer infectious pathogens from one infected person or animal to another. Mosquitoes and ticks are the primary vectors of concern to residents of Waterloo Region, because they are capable of transmitting West Nile Virus (WNV) and Lyme disease, respectively.

The objective of Region of Waterloo Public Health's Vector-Borne Disease Program is to reduce the risk of human exposure to WNV and Lyme disease. Public Health works to accomplish this objective by:

1. Monitoring (or surveillance) and investigating human cases
2. Monitoring and controlling vector species (mosquitoes); and
3. Raising public awareness

This report outlines some of the key activities carried out in 2015 regarding WNV and Lyme disease.

WNV

WNV is primarily a disease seen in birds, but it can be spread to humans through the bite of an infected

mosquito. In 2015, there was one confirmed case of WNV in Waterloo Region reported to Public Health. Mosquitoes that are capable of transmitting WNV (competent vectors) were identified in the region. In response to these findings, larval (young) mosquito control and public education through "Fight the Bite" campaign were carried out. Residents were recommended to take precautions against being bitten by mosquitoes.

Lyme disease

Lyme disease is caused by *Borrelia burgdorferi* bacteria through being bitten by black-legged ticks. Certain geographic areas in Ontario are high-risk for exposure to the black-legged ticks. In 2015, 9 confirmed and probable cases of Lyme disease were reported to Public Health. However, all cases were acquired through travel to regions endemic for Lyme disease. Active and passive tick surveillance was carried out in Waterloo Region. Of the ticks that have been found locally, none were black-legged ticks. When travelling to parts of Ontario or Canada endemic for Lyme disease, residents are encouraged to take precautions against being bitten by ticks. Public education was carried out to deliver this message through the "Fight the Bite" campaign.



Introduction

Vectors are organisms that transfer infectious pathogens from one infected person or animal to another. Many vectors are bloodsucking insects that consume infectious microorganisms during a blood meal from an infected human or animal and then inject them into a new non-infected human or animal.² A number of diseases can be transmitted to humans by vectors. West Nile virus & Lyme disease



are two vector borne diseases that are transmitted by mosquitoes and ticks, respectively. As a result, mosquitoes and ticks are the primary vectors of concern to residents of Waterloo Region.

West Nile virus (WNV) is a disease primarily seen in birds, but it can spread to humans through the bite of an infected mosquito. Seven years (2002-2008) of dead bird surveillance in the region has confirmed the presence of WNV in bird specimens and, as such, the virus is considered established in the bird population of Waterloo Region. This means that there is an increased likelihood for a mosquito to come into contact with an infected bird and transmit the disease to humans.



It is important to note that only adult female mosquitoes of certain species (e.g. *Culex pipiens* and *Culex restuans*) are capable of carrying and transmitting WNV to humans. These mosquitoes thrive in small bodies of standing water such as catch basins, abandoned swimming pools, and blocked eavestroughs, making these sites important points of target for vector control. Further, a mosquito carrying WNV does not always act as a vector;

the virus must enter the mosquito's salivary glands in order to transmit the virus to a human during a mosquito bite. The time it takes for the virus to be ingested and appear in the mosquito's salivary glands is typically 10-12 days and is called the incubation period.

The incubation period is largely influenced by climatic and seasonal variations.³ Warmer temperatures are known to speed up mosquito development and shorten the incubation period, therefore increasing the overall probability of WNV transmission to humans.⁴ It is also possible for increased precipitation to play a role in increasing the viral load and risk of transmission to humans, but the exact relationship between precipitation and mosquito abundance is not the same for all mosquito species.⁵

WNV was first confirmed in Ontario in 2001 and first identified in Waterloo Region in 2002. The majority of people infected with WNV show no symptoms. However, one in five infected individuals will develop mild, flu-like symptoms and one in 150 can develop serious neurological symptoms. While more serious symptoms can occur at any age, adults over the age of 50 and those with compromised immune systems are at the highest risk. The usual time from infection with WNV to onset of disease symptoms ranges from 2 to 15 days.

