

NO: R114

COUNCIL DATE: **June 13, 2011**

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## REGULAR COUNCIL

TO: **Mayor & Council**

DATE: **June 8, 2011**

FROM: **General Manager, Engineering**

FILE: **5280-80 (WNV)  
4807-9130-00**

SUBJECT: **2011 City of Surrey West Nile Virus Response Plan**

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## RECOMMENDATION

The Engineering Department recommends that Council:

1. Receive this report as information; and
2. Endorse the 2011 West Nile Virus Response Plan, which is attached to this report as Appendix II; and
3. Endorse the City's representatives on the Fraser Health Authority Adult Mosquito Control Local Advisory Committee as documented in this report.

## INTENT

The purpose of this report is to advise Council of the mosquito control activities that are planned for within Surrey in 2011 to control the spread of the West Nile virus.

## BACKGROUND

West Nile virus (WNV) is an emerging infectious disease in North America. Since arriving in New York in 1999, the virus has spread steadily across the continent. WNV was first detected in British Columbia in late 2009, when three human cases were detected (one travel-related) along with three cases in horses. During that same year 10 mosquito pools tested positively for the virus in B.C. The majority of these circumstances occurred in the South Okanagan. Only one of the cases that being a horse which tested positively for the virus was in the Fraser Valley.

In 2010 West Nile virus (WNV) activity in BC was isolated to the Interior Health region of BC but in the Central Okanagan area. In total in 2010, one human tested positive (non-travel related) case and 4 birds tested positive for the virus. There were no positive tests for the WNV virus in 2010 in the lower mainland area. Despite the 2010 results, now that the virus is present in B.C., it is expected to be observed more prevalently throughout the province in 2011 including a greater number of human cases.

## **Methods Used to Control Mosquito Populations:**

There are three basic methods for controlling mosquito populations. These being:

- Larviciding;
- Adulticiding; and
- Source control.

**Larviciding**, or larval mosquito control, is targeted at immature mosquitoes in their aquatic habitat before they become flying, biting adults. In general, larval control is the most effective method of controlling mosquito populations.

**Adulticiding**, or adult mosquito control, targets adult mosquitoes using insecticides that are applied using “foggers” that produce clouds of tiny droplets that kill a mosquito upon contact. Adulticiding is relatively ineffective, in that it is non-selective, killing other insects including mosquitoes and can create other problems.

**Source control** consists of modifying potential mosquito breeding habitat so that it no longer functions as breeding habitat. Examples of this type of control include agitation of stagnant water bodies (e.g., golf course water fountain features in ponds) and elimination of areas of pooled water (e.g., in roof gutters, ponds, old tires, etc.).

## **DISCUSSION**

The City currently has two separate mosquito control programs. The first is an ongoing mosquito nuisance control program administered by Metro Vancouver on behalf of the City of Surrey, the District of Maple Ridge, the Township of Langley, and the District of Pitt Meadows. The objective of the control program is to monitor and reduce mosquito populations to tolerable levels through larviciding and source control. The City has participated in this program since the 1990’s.

The second program is the WNV Risk Reduction Initiative. Since 2004, the City has conducted a program to reduce the risk associated with the spread of the WNV virus. The program focuses on educating the public about the virus and what they can do to protect themselves, on larviciding (primarily in the form of installing water soluble larvicidal pouches in catchbasins) and on source control. The program is funded by the Province and administered through the Union of BC Municipalities (UBCM). The City has received a grant of up to \$179,375 from the UBCM for the 2011 WNV Risk Reduction Initiative.

In advance of the 2011 WNV season and as part of the WNV Risk Reduction Initiative, the Fraser Health Authority has recommended pre-emptive larviciding of known WNV habitat along with source reduction, habitat modification and public education. Information on Fraser Health Authority West Nile Virus Strategy and Recommendations is included in Appendix I.

The Engineering Department has retained Culex Environmental Ltd. for the delivery in 2011 of each of the mosquito nuisance program and the WNV risk reduction program.

The Engineering Department has updated its West Nile Response Plan for 2011. This plan details the actions that will be taken by the Engineering Department in response to each of the three

different Response Levels that may be issued by the British Columbia Centre for WNV Disease Control.

