

Adult Mosquito Surveillance

Adult Mosquito Surveillance Highlights for 2006

- 71,099 female adult mosquitoes were collected and separated into species in Peel Region, a 22% decrease over the number collected in 2005
- 20 different mosquito species and species groups were found in the Region of Peel
 - *Aedes vexans* and *Coquillettidia perturbans* were the most common species collected at 39% and 28%, respectively
 - 5% of all mosquitoes collected were *Culex* species
 - The abundance of *Ochlerotatus japonicus* increased by four times in 2006
- A total of 35 permanent and special study traps were set in Peel Region (Mississauga – 19; Brampton – 11; Caledon – 5)
- 9 traps contained positive mosquitoes in 2006
 - 7 traps had positive mosquitoes only once
 - one trap had positive mosquitoes more than 4 times
- The number of positive batches decreased to 14 from 24 in 2005
 - 12 positive batches were due to *Culex* species
 - 1 positive batch was due to *Aedes vexans* and another positive batch due to *Ochlerotatus trivittatus*
- The first positive batch was reported on July 25, 2006 in Mississauga
- Peel Region had the third highest number of positive mosquito batches in the province. Only the City of Toronto and Halton Region had more with 47 and 17 positive batches, respectively.
- Nationally, five provinces reported positive mosquito batches – Ontario had the greatest number, 182, followed by Manitoba with 171
- In the Great Lake States, Illinois reported the most positive batches with 2,980
- A pilot study of the Asian tiger mosquito (*Stegomyia albopicta*), a vector for a number of viruses including WNV, was conducted. No Asian tiger mosquitoes were collected in 2006.

West Nile Virus (WNV) circulates between mosquitoes and birds when a female mosquito feeds on the blood of a WNV-infected bird. Once the virus has incubated in the mosquito, it can be passed to another host through the saliva of the mosquito. Mosquito surveillance programs serve to monitor the mosquito population both for their size and species. Certain species are associated with WNV transmission to humans. It is therefore important to monitor their occurrence in order to assess the potential human health risk. In 2006, the species of particular interest due to their WNV transmission risk continued to be the *Culex* species.



Figure 11 CDC Light Trap

Source: Region of Peel, 2005

In 2006, Peel Public Health used two types of mosquito traps. The majority of the traps were the Center for Disease Control (CDC) light trap (Figure 11). These traps were placed in fixed locations throughout the surveillance season. This type of trap uses light and carbon dioxide to attract adult female mosquitoes that are looking for a blood meal. The second type of trap, the Omni-Directional Fay-Prince trap was used as part of a special study related to the Asian tiger mosquito. Five Omni-Directional Fay-Prince traps were used throughout the Region. In addition, tire traps were used in the Asian tiger mosquito study to monitor Asian tiger egg laying activities. Refer to the end of this chapter for more information on the Asian tiger mosquito study.

Adult mosquitoes were collected once weekly from the fixed location trapping sites. The mosquitoes were packed on dry ice and sent by courier to GDG Environment Ltd. (GDG) in Trois-Rivières, Québec.

Upon receipt, taxonomists sorted the specimens by removing other insects and male mosquitoes. The remaining female mosquitoes were identified at the species level. If specimens were unidentifiable due to their condition, they were placed at the highest species level possible (group, genus and in extreme cases, family).

The mosquitoes were grouped into batches of approximately 50 individual mosquitoes and placed in air tight vials each containing one species or species group (Figure 12).



The number of gravid females (egg carrying females) present was recorded for each pool. When the trap contained more than 500 female mosquitoes, a subsample was extracted and processed. Enriched subsampling was also done which involved removing all visible specimens of *Culex pipiens* and *Culex restuans* in the unprocessed portion of the trap contents and adding these to the processed portion of the trap contents. The unprocessed portion of the trap contents were preserved for possible subsequent research.¹⁶

Figure 12 Mosquito Sorting at GDG

Source: Region of Peel - Public Health

While there was an attempt to identify all species in a given pool, particular attention was placed to identifying and testing those mosquito species that have been confirmed to be carriers of WNV in Ontario and in North America. The species tested for WNV were prioritized based on a number of factors including species, vector potential, abundance, population density, risk of humans being bitten and past WNV activity.

Once separated into species-specific batches of no more than 50 mosquitoes, the samples were tested for WNV. GDG Environment Ltd. tested the batches according to the standards proposed by the Health Canada Special Pathogens Branch of the National Microbiology Laboratory. The method used to detect WNV is called reverse transcription polymerase chain reaction (RT-PCR) – Figure 13.¹⁷



Figure 13 Reverse Transcription Polymerase Chain Reaction Instrument

Source: Region of Peel – Public Health, 2006

Table 11 presents the estimated number of mosquitoes collected by species.ⁱⁱ These estimates are based partially on actual counts, where the pool size was less than 50 mosquitoes and partially on estimating methods when the pool sizes exceeded 50 mosquitoes.¹⁶ Almost 71,000 mosquitoes were collected and identified by species. This represents a 22% decrease in the total number of mosquitoes collected over 2005 when 90,769 mosquitoes were collected. The same numbers of permanent CDC light traps were deployed in 2004, 2005 and 2006; whereas there were fewer traps deployed in years 2001 to 2003.

Twenty mosquito species or species groups were identified in Peel in 2006.¹⁶ Less than one per cent of the mosquitoes were unclassifiable and were placed in an “other species” grouping.

