

West Nile Virus in the City of Toronto 2007

Toronto Public Health



For More Information on West Nile Virus:

Please visit <http://www.toronto.ca/health/westnile/> or contact Toronto Public Health at 416-338-8102.

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OVERVIEW

From 2003 to 2007, a total of 98 WNV human cases, 295 WNV positive mosquito batches and 87 WNV positive birds were reported in the City of Toronto. Overall, WNV activity was much lower in 2004 compared to 2003, followed by a marked increase in 2005, and a considerable decrease in 2006 and 2007. Within the last five years of surveillance, the earliest collection date of a positive bird occurred in the first week of June, the earliest collection date of a positive mosquito batch was in the third week of July, and the earliest onset date of a positive human case was in the third week of July (Table 1).

The following report will present the 2007 WNV data in more detail. In 2007, four WNV positive human cases (2 cases were travel related), seventeen WNV positive mosquito batches and two WNV positive birds were reported in the city of Toronto as shown in Map 1. In comparison to previous WNV seasons, the 2007 WNV season was the best thus far in terms of the low number of positive human cases, mosquito batches and dead birds (Table 1).

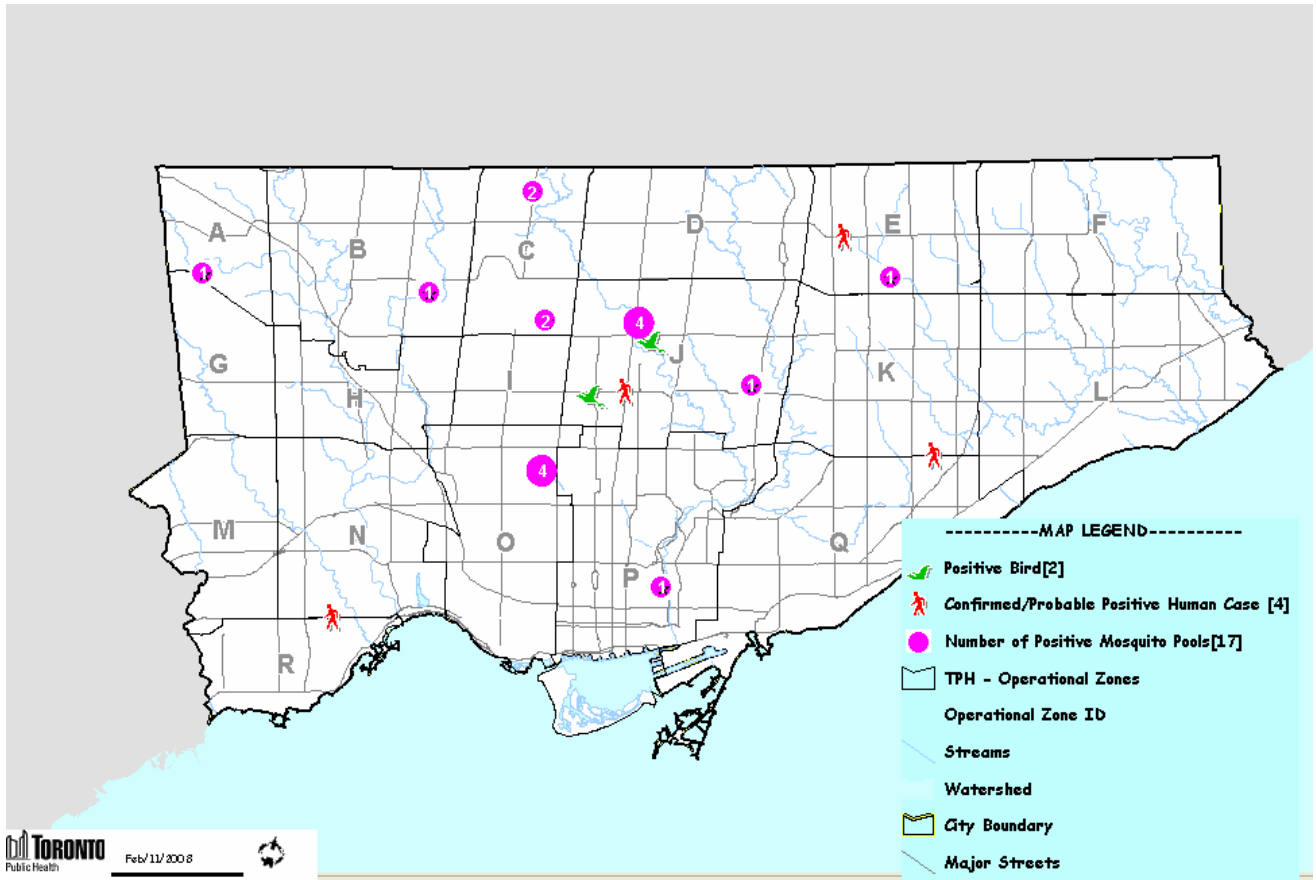
Table 1. WNV Positive Indicators in Toronto, 2003 to 2007