The plan also includes a detailed treatment strategy in the event that an “Order to Treat” is issued by the Fraser Health Authority. If the WNV is observed in the Lower Mainland in 2011 the Fraser Health Authority may issue an “Order to Treat” under which adult mosquito control may be required and an “Adult Mosquito Control Local Advisory Committee” (LAC) may be a necessary element. The purpose of the LAC is to provide advice to and consult with the FHA Medical Health Officer regarding the advisability and feasibility of adult mosquito control in a specific situation to mitigate a human health hazard. Further information regarding the membership and function of the LAC is documented in Appendix III.

The following individuals would be the City representatives on the LAC:

- Mayor or her designate (in the event any governance decisions need to be made);
- City Manager (or his designate);
- Drainage & Environment Manager (Metro Vancouver Regional Engineers Advisory Committee - mosquito sub-committee member for Surrey); and
- Fire Chief (or his designate as “emergency program coordinator”).

This is the same membership that has been endorsed by City Council in prior years.

A copy of the City of Surrey 2011 West Nile Response Plan is attached as Appendix II.

## CONCLUSION

Based on the above discussion, it is recommended that Council endorse:

- the 2011 West Nile Virus Response Plan, which is attached to this report as Appendix II; and
- the City’s representatives on the Fraser Health Authority Adult Mosquito Control Local Advisory Committee as documented in this report.

Vincent Lalonde, P.Eng.  
General Manager, Engineering

JA/SBG:brb

Appendix I - Fraser Health Authority Strategy and Recommendations 2011

Appendix II - 2011 West Nile Virus Response Plan

Appendix III - WNV Adult Mosquito Control Local Advisory Committee

April 15<sup>th</sup>, 2011

Mr. Murray Dinwoodie  
City Manager  
City of Surrey  
14245 - 56 Avenue  
Surrey, BC V3X 3A2

Dear Mr. Dinwoodie:

Re: West Nile Virus (WNV) - Strategy and Recommendations for 2011

This letter contains important information about:

1. Fraser Health mosquito control expectations for 2011;
2. WNV funding for 2011;
3. Access to Fraser Health Pest Management Plan (PMP# 843-0001 09/14)

*West Nile virus (WNV) activity in BC for the 2010 season was isolated to the Interior Health region of BC, this time in the Central Okanagan area. In total, one human (non-travel related) case, and 4 corvids tested positive for the virus. Unlike 2009, no mosquito pools or horses tested positive for WNV in 2010, and no activity at all was noted in the Fraser Health areas.*

*Discussions in the fall of 2010 between the Province, the Health Authorities and the BCCDC took place to review the provincial WNV risk situation. The outcome of these discussions emphasized continued need for disease surveillance, public education, and strategic larval mosquito control initiatives to reduce the risk of WNV in high risk areas.*

*According to the BCCDC WNV risk modeling, Fraser Health is identified as a high risk area for WNV disease. If WNV activity in parts of BC outside of the Okanagan remains low during the summer of 2011, the BCCDC will re-evaluate its WNV risk model, in particular for the Fraser Health region. Until such time, our commitment to reduce the burden of WNV risk to Fraser residents remains unchanged.*

1. Fraser Health local mosquito control expectations for 2011.

*For the 2011 WNV season, Fraser Health recommends that local Risk Reduction Programs continue and focus on mosquito control in the following manner and in accordance with UBCM funding considerations:*

- *wide-scale larvaciding to catch-basins based on a June 19<sup>th</sup> to July 9<sup>th</sup> date range trigger and a single treatment protocol;*
- *larvaciding to prioritized surface water sites. Priority may be defined as demonstrating a history of vector larvae mosquito production (Data support for this is requested); or,*
- *a blend of prioritized catch basin and surface water treatment areas based on community and vector mosquito risk elements.*

2. WNV funding for the 2011 season.

*Funding remains an important component of the continued success of the provincial WNV risk reduction strategy and once again Provincial funds have been obtained for local government risk*

reduction initiatives. Also, local government funding for this program will be administered by the Union of BC Municipalities (UBCM). For details on eligibility and funding application guidelines please refer to the UBCM website as identified below.

<http://www.ubcm.ca/EN/main/funding/community-safety/west-nile-risk-reduction.html>

In order to keep program costs down in order to ensure most funding goes to mosquito control we ask the following:

- Administrative costs be capped at 5-10% of the total funding allocated;
- Planning costs, typically endorsed during the development phase of local Risk Reduction Programs, not be included in the funding application, as most programs in Fraser Health are past the planning phase;

Please note, to help minimize administrative costs Fraser Health no longer requires a formal year-end summary report of local risk reduction activities, although will still be welcomed.