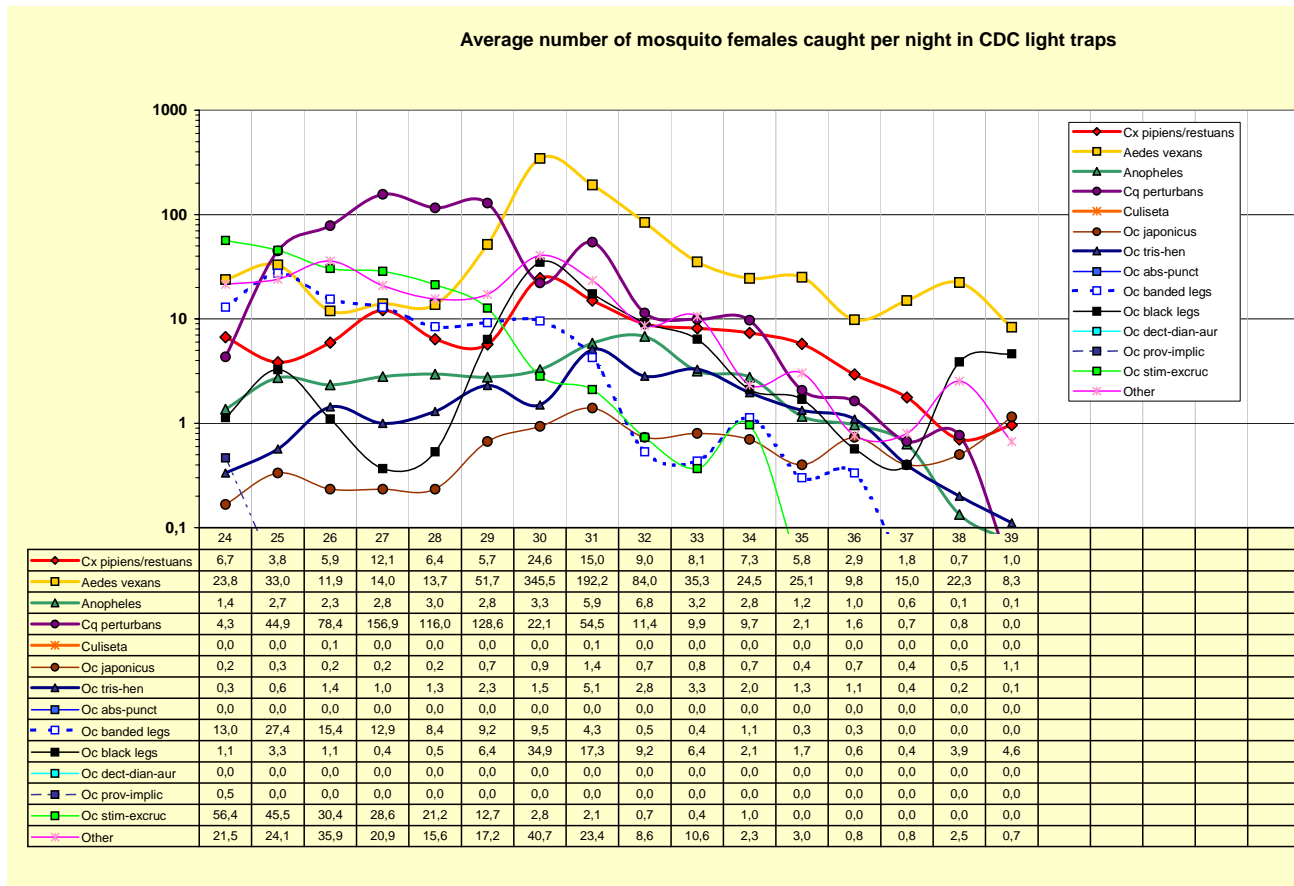
Aedes vexans and *Coquillettidia perturbans* were the most common mosquito species collected representing 39% and 28% of the total number of adult female mosquitoes collected (Table 11). This finding is somewhat consistent with the species prevalent in previous years. In 2005, *Coquillettidia perturbans* was the most common at 38% followed by *Aedes vexans* at 26%.¹¹ Vector mosquitoes, *Culex* species, accounted for slightly more than 5% of the total number of adult female mosquitoes collected which was marginally greater than this species proportion in 2005 (approximately 4.7%). Figure 14 illustrates the intra-seasonal trend where a shift in abundance between *Coquillettidia perturbans* and *Aedes vexans* were observed (*Coquillettidia perturbans* being more abundant in the early part of the season and *Aedes vexans* in the later part).¹⁷ This figure also shows that *Culex pipiens/restuans* demonstrated a bimodal abundance pattern with elevated numbers of *Culex* species corresponding to elevated or peaks in *Coquillettidia perturbans* and *Aedes vexans* abundance.

ⁱⁱ These totals are based on the results of weekly reports provided to the Region of Peel by GDG Environment Ltd.

2006 – West Nile Virus in the Region of Peel

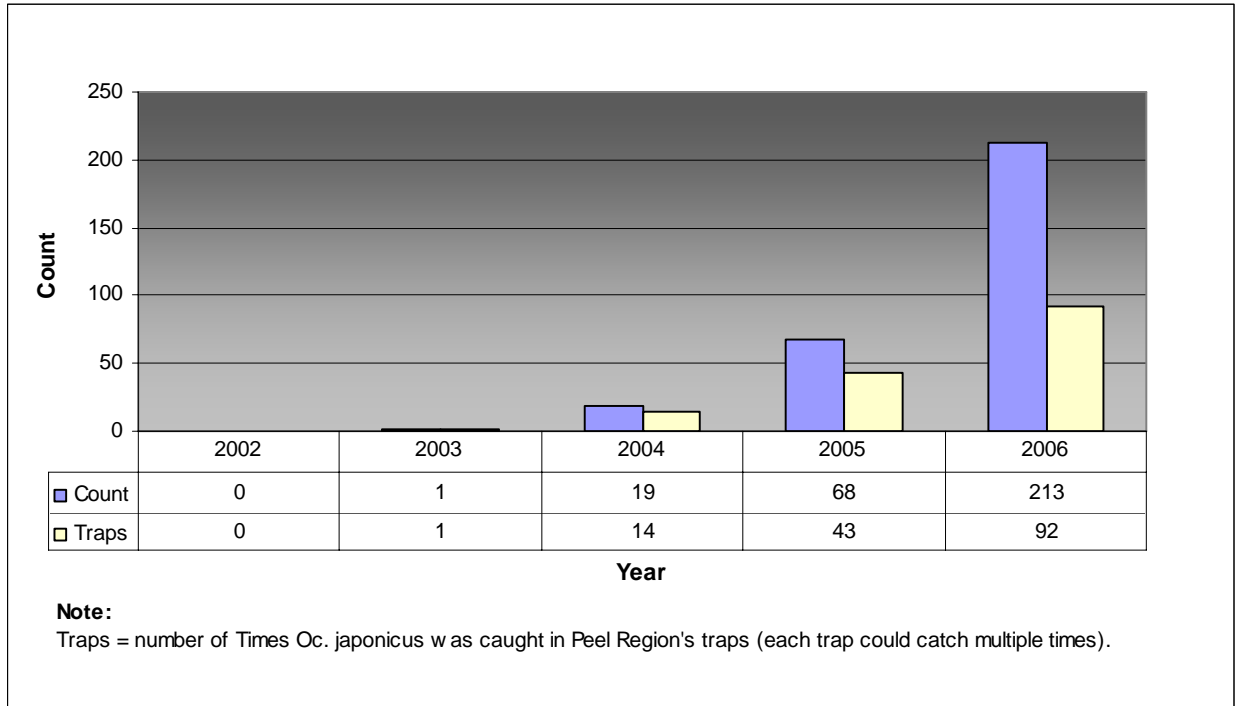
Other than the species already noted, *Aedes vexans*, *Coquillettidia perturbans* and *Culex pipiens/restuans*, most other species decreased in abundance in 2006, when compared as a percentage of the total. *Ochlerotatus japonicus* (*Oc. japonicus*) was the exception showing an increase, from 0.1% in 2005 to 0.4% in 2006 (Table 11).¹¹ Figure 15 illustrates the annual increase in the abundance of *Oc. japonicus* captured as a total across the Region of Peel and the increase in the number of trapping events *with Oc. japonicus* present. Laboratory studies indicate that *Ochlerotatus japonicus* is a very efficient vector of WNV. Several batches were positive for WNV in the United States in 2000, 2001, and 2002.¹⁸

Figure 14 Seasonal distributions of the main species/taxons of adult mosquitoes in Peel, 2006 (Average number of adult mosquito females caught per week in CDC light traps)



Source: GDG, 2006¹⁷

Figure 15 *Ochlerotatus japonicus* (*Oc. japonicus*) abundance in the Region of Peel - 2002 to 2006



Of the total number of mosquitoes collected, most of them were collected in the City of Mississauga (49%), followed by the City of Brampton (36%) and the Town of Caledon (16%). The overall distribution is consistent with 2005 where 57, 32 and 11% were collected from Mississauga, Brampton and Caledon, respectively. However, the species distribution across the municipalities varied. For example, the combined number of *Aedes vexans* and *Coquillettidia perturbans* captured were found in the City of Mississauga, representing approximately 56% of the total of each species caught in the Region of Peel. However, 34% of mosquitoes captured in the Brampton and 10% in Caledon were *Aedes vexans* compared to 40% and 5% for *Coquillettidia perturbans*, respectively. In the case of vector mosquitoes, *Culex pipiens/restuans* exhibited yet a different distribution pattern with 53% in Mississauga, 44% in Brampton and 3% in Caledon.