Year	Indicator					
	Human Cases		Mosquito Batches		Dead Birds	
	Number of Positives	Date of First* Positive	Number of Positives	Date of First* Positive	Number of Positives	Date of First* Positive
2003	44	August 9	56	August 12	17	July 18
2004	6	August 14	33	August 4	18	June 3
2005	38	July 20	142	July 21	37	July 18
2006	6	July 23	47	July 25	13	July 28
2007	4**	August 21	17	August 14	2	August 23

* Based on illness onset date and date of collection

** Two cases were acquired outside the City of Toronto

Map 1. WNV Positive Indicators, Toronto, 2007



HUMAN SURVEILLANCE

Toronto's WNV human infection rate was 0.2 per 100,000 population in 2007. This is double the rate for the rest of Ontario. With the exception of the 2006 season, the human infection rate in Toronto has been higher than the rest of Ontario; Toronto's infection rate was three times higher in 2003, two times higher in 2004, and two and a half times higher than the rest of Ontario in 2005 (Table 2).

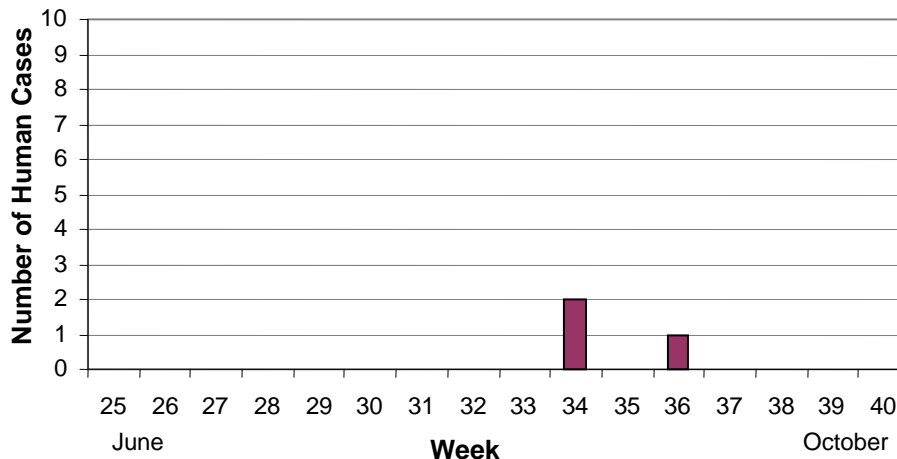
Table 2. WNV Human Cases and Deaths, 2003 to 2007.

YEAR	TORONTO				ONTARIO (excluding Toronto)			
	Number of Cases (n)	Incidence Rate (per 100,000)	Number of Deaths (n)**	Case Fatality Rate (%)	Number of Cases (n)	Incidence Rate (per 100,000)	Number of Deaths (n)	Case Fatality Rate (%)
2003	44	1.7	0	0.0	45	0.5	2	4.4
2004	6	0.2	0	0.0	8	0.1	0	0.0
2005	38	1.5	6	15.8	63	0.6	6	9.5
2006	6	0.2	1	16.7	36	0.4	1	2.8
2007***	4*	0.2	0	0.0	11	0.1	0	0.0

* Two cases were acquired outside the City of Toronto
 **Deaths include those with evidence of WNV infection where WNV may not be the cause of death. The fatality in 2006 was determined to not be associated with WNV. Rates are calculated based on population projections and estimates from the Ministry of Health and Long-Term Care.
 *** Due to small numbers, caution must be used when interpreting rates

Figure 1 presents the distribution of WNV human cases by onset of illness in Toronto 2007. The first two human cases experienced symptoms at the end of August (August 19-21, 2007), while the other case had an onset date in early September (September 2, 2007). The onset date for one human case could not be determined.