The other disease of concern in the region is **Lyme disease**. Lyme disease is caused by the *Borrelia burgdorferi* bacterium, which can be transmitted to humans through the bite of a black-legged tick carrying this bacterium. Unlike mosquitoes, ticks cannot fly. They settle on tall grass and bushes until they attach themselves to a person or animal passing by. As ticks feed on blood, its body slowly enlarges as it feeds, initially the size of a sesame seed and growing to the size of a dime.⁶

In Ontario, the tick species responsible for transmitting Lyme disease to humans is the black-legged tick, also known as *Ixodes scapularis* or the “deer tick”. While this species of tick is not currently found in Waterloo Region, areas along the north shores of Lake Erie and Lake Ontario have traditionally been endemic for the black-legged tick that can transmit Lyme disease. In addition, surveillance continues to identify new areas of risk including Rouge Valley and Pinery Provincial Park. The areas endemic for black-legged ticks are expected to continue to increase due to several factors such as climate change, changes in land use (e.g. farmland to forest, encroaching human population) and increase in the range of animal hosts available for ticks. Refer to Figure 1 in Appendix to find the risk areas. Residents of Waterloo Region may be exposed to black-legged ticks during visits to these or other endemic areas and are advised to take precautions to prevent tick bites. It is important to know that because ticks travel on migratory birds they can be found anywhere in the province, including Waterloo Region on occasion.

A circular rash, referred to as a “bull’s-eye” rash (Erythema migrans) at the site of the tick attachment could be one of the earliest symptoms

of infection. Fever, chills, and fatigue may also be present. Antibiotics can be effective in treating Lyme disease especially if taken in the early stages of infection, and can prevent long-term neurological, rheumatological, and cardiac complications.⁷ The usual time from tick bite to onset of disease symptoms ranges from three to 32 days, lasting an average of seven to ten days.⁸ The longer a tick is attached to the body, the higher the risk of infection with Lyme disease. An infected black-legged tick has to be attached and feeding for at least 24 hours before it can transmit the bacteria. Disease transmission can be prevented by inspecting the body for ticks after being outdoors and carefully removing them if found.

The objective of the Vector-Borne Disease Program at Region of Waterloo Public Health and Emergency Services is to protect residents from exposure to WNV and Lyme disease. Public Health works in a number of ways to accomplish this objective, including investigation of any human cases of WNV and Lyme disease; routine monitoring and control (when possible) of factors involved in vector-borne disease transmission; and educating the public about the risks and prevention methods. This report summarizes the activities carried out in 2015.

Glossary

Epidemic – widespread occurrence of an infectious disease or disease causing agent in a community at a particular time

Larvicide – pesticides that are specifically targeted at destroying mosquito larvae (young)

Mosquito pool – a collection of female mosquitoes (usually about 50 mosquitoes) of any given species or group that are likely to carry and transmit the disease

Surveillance – continuous and systematic close monitoring of diseases of public health significance to minimize health impacts of these diseases

Human Case Surveillance

- One West Nile virus case and nine Lyme disease cases were reported to Public Health.
- Both disease rates increased only slightly in 2015 compared to 2014. The public should be encouraged to take precautions against mosquitoes and ticks (especially when travelling to endemic areas).

Human cases of certain diseases including, West Nile virus and Lyme disease are required to be reported to Public Health. The purpose of encouraging reporting is to monitor disease trends and to identify possible sources of exposure, including geographic areas of risk. Monitoring such trends enable Public Health to identify high risk populations and focus public education to these populations. In addition, Public Health follows up with infected individuals to help them understand the disease and to ensure they are seeking medical attention.

WNV

In 2015, one confirmed case of WNV was reported in Waterloo Region. Provincially, there were 34 confirmed and probable cases of WNV documented.⁹ Table 1 shows the number of confirmed and probable cases of WNV among residents of Waterloo Region and Ontario, as well as local and provincial WNV disease rates.¹⁰ A slight increase in the local WNV disease rate was observed in 2015 (0.2 cases per 100,000) compared to 2014 and 2013 (0 cases per 100,000).