2006 – West Nile Virus in the Region of Peel

Table 11 Estimated Number of Female Adult Mosquitoes Collected and Identified by Species - Region of Peel, 2006*

Species	Brampton	Caledon	Mississauga	Peel	% of Total
<i>Ae. vexans vexans</i>	9,576	2,779	15,721	28,076	39
<i>Cq. perturbans</i>	7,965	943	11,168	20,077	28
<i>Oc. stimulans</i>	1,345	3,488	1,407	6,240	9
<i>Ae./Oc. Spp.</i>	1,790	1,489	1,373	4,652	7
<i>Cx. pipiens/restuans</i>	1,590	101	1,918	3,609	5
<i>Oc. trivittatus</i>	1,013	266	1,034	2,313	3
<i>Oc. canadensis</i>	804	1,155	69	2,029	3
<i>Oc. broad-banded</i>	383	400	400	1,183	2
<i>An. punctipennis</i>	369	175	512	1,057	1
<i>Oc. triseriatus/hendersoni</i>	117	52	594	762	1
<i>Ae. cinereus</i>	242	45	47	334	0.5
<i>Oc. japonicus</i>	12	13	266	291	0.4
<i>Oc. black legged</i>	105	31	90	225	0.3
<i>An. quadrimaculatus</i>	46	40	10	96	0.1
<i>An. species</i>	40	29	7	76	0.1
<i>Other species</i>	7	1	28	36	0.1
<i>Cx. species</i>	4	5	8	18	0.02
<i>Oc. provocans</i>		16		16	0.02
<i>Cs. morsitans</i>		3		3	0.005
<i>Oc. triseriatus</i>			3	3	0.004
<i>An. walkeri</i>	1			1	0.001
Total Mosquitoes	25,410	11,034	34,655	71,099	100.00 [†]

Source: sum of weekly reports provided to the Region of Peel from GDG

* estimates based on CDC light trap surveillance data

† does not equal 100 due to rounding

WNV vector mosquitoes of particular interest for Ontario highlighted in green

Map 9 shows the fixed locations for the traps set in the Region of Peel for 2006. There were a total of 35 fixed and special study traps: 19 in the City of Mississauga, 11 in the City of Brampton and five in the Town of Caledon. The traps were distributed by Regional ward where there was a minimum of one trap per ward. Thirty of the traps

2006 – West Nile Virus in the Region of Peel

were CDC light traps and five were Omni-directional Fay-Prince traps. Of the thirty-five traps, nine traps contained positive mosquitoes in 2006. Seven traps were positive only once, one trap three times and another trap four times.¹⁷

Upon notification of a positive mosquito batch, seasonal staff in the WNV program went door-to-door in the immediate area advising residents of the positive batch and offering to survey the property for mosquito breeding sites. In addition, educational material on symptoms of WNV, reduction of mosquito breeding sites and personal protection were provided to the residents. An intensified environmental scan around the area of the identified positive batch was conducted to verify that roadside catch basins were treated and identify stagnant water sites. Any mosquito breeding sites identified on public property were larvicided or remediated.

Table 12 presents the number of WNV-positive mosquito trapping events since 2001 by area municipality. In 2006, there were 14 separate events where a mosquito trap tested positive compared to 24 in 2005 and 4 in 2004. Ten of the positive batches were caught using the CDC light traps and 4 using the Omni-directional Fay-Prince trap.

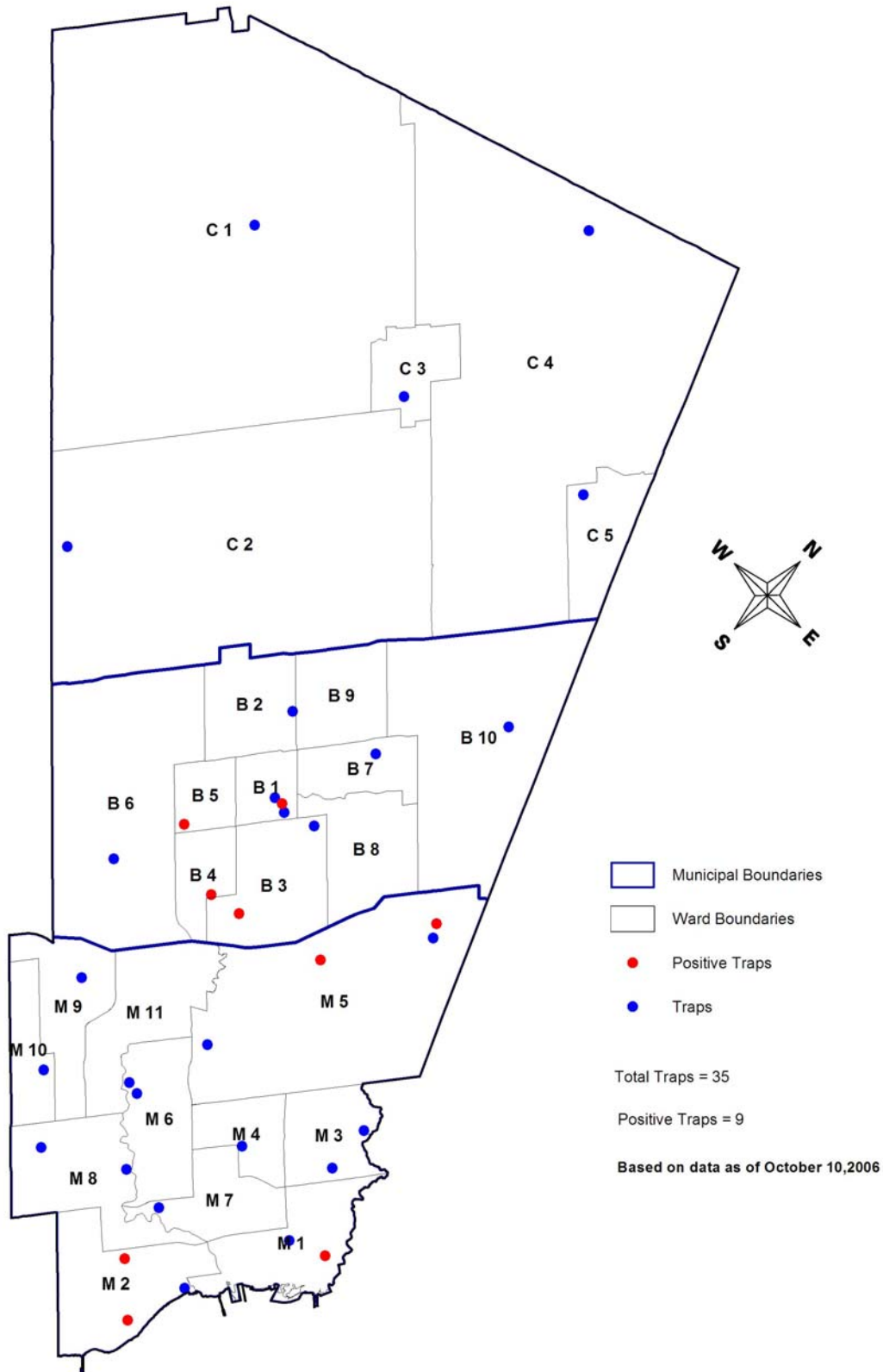
Since the beginning of the WNV surveillance program in the Region of Peel, 2002 remains the overall high with 128 positive trapping events. Only the City of Mississauga and the City of Brampton had positive trapping events in 2006. As in previous years, the majority of the positive trapping events occurred in Mississauga numbering at 10 compared to four in the City of Brampton. The Town of Caledon did not have any positive events in 2006, compared to two events in 2005, the only year with positive mosquito traps in this municipality. This mirrors the finding that the greatest percentage of mosquitoes was collected from traps located in the City of Mississauga (Table 11).

The first positive trapping event in 2006 was reported on July 25 in Mississauga.