Figure 1. WNV Human Cases by Week of Onset, Toronto 2007



The mean age of the 2007 WNV cases is 49 years, with a range from 13 years to 77 years. Seventy-five percent of the 2007 cases are male. One case required hospitalization.

DEAD BIRD SURVEILLANCE

From May to October 2007, Toronto Animal Services staff received 516 dead bird reports, collected 60 dead crow and blue jay birds, 4 of which were sent for testing. The majority of the dead birds were reported and collected between June and September. The first positive bird was collected at the end of August (Table 3).

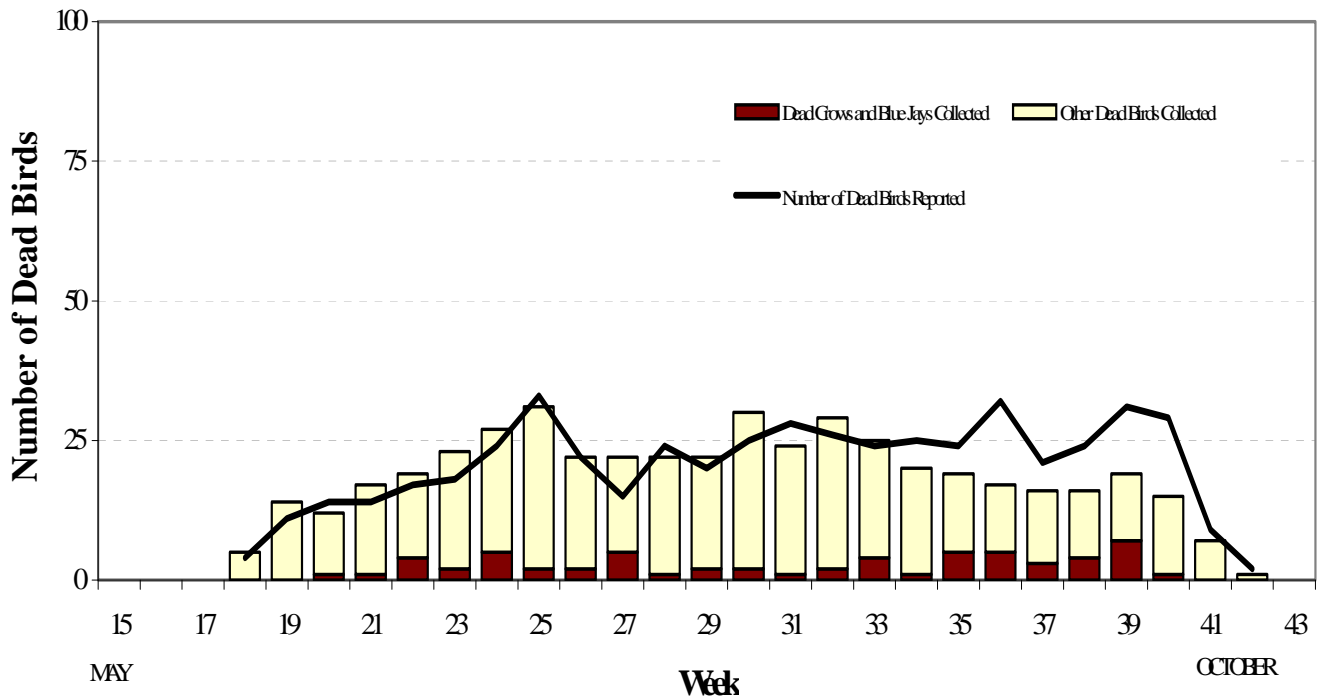
Table 3. Dead Birds Reported, Collected and Sent for Testing by Month, 2007

Month	Dead Birds Reported	Dead Crows & Jays Collected	Dead Crows & Jays Sent for Testing	Positive Birds (%)
April	4	-	-	N/A
May	56	2	-	N/A
June	97	13	-	N/A
July	112	12	1	0 (0.0)
August	99	8	1	1 (100.0)
September	137	24	1	1 (100.0)
October	11	1	1	0 (0.0)
TOTAL	516	60	4	2 (50.0)

N/A: Not Applicable.