Table 1: Total number and rate per 100,000 of confirmed and probable West Nile Virus cases, Waterloo Region and Ontario, 2005-2015[†]

Year	Waterloo Region			Ontario		
	Total Case Count ^{B, C}	Crude rate per 100,000 ^A	Age standardized rate per 100,000	Total Case Count ^{D, E}	Crude rate per 100,000 ^A	Age standardized rate per 100,000
2005	1	0.2	0.16	91	0.73	0.65
2006	0	0.0	0.0	42	0.33	0.30
2007	0	0.0	0.0	16	0.13	0.1
2008	0	0.0	0.0	7	0.05	0.05
2009	0	0.0	0.0	4	0.03	0.03
2010	0	0.0	0.0	9	0.07	0.05
2011	2	0.38	0.34	81	0.61	0.49
2012	3	0.57	0.48	271	2.02	1.72
2013	0	0.0	0.0	57	0.42	0.35
2014	0	0.0	0.0	13	0.09	0.08
2015*	1	0.18	0.12	34	0.24	0.2

[†] Due to case definition changes in 2009, case counts for 2009-2015 include both confirmed and probable cases to allow for historical comparison over the time period.

*Ontario and Waterloo Region data for 2015 should be considered preliminary and subject to future revisions.

A RDIS (2002-2004), Region of Waterloo Public Health, Extracted: January 27, 2012

B iPHIS (2005-2015), Region of Waterloo Public Health, Extracted: January 27, 2016

C Population Estimates (2002-2013) and Projections (2014, 2015), Ontario Ministry of Health and Long-Term Care (MOHLTC), Extracted via IntelliHEALTH: April 20, 2015

D Ontario Public Health Portal (2002-2004), downloaded: January 27, 2012

E Public Health Ontario Query (2005-2015), Extracted from iPHIS January 27, 2016.

Lyme disease

In 2015, 9 confirmed and probable cases of Lyme disease were reported to Public Health and all were acquired outside the region. Provincially, there were 401 confirmed and probable cases of Lyme disease documented in 2015. Table 2 illustrates the number of confirmed and probable human cases of Lyme disease among residents of Waterloo Region and Ontario, as well as local and provincial disease rates.¹¹ In 2015, the rate of Lyme disease was 1.6 cases per 100,000. The increase in the local rate (of cases acquired outside the region) is consistent with an increase in the 2015 provincial rate overall.

The reason for the overall increase in Lyme disease rates is likely due to the changes introduced in 2015 to Ontario's Lyme

disease case definition. The case definition for Lyme disease takes into account clinical diagnosis and the geographical location where the disease was acquired. In 2015, new geographic areas were identified and designated as risk areas for Lyme disease acquisition in Ontario. As a result, the new case definition became broader and classifies more people as probable or confirmed cases that would otherwise have not been captured by the previous definition. The increase in cases associated with travel to locations outside of the Region may continue to grow over time with the increase in newly identified risk areas in Ontario. Therefore it will be important for residents to be aware of newly identified risk areas and continue to take precautions when travelling to areas of greater risk.

Table 2: Total number and rate per 100,000 of confirmed and probable Lyme disease cases, Waterloo Region and Ontario, 2005-2015[†]

Year	Waterloo Region			Ontario		
	Total Case Count ^{B, C}	Crude rate per 100,000 ^A	Age standardized rate per 100,000	Total Case Count ^{D, E}	Crude rate per 100,000 ^A	Age standardized rate per 100,000
2005	1	0.2	0.22	44	0.35	0.34
2006	1	0.2	0.19	41	0.32	0.30
2007	5	0.99	1.04	67	0.52	0.52
2008	3	0.59	0.61	88	0.68	0.67
2009	1	0.2	0.19	85	0.65	0.63
2010	0	0.0	0.0	89	0.68	0.62
2011	4	0.76	0.85	134	1.01	0.98
2012	3	0.57	0.49	170	1.27	1.18
2013	3	0.56	0.54	302	2.23	2.12
2014	1	0.18	0.17	242	1.76	1.63
2015*	9	1.61	1.48	401	2.89	2.62

[†] Due to case definition changes in 2009 and 2015, case counts for 2009-2015 include both confirmed and probable cases to allow for historical comparison over the time period
*Ontario and Waterloo Region data for 2015 should be considered preliminary and subject to future revisions.