Table 12 Number of Positive Trapping Events by Municipality - Region of Peel, 2001-2006

Year	Region of Peel	Mississauga	Brampton	Caledon	Date of First Positive
2001	4	4	0	0	August 31, 2001
2002	128	106	22	0	June 20, 2002
2003	24	16	8	0	July 24, 2003
2004	4	2	2	0	July 15, 2004
2005	24	16	6	2	July 7, 2005
2006	14	10	4	0	July 25, 2006

Map 9 Location of Mosquito Traps by Municipal Ward, Region of Peel, 2006



2006 – West Nile Virus in the Region of Peel

Figure 16 illustrates the temporal occurrence of WNV positive mosquito batches throughout the season by municipality. The first positive batch was reported on July 25, 2006. While the July timeframe of the first positive trapping event was generally consistent with previous years, the first positive batch occurred in late July compared to the first week of July in 2005. For the second consecutive year, the first WNV positive mosquito batch preceded the first report of WNV positive bird in the Region of Peel (July 31, 2006).

Figure 16 WNV Positive Mosquito Batches by Week of Collection and Municipality - Region of Peel, 2006

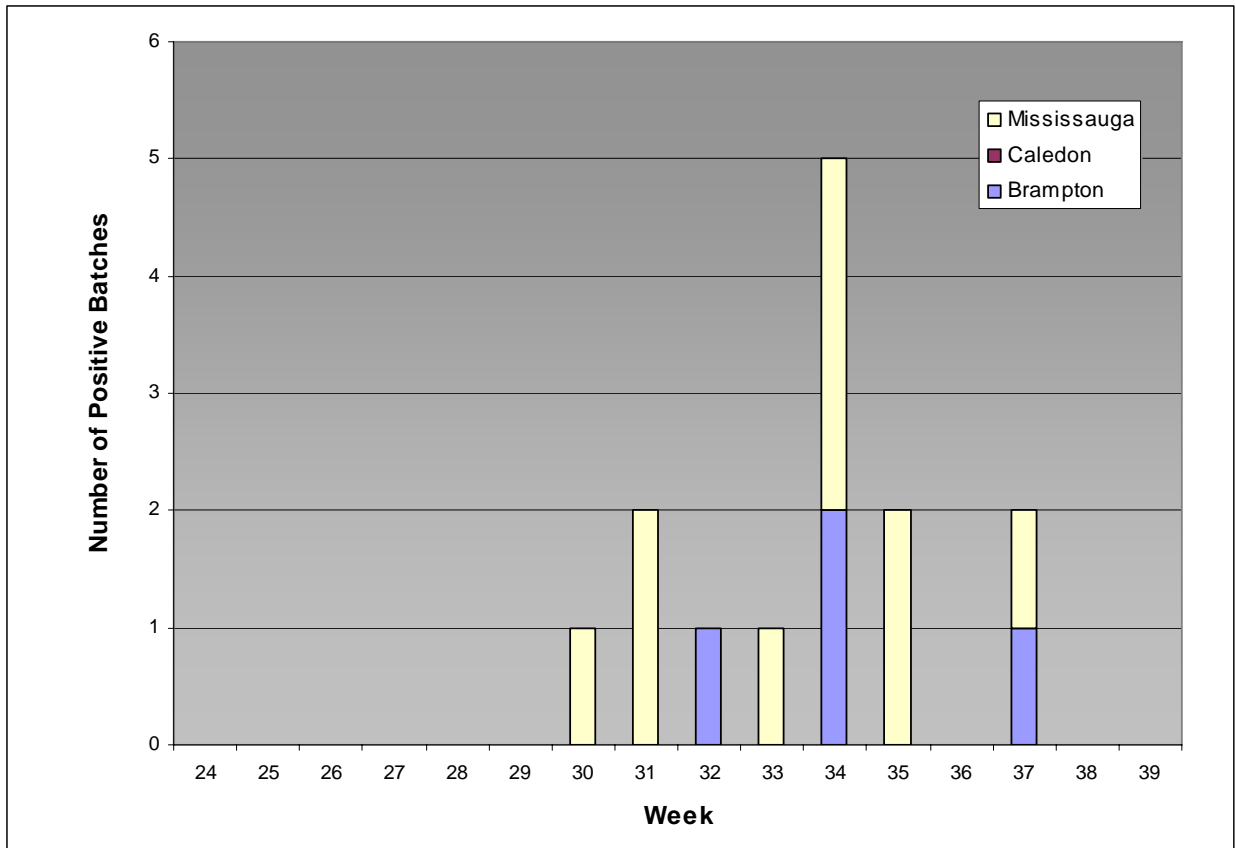
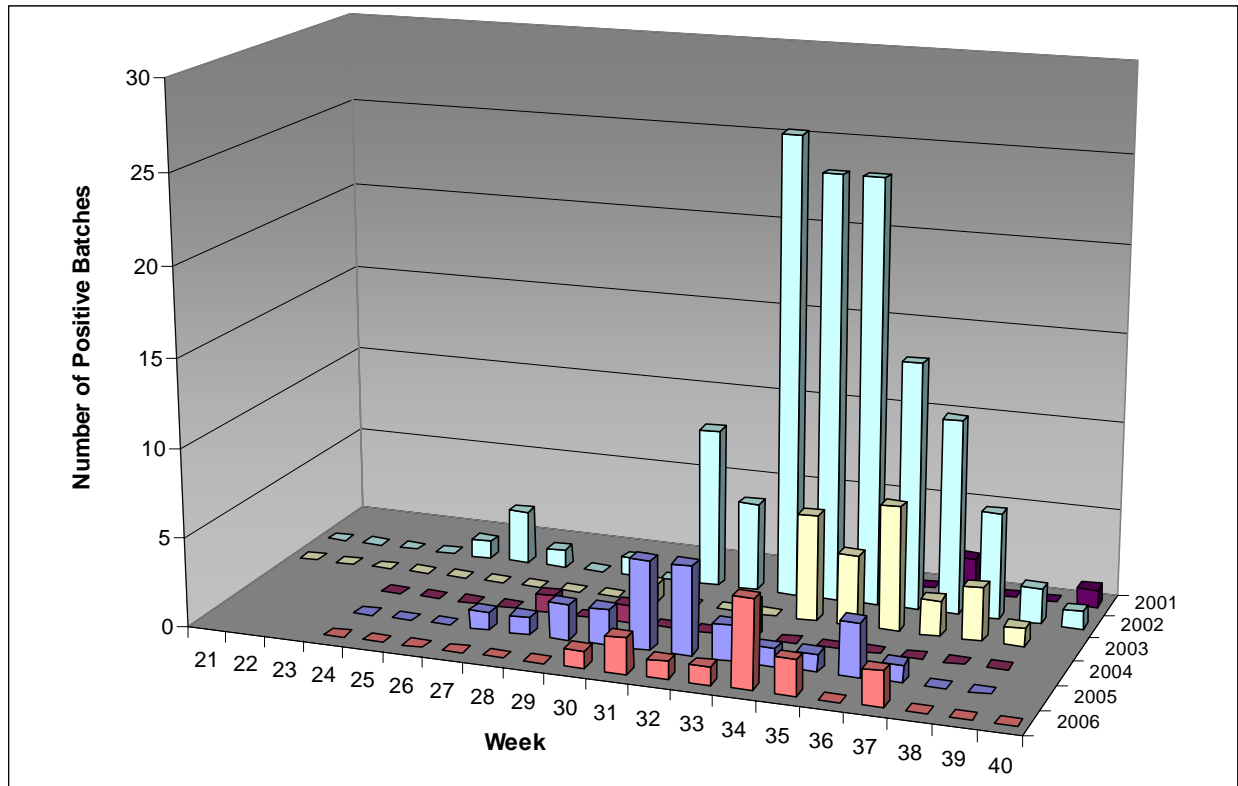