Figure 2 presents the distribution of reported dead birds and the number of dead birds collected in 2007. Dead bird reports peaked from June 17 to 23 and from September 2 to 8. Thirteen percent (n=60) of the birds collected were crows or blue jays – the species targeted for WNV testing.

Figure 2. Dead Birds Reported and Collected, 2007



ADULT MOSQUITO SURVEILLANCE

In 2007, forty-three permanent trap locations were used to collect mosquitoes in the City of Toronto. A total of 15,580 mosquitoes from sixteen species/species groups¹ were captured in the City of Toronto. The most abundant captures occurred from July 29 to August 4 and from August 12 to August 18. *Culex pipiens/restuans* species were the most predominant, representing 47 percent of all species captured. Other dominant species/species groups identified include *Aedes vexans vexans* (23%), *Coquillettidia perturbans* (13 %) and *Ochlerotatus stimulans* (7%) (Table 4).

Compared to the 2006 season, the 2007 season trapped considerably fewer mosquitoes (approximately half). Although *Culex pipiens/restuans* and *Aedes vexans vexans* species were the top two species trapped for both years, the proportional ranking of each switched from 2006 to 2007.

Table 4. Mosquitoes Trapped by Species/Species Group, 2006 & 2007

Mosquito Species/Species Group	Estimated Number of Mosquitoes Trapped 2006**	Percentage of Total Trapped (%) 2006	Estimated Number of Mosquitoes Trapped 2007***	Percentage of Total Trapped (%) 2007
<i>Culex pipiens/restuans complex</i>	11,871	40.1	7309	46.9
<i>Aedes vexans vexans</i>	12,392	41.9	3578	23.0
<i>Coquillettidia perturbans</i>	1,073	3.6	2066	13.3
<i>Ochlerotatus stimulans</i>	889	3.0	1018	6.5
<i>Anopheles punctipennis</i>	649	2.2	546	3.5
Other species*	489	1.7	369	2.4
<i>Ochlerotatus triseriatus/hendersoni</i>	510	1.7	283	1.8
<i>Ochlerotatus trivittatus</i>	1,169	3.9	250	1.6
<i>Ochlerotatus canadensis</i>	497	1.7	103	0.7
<i>Anopheles quadrimaculatus</i>	63	0.2	58	0.4
Total	29,602	100.0	15,580	100.0

* Mosquito species not included were captured in 'Other species'.

**In 2006, 1,254 mosquitoes were damaged, or 4% of the total trapped. Damaged species were not included in Total

*** In 2007, 87 mosquitoes were damaged, or .6% of the total trapped. Damaged species were not included in Total

Of the mosquitoes captured in 2007, 12,728 mosquitoes were identified and divided into mosquito batches². Out of the batches tested, 17 mosquito batches (1.4%) tested positive for WNV. The first positive batches were collected mid-August. Testing ended at the end of September, and the last positive batches were collected in mid-September. The majority of the positive batches were collected during the month of August, with 77% of all positive batches belonging to the *Culex pipiens/restuans complex* group. (Table 5). The Toronto WNV program focuses its mosquito reduction efforts on this species group of mosquitoes.

¹ Mosquito species that could not be distinguished were reported as combined groups (e.g. *Culex pipiens/restuans complex*).

² Trapped adult mosquitoes were grouped by trap and species into batches with a maximum of 50 mosquitoes per batch for WNV testing. When there were more than 50 mosquitoes from the same trap-night and species, additional batches were created.