A RDIS (2002-2004), Region of Waterloo Public Health, Extracted: January 27, 2012

B iPHIS (2005-2015), Region of Waterloo Public Health, Extracted: January 27, 2016

C Population Estimates (2002-2013) and Projections (2014, 2015), Ontario Ministry of Health and Long-Term Care (MOHLTC), Extracted via IntelliHEALTH: April 20, 2015

D Ontario Public Health Portal (2002-2004), downloaded: January 27, 2012

E Public Health Ontario Query (2005-2015), Extracted from iPHIS January 27, 2016.

Vector Surveillance and Control

- Larval and adult mosquitoes capable of transmitting WNV were identified in Waterloo Region and larval mosquito control was carried out to reduce mosquito population.
- The public should continue to take precautions to prevent being bitten by mosquitoes.
- Ticks capable of transmitting Lyme disease were not identified in Waterloo Region.
- Residents should be aware of areas endemic for Lyme disease and take precautions to prevent being bitten by ticks when travelling outside the Region.

Vector surveillance helps Public Health understand the extent of vector population present and make an informed decision about the need to do vector control and public education. Only certain types of mosquitoes and ticks are capable of transmitting WNV and Lyme diseases, respectively, to humans. When competent vectors are identified, a risk based approach is used to determine when vector control should be initiated, usually by the application of target specific larvicides.

WNV

Mosquito surveillance

Public Health conducts larval (young) and adult mosquito surveillance. Mosquitos begin their life in standing water as eggs, which then hatch into larvae. Larvae thrive in standing water and eventually mature into adult mosquitoes, which are capable of flying shortly after emerging from water. The purpose of larval mosquito surveillance is to identify areas that have considerable amount of larvae that are capable of becoming competent vectors. Larval mosquito surveillance was conducted in public small bodies of standing water areas such as municipal catch basins, storm water management ponds and ditches. In 2015, at least 54% of larvae captured and species identified, consisted of larvae that could mature into *Culex pipiens* and *Culex restuans*, which are the major vector species for WNV (Table 3 in Appendix).

In contrast to larval mosquito surveillance, which predicts the percentage of vectors that could grow into adult mosquitos, adult mosquito surveillance indicates the proportion of competent and disease carrying vectors present during a season. Competent vector species have been identified in Waterloo Region every year since monitoring began. In 2015, 68% percent of adult female specimens tested were competent vectors of WNV, as compared to 78% in 2014 (Table 4 in Appendix). Of the competent vectors, one mosquito pool tested positive for WNV (Table 5 in Appendix). This finding shows that there is a possibility that WNV carrying mosquitoes are present in Waterloo Region and the public should avoid being bitten by mosquitos when outside, especially if they are identified as high risk population (i.e. immune-compromised, young children, seniors, and pregnant women). Some precautionary measures to avoid being bitten by mosquitos are to avoid being outside from dawn to dusk; wearing clothing such as light-colored long pants, long sleeved shirts, socks; and using insect repellent containing DEET or Icaridin.

Mosquito control

To determine the need for vector control, Public Health considers a number of factors, including weather patterns, larval and adult mosquito populations, positive adult mosquito pools, and rates of human infection. These factors are considered together with the expected benefits and risks of larvicide use for mosquito control.

As competent adult and larval mosquitos were found vector surveillance, Public Health decided to employ preventive control measures against larvae in standing water areas. Larval mosquito control is a practice supported by Public Health Ontario and is a feasible approach as larvae are confined to standing water. Public Health employs two means of identifying standing waters: routine monitoring carried out by Public Health, or via a public complaint investigation. Examples of standing water areas across the region are catch basins, ditches, or storm water management ponds.