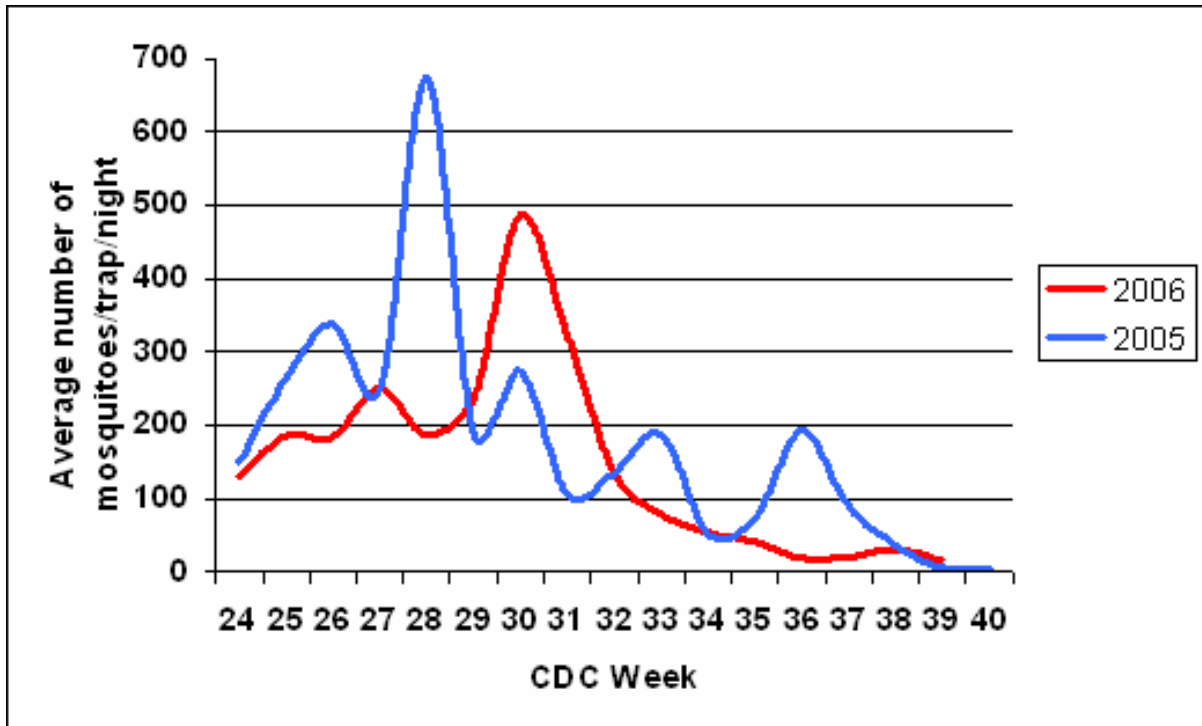
Figure 17 compares the total number of positive batches per week for 2002 through 2006. Based on previous year’s data, positive traps are likely to occur anytime after June (week 21). However, from year to year the onset and peak of WNV-positive traps vary. This is likely due to a range of factors including weather (temperature and rainfall) and the effectiveness of the multifaceted prevention program involving reduction of breeding sites on public and private property and larviciding catch basins and surface water on public property. In 2006, the occurrence of the first positive batch was the latest since the onset of the surveillance program in 2001. With respect to the last positive batch, it occurred in mid-September (week 37), the same as 2005.¹¹

Figure 17 WNV Positive Mosquito Batches by Week of Collection - Region of Peel, 2001-2006



The mosquito abundance per week for 2005 and 2006 mirrors the temporal pattern for number of positive batches per week especially for peaks in mosquito abundance for some of the season. Figure 18 presents the average number of mosquitoes trapped per week for both 2005 and 2006. For 2006, positive batches were observed between weeks 30 and 37. The peak mosquito abundance occurred in weeks 30 and 31 averaging almost 500 mosquitoes per trap but dropped quickly and significantly (below 100 mosquitoes per trap) in week 32. In 2005, the peak abundance preceded the peak number of positive batches by two weeks.

Figure 18 Average number of mosquitoes captured per trap per week for the whole surveillance network in 2005 and 2006



Source: GDG. 2006¹⁷

Culex spp. mosquitoes are of particular interest because they have been the predominant species positive for WNV in Peel Region. Table 13 presents the annual comparison of the number of female *Culex* mosquitoes. In 2006, the absolute number of mosquitoes (all species) captured decreased when compared to 2005 but was greater than in 2002, 2003 or 2004. However, the absolute number of *Culex* species mosquitoes captured was the lowest of any year. In 2006, the relative percentage of *Culex* species mosquitoes to total mosquitoes captured remained the same as 2005; approximately 5% of the female mosquitoes collected were *Culex* species compared to 8% in 2004, 13% in 2003 and 30% in 2002.

In 2006, 12 of the 14 positive batches were associated with the *Culex* species. *Aedes vexans* and *Ochlerotatus trivittatus* were associated with the other two positive batches. *Aedes vexans* act as bridge vector, biting both animals and birds, and are a confirmed WNV vector in Ontario. Larval development occurs predominantly in roadside ditches and grassy fields. *Ochlerotatus trivittatus* is a WNV carrier that prefers breeding in temporary pools located in well-shaded areas.¹⁸

Table 13 Annual Comparison of Female *Culex* Mosquitoes Collected and Positive Batches - Region of Peel, 2002-2006

Year	Female Mosquitoes Collected			Positive Mosquito Batches		
	Total Number	Number of <i>Culex</i>	% <i>Culex</i>	Total Number	Number of <i>Culex</i>	% <i>Culex</i>
2002*	24,269	7,278	30.0%	128	98	76.6%
2003*	41,212	5,326	12.9%	24	23	95.8%
2004*	53,556	4,305	8.0%	4	4	100.0%
2005*	90,769	4,276	4.7%	24	24	100.0%
2006†	71,099	3,627	5.1%	14	12	85.7%

* Source: 2005 West Nile in the Region of Peel, 2005¹¹

† Source: GDG, 2006¹⁷

Figure 19 illustrates the average number of *Culex* mosquitoes collected per trapping event for each week. In 2006, the average number of *Culex* per trap peaked during week 30 and 31, corresponding to the last week of July and the first week of August. During these weeks the number of *Culex* per trap exceeded 10 and peaked at approximately 24. Week 27 was the only other week in 2006 to exceed 10 with 13 *Culex* per trap. Overall, the average number of *Culex* per trap in 2006 was less than 2005 with the exception of weeks 24, 27, 30, and 39. The temporal pattern is consistent with the previous year although the number of *Culex* per trap dropped off quicker in 2006. During this same period the average number of *Culex* per trap exceeded those seen in 2003, the year with the second highest number of *Culex* per trap. However, the high numbers of *Culex* per trap in 2003 occurred early on (weeks 24 through 26) and later on in the season (weeks 34 and 35). 2002 remains the benchmark year where the number of *Culex* per trap regularly exceeded 30 per trap and approached or exceeded 50 per trap on two occasions.