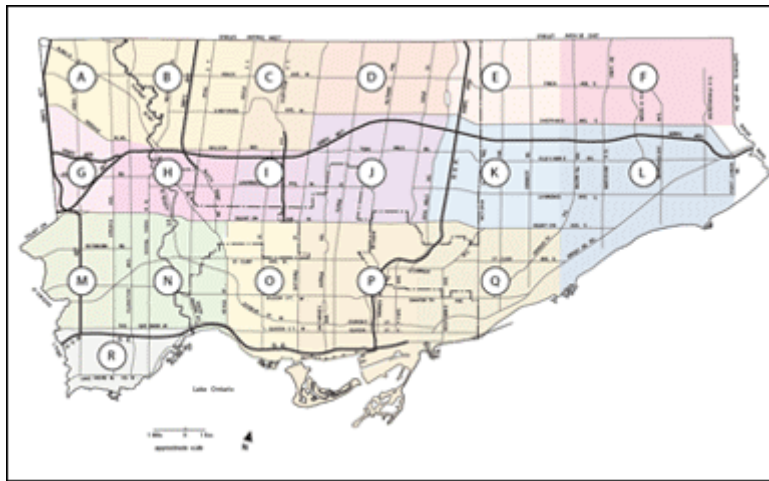
Table 5. Mosquito Batches Tested and Positive Batches by Species/Species Group, 2007

Mosquito Species/Species Group	Number of Mosquito Batches Tested	Number of Positive Batches (%)
<i>Culex pipiens/ restuans</i>	668	13(1.9)
<i>Aedes vexans vexans</i>	326	3(0.9)
<i>Ochlerotatus triseriatus</i>	28	1(3.6)
<i>Other species</i>	229	0 (0.0)
Total	1,251	17 (1.4)

MOSQUITO REDUCTION

Larviciding is the use of chemical and biological products to reduce numbers of mosquito larvae. It is an important method to reduce mosquito numbers in the City of Toronto. The larviciding program divided the city into 18 zones for planning purposes (Map 2).

Map 2. WNV Geographic Zones, Toronto, 2007



Catch basins are the main site of larvae important to WNV transmission. Table 6 presents the mosquito larvicide applications to catch basins across the 18 geographic zones in the city of Toronto. Methoprene and *Bacillus sphaericus* (*Bs*) were applied to city-owned storm-water catch basins to reduce mosquito populations. *Bs* required monthly application while Methoprene ingots required one application for the season.

Table 6. Mosquito Larvicide Applications, 2007

Larvicide	Start Date	Zones	Completion Date
<i>Bs</i> (Round 1)	June 14, 2007	M, N, O, P	June 27, 2007
<i>Bs</i> (Round 2)	July 12, 2007	M, N, O, P	July 26, 2007

<i>Bs</i> (Round 3)	August 10, 2007	M, N, O, P	Aug 23, 2007
<i>Bs</i> (single round)	July 31, 2007	F	Aug 2, 2007
Methoprene Ingot	June 05, 2007	A, B, C, D, E,G, H, I, J, K, L, Q, R	Aug 2, 2007

Mosquitoes also breed wherever there is standing water outside of catch basins (surface water sites) that lasts seven days or longer, depending on the weather. A licensed pesticide applicator was hired to apply the larvicide, *Bti*, to surface water sites that had elevated counts of mosquito larvae. From June 20 to September 29, 106 surface water sites were routinely inspected and 48 of these sites were treated at least once, with a total of 210 larvicide applications.

EDUCATION AND OUTREACH

Public education activities included a print advertising campaign, presentations to community groups, the distribution of pamphlets and information packages to various locations across the City, and displays at various institutions and community events.

WNV information was made available to the public on the Toronto Public Health website. The site was regularly updated from the middle of May to the end of October, and contained WNV fact sheets, updates on larviciding locations, the current status of WNV in the city of Toronto, and media releases. Public Health staff at Toronto Health Connection (416-338-7600) were available to provide information on WNV for those without access to the internet.

Toronto Public Health recommended the use of personal protection against mosquitoes when out at night, especially during dusk and dawn when mosquitoes tend to be most active.

Toronto Public Health requested that the public report all dead bird sightings to Toronto Health Connection, at 416-338-7600. In addition, the public was asked to report areas of stagnant water to Toronto Health Connection, as water that stands for longer than one week may serve as breeding grounds for mosquitoes. The public was also asked to minimise areas of stagnant water around their homes.