Larval control products were chosen based on their suitability for a given mosquito habitat and were informed by recommendations from the Ministry of Health and Long Term Care WNV Preparedness and Prevention Plan, the Pest Management Regulatory Agency of Canada, and the Ministry of Environment and Climate Change. Catch basin treatments were applied three times between June and September (initiated on June 24th, July 20th and August 23th). The vast majority of preventive larvicide applications were carried out by bicycle, resulting in reduced greenhouse gas emissions (as compared to conducting this service with a motor vehicle).

Efficacy of these treatment programs were also tested in 2015. Treated areas showed that after one week of treatment, 9 out of 10 catch basins were efficacious. The overall mean efficacy is 99%, one week after treatment. This means that the vector control program was successful in destroying a large proportion of larval mosquitoes which likely decreased the proportion of larvae that matured and contributed to adult mosquito population in the region.

Lyme Disease

Tick surveillance

Black-legged ticks are not currently considered native to Waterloo Region. However they may be found on occasion in the region, having traveled on migratory birds or other warm-blooded mammals who have visited endemic areas. Tick surveillance can help to determine the extent of black-legged tick populations within a given area. In 2015, Public Health used two ways of monitoring the tick population in the region.

First, ticks were collected by an active surveillance method where public health staff collect ticks from their natural habitats and identify their species. In 2015, Public Health staff conducted active tick surveillance at 18 sites in the spring of 2015 across various urban and rural sites in Waterloo Region through a process called tick-dragging. Three ticks were found during these investigations, but none were identified as black-legged ticks. Active surveillance was conducted in Waterloo Region for 3.5 years and no black-legged ticks were identified during this period. This finding suggests that black-legged ticks are not currently present in Waterloo Region.

After completing active tick dragging for the spring of 2015, the biannual active tick dragging program at Region of Waterloo Public Health was discontinued due to: no discovery of black legged ticks throughout the program length; increased active tick dragging surveillance by Public Health Ontario and enhanced risk area maps for Lyme Disease; and specific direction from Public Health Ontario on when to actively tick drag. From this point forward, Public Health will resume active tick dragging when strategically valid or if directed to do so by the Ministry of Health and Long-term Care / Public Health Ontario.



The second method of tick surveillance is a passive means, where Public Health collects tick specimens from the public when there is reported exposure to a human, and submits them for laboratory testing. When identified, black-legged ticks are submitted for further testing for the presence of the *Borrelia burgdorferi* bacterium. Public Health submitted 99 tick specimens for laboratory testing in 2015, and of those, 19 were identified as black-legged ticks. Five of the

19 black-legged ticks submitted tested positive for the Lyme disease-causing bacterium *Borrelia burgdorferi*. None of the five ticks that tested positive for *Borrelia burgdorferi* bacteria were acquired locally. The remaining ticks submitted were not species capable of transmitting Lyme disease, and are not a public health concern. Passive surveillance will continue in Waterloo Region.

Public Awareness

Public Health raises awareness about vector borne diseases through the following ways:

- Fight the Bite campaign including social media
- Media releases and appearances
- Availability to answer questions over the phone and in-person via the Public Health Inspection intake line
- Maintaining an updated website

In addition to vector surveillance and control, another crucial component of controlling and preventing vector-borne diseases is behaviour change. Public Health works both independently and in collaboration with community partners (i.e. municipalities) to increase the awareness and knowledge about preventing behaviours that increase the risk of being exposed to the vectors.

“Fight the Bite” is Public Health’s public education campaign on vector-borne disease, including WNV and Lyme disease. The campaign provides general information about the diseases, their risk factors, and recommended personal protective measures to minimize risk of exposure. This campaign also encourages the public to identify bodies of standing water in their neighbourhood and to report them to Public Health or to municipalities with standing water by-laws. “Fight the Bite” print and social media materials referencing our webpage are widely distributed to our community partners including the Region of Waterloo Museum,



Regional libraries, Grand River Conservation Authority sites and by request to municipalities, childcare centres, community centres, and schools. “Fight the Bite” information was also shared through interactive displays at community events such as EcoFest and at the Waterloo Wellington Children’s Groundwater Festival in 2015.