Figure 19 Average Number of *Culex* Species per Trap Event by Week - Region of Peel, Weeks 24-39, 2002-2006

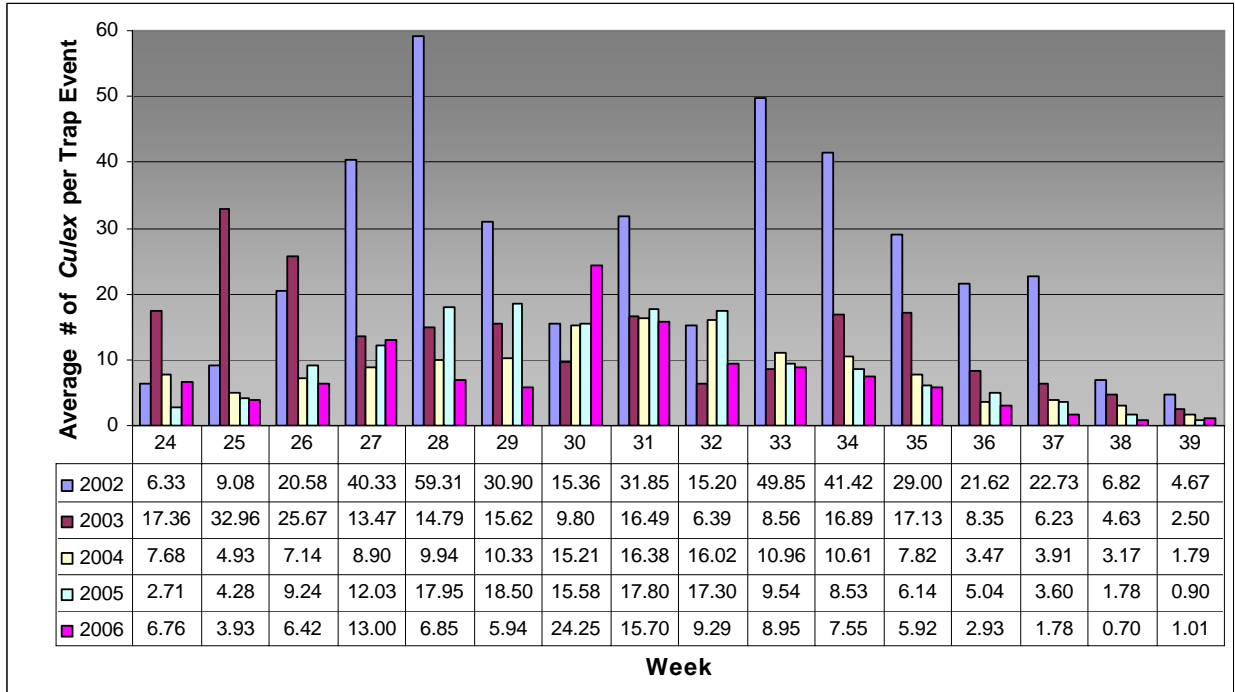


Figure 20 illustrates the weekly percentage of *Culex* species relative to the total number of mosquitoes present at 13 traps that were located at the same sites during the same time period in all years, 2002 through 2006. The site count represents the number of traps included in a given weekly analysis. This value is not consistent throughout all weeks because trap data may not have been available for all weeks. In 2006, the percentage of *Culex* relative to the total number of mosquitoes collected was higher than in 2005 for most weeks except for weeks 26, 31 and 38. The weekly proportion of *Culex* was equal to or greater than the overall seasonal average proportion of approximately 5% on ten occasions and exceeded 10% three times. This is much lower than the high values seen in 2002 when the percentage of *Culex* reached values greater than 70%.

Figure 20 Proportion of *Culex* Species to Total Species in Selected Sites - Region of Peel, 2002-2006

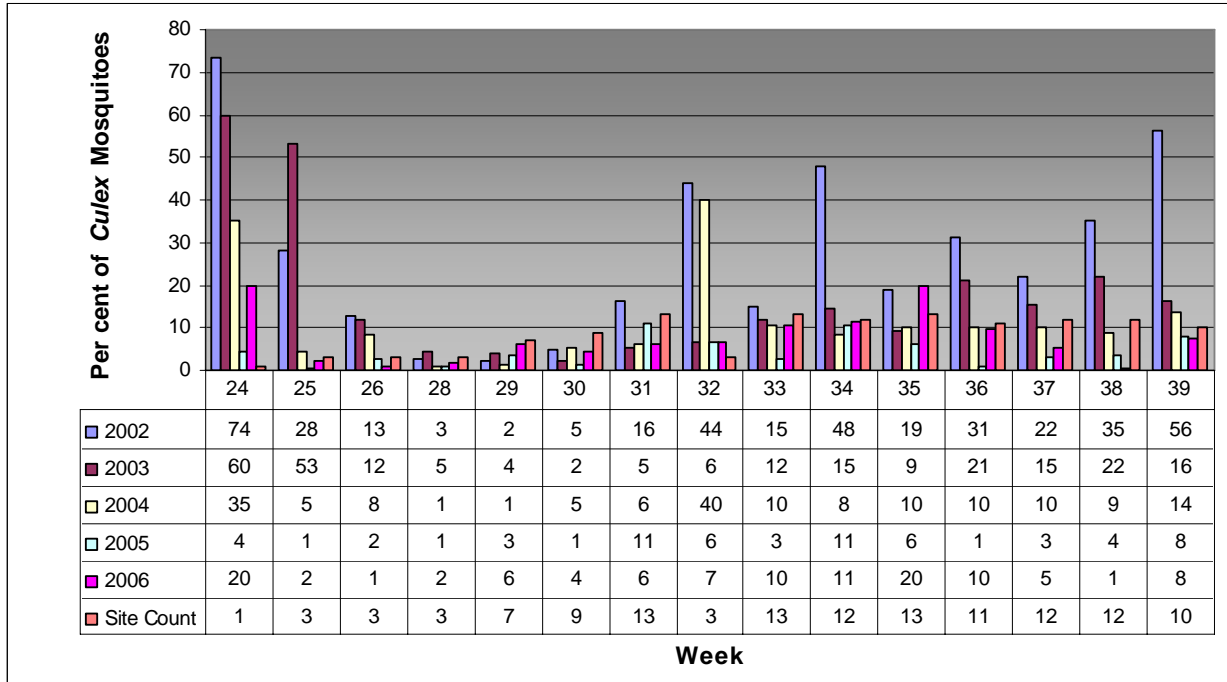


Table 14 compares the top 12 mosquito species collected at 13 traps that have been present across all years. In 2002, the number of mosquitoes were based on actual counts. In subsequent years, the mosquito counts were based on estimating methods. *Coquillettidia perturbans* and *Aedes vexans* continue to rank first and second, respectively, as they have for all years prior to 2006. Overall, this finding is consistent with the ranking for all 30 CDC light traps in the Region of Peel (Table 11), except that *Aedes vexans* is more abundant across all traps than *Coquillettidia perturbans*. The percentage of *Coquillettidia perturbans* in these 13 common traps is greater (48%) than the prevalence across all traps (28%). The percentage of *Aedes vexans* in the common traps is lower (29%) than the prevalence across all traps (39%).