In addition to reaching out to the public through social media and the Regional website, Public Health raises public awareness by issuing media releases and appearing on various news channels to answer questions from the media. In 2015, Public Health engaged with the media on 11 occasions related to vector borne diseases.

Further, the public can contact Public Health directly through the Public Health Inspection intake line (519-575-4400 ext. 5147) for information, questions, complaints, or requests regarding vector-borne diseases. Vector-borne disease information is also available and kept up-to-date on the Region of Waterloo Public Health’s website under the Environment and Your Health, Insects and Animals webpages at chd.region.waterloo.on.ca/en/healthyLivingHealthProtection/Insects-and-Animals.asp.

Conclusion

In 2015 one confirmed human case of WNV was identified in the local population and one mosquito pool tested positive for WNV. The Medical Officer of Health's decision to continue a larviciding control program was informed by direction from the Ministry of Health and Long-term Care, the presence of vector species identified through larval mosquito surveillance, as well as a past history of positive pools, bird specimens and human cases in the Region. Increasing the public's awareness about the risk of WNV infection, as well as reminding residents to take personal protective measures from mosquitoes, is essential to reduce the risk of infection.

Nine probable or confirmed Lyme disease cases were reported to Public Health; all were acquired through travel to an endemic area outside the Region of Waterloo. The local risk of exposure

to Lyme disease remains extremely low since the Waterloo Region does not presently have an endemic black-legged tick population. However, it is important for residents to continue to take preventative protective measures, especially when travelling to areas of higher risk in Ontario.



Acknowledgements

Public Health's WNV program is the product of collaboration with a number of provincial ministries, area municipalities, school boards, colleges and universities, and other community stakeholders. We gratefully acknowledge our partners for their important contributions to our vector-borne disease program, including: human case surveillance among blood donors, granting access to their lands for mosquito control programs, assisting with coordination and implementation of catch basin larviciding programs and standing water investigations, participating in public education campaigns, and providing laboratory and vector surveillance and control services.

Canadian Blood Services
City of Cambridge
City of Kitchener
City of Waterloo
Conestoga College
Conseil scolaire de district catholique Centre-Sud

Conseil scolaire Viamonde
Goderich-Exeter Railway
Grand River Conservation Authority
Hydro One
Kitchener-Waterloo Humane Society
London Public Health Laboratory
Ministry of Environment and Climate Change
Ministry of Health and Long Term Care
Ministry of Natural Resources
Ministry of Transportation
Region of Waterloo
Toronto Public Health Laboratory
Township of North Dumfries
Township of Wellesley
Township of Wilmot
Township of Woolwich
University of Waterloo
Waterloo Catholic District School Board
Waterloo District School Board
Wilfred Laurier University

Appendix

Figure 1: Known blacklegged tick populations: Southern Ontario, 2016

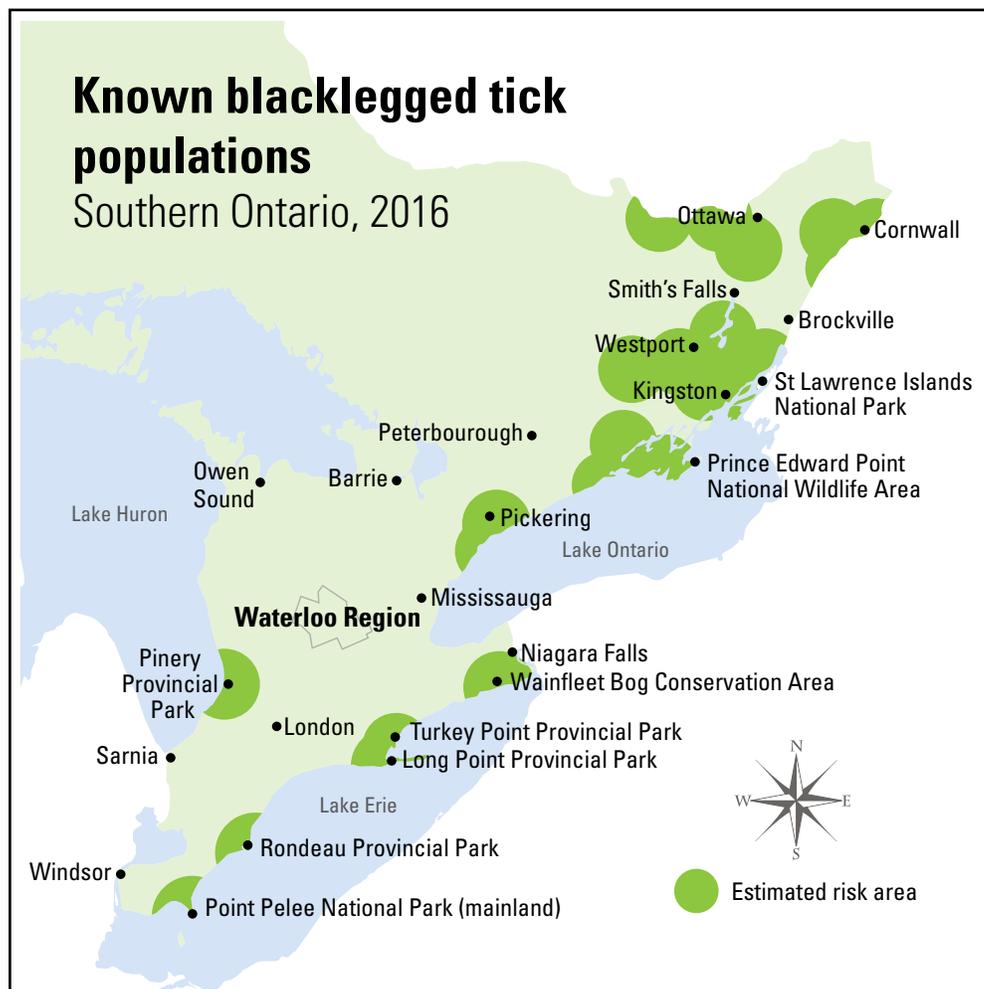


Table 3. Distribution of larval mosquitoes for Waterloo Region in 2015

Mosquito Species	Relative Abundance (%)
Cx. restuans	46.93
Oc. japonicus	28.48
Cx. pipiens	7.44
An. punctipennis	0.97
Cx. territans	0.32
Non-species identified	15.85

Table 4. Distribution of mosquito species identified for Waterloo Region, 2005-2015

Species	Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Vector Species (adult females)											
Cx. pipiens/restuans	6%	7%	12%	6%	7%	7%	4%	6%	7%	2%	2%
Ae. vexans	32%	33%	11%	26%	10%	27%	16%	45%	36%	16%	27%
An. punctipennis	2%	4%	3%	4%	2%	2%					2%
An. quadrimaculatus	3%	2%	4%	1%	1%	1%	10%	9%	8%	2%	2%
An. walkeri	0%	0%	0%	0%	0%	0%					0%
Cx. salinarius	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cx. tarsalis	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Oc. canadensis	0%	1%	1%	1%	3%	0%	0%	0%	0%	0%	1%
Oc. japonicus	1%	2%	3%	1%	4%	3%	2%	5%	2%	2%	3%
Oc. stimulans	16%	19%	27%	24%	15%	4%	10%	6%	18%	30%	9%
Oc. triseriatus*2015 included Oc. triseriatus/hendersoni	3%	1%	2%	1%	2%	2%	1%	2%	1%	2%	*1%
Oc. trivittatus	6%	9%	1%	20%	8%	24%	0%	0%	15%	14%	21%
Other vector species	--	--	--	--	--	--	7%	7%	4%	10%	0%
Non vector species											
Cq. perturbans	18%	15%	28%	9%	43%	22%	46%	17%	8%	19%	22%
Other non-vector species (includes adult males)	11%	8%	9%	6%	5%	10%	4%	2%	3%	3%	9%