2006 – West Nile Virus in the Region of Peel

Table 14 Annual Comparison of the Top 12 Mosquito Species Collected from Common Traps – Region of Peel, 2002-2006

Rank	2002			2003			2004			2005			2006		
	Species	Average Actual Number of Mosquitoes Collected	%	Species	Average Estimated Number of Mosquitoes Collected	%	Species	Average Estimated Number of Mosquitoes Collected	%	Species	Average Estimated Number of Mosquitoes Collected	%	Species	Average Estimated Number of Mosquitoes Collected	%
1	<i>Cq. perturbans</i>	4147	38.8	<i>Cq. perturbans</i>	11991	58.0	<i>Cq. perturbans</i>	14608	66.4	<i>Cq. perturbans</i>	27302	61.8	<i>Cq. perturbans</i>	7667	47.5
2	<i>Ae. vexans</i>	2301	21.5	<i>Ae. vexans</i>	3646	17.6	<i>Ae. vexans vexans</i>	3708	16.8	<i>Ae. vexans vexans</i>	10741	24.3	<i>Ae. vexans vexans</i>	4686	29.1
3	<i>Cx. pipiens/restuans</i>	1173	11.0	<i>Oc. canadensis</i>	1423	6.9	<i>Oc. trivittatus</i>	756	3.4	<i>Oc. trivittatus</i>	2433	5.5	<i>Cx. pipiens/restuans</i>	1096	6.8
4	<i>Cx. spp.</i>	610	5.7	<i>Cx. pipiens/restuans</i>	1284	6.2	<i>Cx. pipiens/restuans</i>	709	3.2	<i>Cx. pipiens</i>	744	1.7	<i>Oc. trivittatus</i>	901	5.6
5	<i>Cx. pipiens</i>	604	5.7	<i>Ae. /Oc. spp.</i>	568	2.7	<i>Ae. /Oc. spp.</i>	529	2.4	<i>Ae. /Oc. spp.</i>	688	1.6	<i>Ae. /Oc. spp.</i>	781	4.8
6	<i>Ae. vexans/cantator</i>	445	4.2	<i>Oc. trivittatus</i>	319	1.5	<i>Oc. canadensis</i>	453	2.1	<i>Oc. black legged</i>	632	1.4	<i>An. punctipennis</i>	192	1.2
7	<i>Ae./Oc. spp.</i>	319	3.0	<i>Oc. stimulans</i>	237	1.1	<i>Cx. pipiens</i>	286	1.3	<i>Oc. broad-banded</i>	506	1.1	<i>Ae. cinereus</i>	178	1.1
8	<i>Cx. restuans</i>	257	2.4	<i>Cx. restuans</i>	216	1.0	<i>Oc. triseriatus</i>	269	1.2	<i>Cx. pipiens/restuans</i>	296	0.7	<i>Oc. triseriatus/hendersoni</i>	174	1.1
9	<i>Oc. excrucians</i>	177	1.7	<i>An. punctipennis</i>	195	0.9	<i>Oc. broad-banded</i>	187	0.8	<i>Ae. cinereus</i>	222	0.5	<i>Oc. stimulans</i>	128	0.8
10	<i>Oc. trivittatus</i>	175	1.6	<i>Culex spp.</i>	169	0.8	<i>An. punctipennis</i>	147	0.7	<i>Oc. triseriatus/hendersoni</i>	161	0.4	<i>Oc. broad-banded</i>	110	0.7
11	<i>Oc. canadensis</i>	120	1.1	<i>Cx. pipiens</i>	147	0.7	<i>Cx. restuans</i>	126	0.6	<i>An. punctipennis</i>	156	0.4	<i>Oc. canadensis</i>	92	0.6
12	<i>Oc. triseriatus</i>	93	0.9	<i>Ae. vexans/cantator</i>	98	0.5	<i>Oc. stimulans</i>	111	0.5	<i>Oc. triseriatus</i>	101	0.2	<i>Oc. Japonicus</i>	56	0.3

2006 – West Nile Virus in the Region of Peel

In 2006, the percentage of *Culex* species collected in the common traps was higher (7%), than the percentage collected in 2005 (2%) and the highest per cent of *Culex* mosquitoes in these common traps since 2003. In addition, the per cent *Culex* collected in common traps was higher than the 5% rate of *Culex* species collected in all the traps in the Region of Peel in 2006 (Table 11). However, as noted previously, the overall (all traps) *Culex* species abundance did not change in 2006 from 2005 and was the lowest since 2002. Prior to 2006, a steady decline in the 13 common traps was observed, going from 24.8% in 2002 to 8.7% in 2003, 5.1% in 2004, and 1.7% in 2005. The overall consistency in *Culex* abundance, based on all traps across the Region of Peel, may be attributed to a successful larviciding program targeted to eliminate the *Culex* species, and a reduction in breeding sites preferred by the *Culex* species.

Historically, the *Culex* species has consistently been responsible for the majority of the WNV-positive mosquito batches in the Region of Peel. Given that most of the WNV-positive mosquito traps in 2006 were due to *Culex* it is imperative to continue to decrease the vector abundance of the *Culex* species in particular. Without taking preventive actions against the *Culex* species, the Region of Peel may well have seen an increase in their overall abundance from 2005 to 2006. The 2006 observations confirm that the WNV Prevention Plan should continue to focus on reducing the number of *Culex* mosquitoes and that the *Culex* species abundance should continue to be reviewed in the weekly WNV risk assessment. However, other mosquito species are WNV vectors, as seen in 2006 with the two positive findings being non-*Culex* species. While reducing the abundance of the *Culex* species remains a priority for the Region of Peel, monitoring the abundance and WNV potential of various species remains very important in order to mitigate the risk in an informed manner.

Minimum Infection Rate

The minimum infection rate (MIR) is used as an indicator of the prevalence of WNV transmission intensity, and therefore the risk for human disease. The Minimum Infection Rate (MIR) is calculated as the number of positive batches of infected mosquitoes of a given species divided by the total number of mosquitoes of a given vector species that were tested for the presence of the virus, expressed per 1,000.

Table 15 presents the 2006 MIRs for the *Culex* species, grouped by municipality in Peel Region and compares these to MIRs for 2004 and 2005, where applicable. Higher MIRs are usually indicative of greater WNV activity among a given species but can be unreliable when the sample size is less than one thousand. In 2006, the MIRs were lower in each respective municipality and as a whole throughout the Region of Peel when compared to 2005. However, they were higher than 2004. The only reliable MIRs, based on a sample size greater than one thousand, are those for *Culex pipiens* in the City of Mississauga and for Peel Region as a whole. The highest MIR was for the City of Mississauga at

2006 – West Nile Virus in the Region of Peel

3.47 compared to the Peel Region total at 3.41. While the abundance of *Culex* species relative to the total number of mosquitoes collected was the same as 2005 (approximately 5%) the actual number of *Culex* collected was slightly higher in 2006 (3,514 versus 3,444). The MIR decreased in 2006 because there were fewer positive batches in 2006 compared to 2005.

Table 15 Minimum Infection Rates of *Culex* Species in Each Municipality - Region of Peel, 2004, 2005 and 2006

Municipality	Vector Species	2006 Actual Number Tested ^{††}	2006 Positive Batches	2006 MIR*	2005 MIR*	2004 MIR*
Mississauga	<i>Culex pipiens</i>	-	-	-	8.59	-
	<i>Culex pipiens/restuans</i>	2,307	8	3.47	4.78 †	0.91
	<i>Culex restuans</i>	-	-	-	6.85 †	3.26 †
Brampton	<i>Culex pipiens</i>	-	-	-	4.47	-
	<i>Culex pipiens/restuans</i>	937	4	4.27 †		
	<i>Culex restuans</i>	-	-	-	11.36 †	-
Caledon	<i>Culex pipiens/restuans</i>	270	-	-	19.61 †	-
	<i>Culex restuans</i>	-	-	-	58.82 †	-
Peel	<i>Culex pipiens</i>	-	-	-	6.76	
	<i>Culex pipiens/restuans</i>	3,514	12	3.41	5.90 †	0.97
	<i>Culex restuans</i>	-	-	-	11.95 †	1.71 †
Total		3,514	12			

* The Minimum Infection Rate (MIR) is calculated as the number of positive batches of infected mosquitoes of a given species divided by the total number of mosquitoes of a given vector species that were tested for the presence of the virus, expressed per 1,000.

† MIRs based on numbers < 1000 are more likely to be unstable than those based on numbers > 1000 (bolded).