Data provided by GDG Environnement

Table 5. Total positive WNV mosquito pools for Waterloo Region, 2005-2015

Sample Type	Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Waterloo Region	1	1	0	0	0	3	2	6	2	0	1
Ontario*	289	182	51	62	14	57	286	464	198	56	94*

* Retrieved on February 24, 2016 from Public Health Ontario WNV Weekly Surveillance Report, Week 40, 2015 at https://www.publichealthontario.ca/en/DataAndAnalytics/Documents/PHO_WNV_Weekly_Vector_Surveillance_Report_2015_Week_40.pdf**Table 6. Public inquiries related to West Nile Virus in Waterloo Region, 2005-2015**

Public Inquiries	Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013*	2014*	2015*
Total public inquiries received	1767	1345	769	652	71	30	82	60	94	53	51
# of dead bird reports	1203	1111	696	533	28	9	53	43	45	38	34
# of standing water reports	167	197	73	96	30	16	17	6	15	5	8
# of other general information requests	397	37	0	23	13	5	12	11	34	10	9

* Data tracking method changed in 2013; data for 2013, 2014, and 2015 comes from a source (i.e. Service First Call Centre (SFCC) public inquiry volume) that is different from previous years (i.e. Hedgehog)

References:

- ¹ WHO (2016). Vector-borne diseases. Retrieved June 21, 2016, from: www.who.int/mediacentre/factsheets/fs387/en/
- ² Last, J.M. (2007). *A Dictionary of Public Health* (pp.387). New York: Oxford University Press.
- ³ Last, J.M. (2001). *A Dictionary of Epidemiology* (4th ed) (pp.185-186). New York: Oxford University Press.
- ⁴ Reisen, W.K., Fang, Y. & Martinez. (2006). *Effects of temperature on the transmission of West Nile Virus by Culex tarsalis*. *Journal of Medical Entomology*, 43 (2); 309-317.
- ⁵ Landesman, W.J., Allan, B.F., Langerhans, L.B., Knight, T.M., & Chase, J.M. (2007). *Inter-annual associations between precipitation and human incidence of West Nile Virus in the United States*. *Vector-Borne and Zoonotic Diseases*, 7 (3); 337-343.
- ⁶ Ministry of Health and Long-Term Care (2009). Lyme disease. Public Health Division, MOHLTC, Catalogue No. 014253, Queen's Printer for Ontario. Retrieved December 29, 2010, from: www.health.gov.on.ca/en/public/publications/disease/pdf/lyme.pdf
- ⁷ Wormser, G. P., Dattwyler, R. J., Shapiro, E. D., Halperin, J. J., Steere, A. C., Klempner, M. S., ... & Bockenstedt, L. (2006). The clinical assessment, treatment, and prevention of Lyme disease, human granulocytic anaplasmosis, and babesiosis: clinical practice guidelines by the Infectious Diseases Society of America. *Clinical Infectious Diseases*, 43 (9), 1089-1134.
- ⁸ Heymann, D.I. (2004). *Control of Communicable Diseases Manual* (18th ed). (pp.317). Washington, Dc: American Public Health Association.
- ⁹ Ontario and Waterloo Region data for 2015 should be considered preliminary and subject to future revisions.
- ¹⁰ The provincial case definition for WNV was revised midway through 2009 and, as a result, caution should be taken when examining trends over time.
- ¹¹ The provincial case definition for Lyme disease was revised midway through 2009 and again in 2015, as a result, caution should be taken when examining trends over time.



2015

Vector-Borne Disease

Annual Report

For more information call Region of Waterloo Public Health
Health Protection and Investigation Division

519-575-4400 ext. 5147 / TTY: 519-575-4608
www.regionofwaterloo.ca/fightthebite

Current as of May 21, 2015

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