††based on mosquito surveillance data from CDC light traps and Omni-directional Fay-Prince traps

Two positive mosquito batches were attributed to non-*Culex* species. Therefore, in 2006 MIRs for the non-*Culex* species were calculated for each municipality and for Peel Region as a whole (Table 16). The MIRs for the City of Mississauga were 0.87 and 0.11 for *Oc. trivittatus* and *Ae. vexans*, respectively compared to 0.62 and 0.07 for Peel Region as a whole.

Table 16 Minimum Infection Rates of non-*Culex* Species in Each Municipality - Region of Peel, 2006

Municipality	Vector Species	Actual Number Tested	Positive Batches	2006 MIR*
Mississauga	<i>Oc. trivittatus</i>	1,151	1	0.87
	<i>Ae. vexans</i>	9,239	1	0.11
Brampton	<i>Oc. trivittatus</i>	212	-	-
	<i>Ae. vexans</i>	3,755	-	-
Caledon	<i>Oc. trivittatus</i>	263	-	-
	<i>Ae. vexans</i>	1,080	-	-
Peel	<i>Oc. trivittatus</i>	1,626	1	0.62
	<i>Ae. vexans</i>	14,074	1	0.07
Total		15,700	2	

* The Minimum Infection Rate (MIR) is calculated as the number of positive batches of infected mosquitoes of a given species divided by the total number of mosquitoes of a given vector species that were tested for the presence of the virus, expressed per 1,000.

Adult Mosquito Surveillance in other Ontario Health Units

Table 17 lists all results of the mosquito testing programs in Ontario Health Units and highlights those health units adjacent to the Region of Peel. Twenty-six of the thirty-six health units reported positive mosquito batches. The City of Toronto reported the greatest number of positive batches at 47, followed by Halton at 17 and then by Windsor-Essex County, Hamilton and Region of Peel at 14 each. Each health unit adjacent to the Region of Peel reported positive mosquito batches in 2006.

2006 – West Nile Virus in the Region of Peel

Table 17 Mosquito Surveillance Statistics by Health Unit - Ontario, 2006

Health Unit	Total Positive Batches
Algoma Health Unit	3
Brant County Health Unit	2
Chatham-Kent Public Health Division	4
Durham Region Health Department	7
Eastern Ontario Health Unit	0
Elgin-St. Thomas Health Unit	1
Grey-Bruce Health Unit	0
Haldimand-Norfolk Health Unit	0
Haliburton-Kawartha-Pine Ridge District Health Unit	1
Halton Region Health Department	17
City of Hamilton-Public Health & Community Services Dept.	14
Hastings & Prince Edward Counties Health Unit	1
Huron County Health Unit	0
Kingston, Frontenac and Lennox & Addington Health Unit	0
County of Lambton Community Health Services Department	5
Leeds, Grenville and Lanark District Health Unit	0
Middlesex-London Health Unit	6
Regional Niagara Public Health Department	7
North Bay Parry Sound Health Unit	0
North Western Health Unit	4
City of Ottawa Public Health and Long-Term Care Branch	3
County of Oxford	3
Regional Municipality of Peel Health Department	14
Perth District Health Unit	1
Peterborough County-City Health Unit	1
Porcupine Health Unit	1
Renfrew County and District Health Unit	0
Simcoe Muskoka District Health Unit	1
Sudbury and District Health Unit	13
Thunder Bay District Health Unit	0
Timiskiming Health Unit	0
Toronto Public Health	47
Region of Waterloo, Public Health	1
Wellington-Dufferin-Guelph Health Unit	1
Windsor-Essex County Health Unit	14
York Region Health Services Department	10
ONTARIO TOTAL	182

Source: Ontario Ministry of Health and Long-Term Care, 2006¹⁹

- Rows shaded in yellow are the municipalities adjacent to the Region of Peel

Table 18 presents the national mosquito surveillance data by province/territory. A total of 512 positive batches were reported from five provinces. The greatest increase was seen in Alberta with 114 positive batches compared to 1 positive in 2005. Quebec and Saskatchewan saw a significant drop in 2006 from 100 and 110 to 9 and 36, respectively. Ontario also dropped in 2006 from 291 to 182.

Table 18 Mosquito Surveillance Statistics by Province, 2006

Province/Territory	No. Confirmed positive mosquito batches
Newfoundland and Labrador	0
Prince Edward Island	0
Nova Scotia	0
New Brunswick	0
Quebec	9
Ontario*	182
Manitoba	171
Saskatchewan	36
Alberta	114
British Columbia	0
Yukon Territory	0
Northwest Territories	0
Nunavut	0
Canada – Total	512

Source: Public Health Agency of Canada, 2006²⁰; *Ontario Ministry of Health and Long-term Care²⁰

Comparison with Great Lake States

In the United States there were a total of 11,127 cumulative positive mosquito batches in 2006 down from 11,303 in 2005.¹⁹ Table 19 lists total number of cases in the seven Great Lake states for 2006. The State of Illinois reported the most positive mosquito batches at 2,980. Wisconsin reported the fewest infections at 115.

Table 19 Mosquito Surveillance Statistics - Great Lake States, 2006*

State	Number of Confirmed Positive Mosquito Batches
Illinois	2,980
Indiana	282
Minnesota	119
New York	360
Ohio	913
Pennsylvania	257
Wisconsin	115
TOTAL	5,026

Source: United States Geological Service, 2006
 (http://diseasemaps.usgs.gov/wnv_us_mosquito.html last)²¹
 *current as of December 11, 2006

Asian tiger Mosquito (*Stegomyia albopicta*)

The Asian tiger mosquito is a vector for a number of viruses including WNV, Eastern Equine Encephalitis and Dengue Fever. The Ministry of Health and Long-Term Care (MOHLTC) included the Asian tiger mosquito in their 2005 WNV Preparedness and Prevention Plan as a species to identify and be included in viral testing.²²

In 2005, for the first time since the establishment of the West Nile Virus program, the Asian tiger mosquito, (species *Stegomyia albopicta*), was found in the Region of Peel. One mosquito was collected in one trapping event. Two other health units in Ontario collected the Asian tiger mosquito: Toronto and Ottawa in 2005. Like Peel Region, only one mosquito was found in each of the other two health units.



Figure 21 Omni-Directional Fay Prince Trap

Source: Region of Peel - Public Health, 2006

2006 – West Nile Virus in the Region of Peel

In 2006, the MOHLTC sponsored a special study, the purpose of which was to determine the abundance of the Asian tiger mosquito in the three Ontario health units that trapped the species in 2005. This study used a different trap, the Omni-Directional Fay-Prince trap, which is designed to attract specific species including the Asian tiger mosquito (Figure 21). This trap uses white-black contrast and carbon dioxide to attract mosquitoes and can trap them coming from any direction. Trapping cycles were adjusted to accommodate the daytime biting behaviour of the Asian tiger mosquito.

No Asian tiger mosquitoes were trapped in 2006 in the Region of Peel using either the CDC light trap or the Omni-Directional Fay-Prince trap.

The Omni-Directional Fay-Prince traps did collect more than 15 mosquito species. *Aedes vexans* was the most dominant mosquito species collected (73%) of the total mosquitoes captured. The second most abundant species was *Culex pipiens/restuans* at approximately 10%. This is double the average abundance observed in the thirty CDC light traps located across the Region of Peel (5%).²³ In addition, it is higher than the abundance observed in the 13 common traps in place since 2002. Four WNV positive batches were from the Omni-Directional Fay-Prince trap - one attributed to *Aedes vexans* and the other three to *Culex pipiens/restuans*. While the Omni-Directional Fay-Prince trap did not show the specificity for the Asian tiger mosquito, it did attract species of particular interest as vector mosquitoes for the Region of Peel.