### 3. Access to Fraser Health Pest Management Plan (PMP).

Once again, Fraser Health will make its PMP available for local governments to access for larvaciding purposes. As part of the requirements under the IPPA the Holder (Fraser Health) must maintain certain records of pesticide activities. As such, to access Fraser's PMP all local governments must do the following:

- Monitor vector mosquito larvae in catch basins for treatment efficacy purposes.\*
- Monitor for the need to treat and for the efficacy of treatment in priority surface water sites;\*
- Provide Fraser with a Notice of Intent to Treat (see link below to template document) which outlines the pesticides of choice, the estimated amount to be used, and where they will be used;
- Provide Fraser with a Summary of Pesticides used (see link below to template document) no later than October 31<sup>st</sup>, 2011;

\*In order to promote region-wide data consistency we recommend monitoring begin one week prior to treatment and continue at a minimum bi-weekly for the duration of the treatment season or until August 20<sup>th</sup>, whichever comes first. Standardized sampling protocol should be implemented.

[http://www.fraserhealth.ca/your\\_health/conditions\\_&\\_diseases/west\\_nile\\_virus/pest\\_management\\_plan](http://www.fraserhealth.ca/your_health/conditions_&_diseases/west_nile_virus/pest_management_plan)

If you would like to discuss any of the issues in this letter, please call Randy Heilbron, Fraser Health WNV Coordinator at 604-587-7647 (FAX: 604-587-7615). Please send all correspondence to:

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#350 - 9801 King George Blvd  
Surrey BC V3T 5H5 [randy.heilbron@fraserhealth.ca](mailto:randy.heilbron@fraserhealth.ca)

Sincerely,



Paul Van Buynder MBBS MPH FAFPHM  
Chief Medical Health Officer

c Mr. Steven Godwin  
Ms. Carrie Baron

# **City of Surrey**

## **West Nile Virus Response Plan**

Updated May 2011

By:  
Michael Jackson PhD, Scott McMahon, MSc and Michelle Evelyn, PhD



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## Executive Summary

West Nile virus (WNV) is an emerging infectious disease in North America. Since arriving in New York in 1999, the virus has spread steadily across the continent. WNV was detected in British Columbia for the first time in 2009, when three human disease cases were reported (one travel-related). In addition, three horses and ten mosquito pools tested positive for the virus. The arrival of WNV to British Columbia occurred late in the mosquito breeding season, and likely contributed to the low number of positive indicators in 2009. In 2010 it was detected in five corvids and one human. The human infection was probably acquired in the central Okanagan (BCCDC 2010). From experience in other jurisdictions, it has been shown that outbreaks of West Nile virus are often patchy in frequency and amplitude (Reisen and Brault 2007, Brault 2009). Often the virus will be found in birds, mosquitoes and mammals one year and then fewer cases will be reported the next, only for it to reappear with greater severity in a subsequent year.

In 2011, the potential of WNV activity across the border and further incursions to the north requires that targeted pre-emptive treatment and monitoring in the Lower Mainland should be continued. This is particularly crucial where there have been reports of WNV infections over the past two years and at the high risk locations. If the most productive vector populations are not kept in check early in the season, particularly *Culex pipiens* and *Culex tarsalis*, then it may be too late to prevent an exponential increase in numbers of adults that generally occurs after the third or fourth generation.

Because of the human health threat from West Nile virus, the Fraser Health Authority (FHA) has encouraged all local governments, including the City of Surrey, to: (i) identify and map habitat that acts as breeding or development sites for WNV vector mosquitoes, (ii) determine the most appropriate methods for controlling larvae in these sites and (iii) prepare a plan enabling implementation of adult mosquito control in the event that it should be deemed necessary. The City of Surrey is also encouraged to undertake public education emphasizing measures to discourage mosquitoes from breeding on private property and encouraging personal protection strategies community members can use to avoid being bitten by mosquitoes.

Now that WNV is present in BC, it is more likely that the FHA will act to mandate wide-scale larviciding of mosquito breeding habitat in surface waters and catch basins. Thus far, alerts and recommendations circulated by the FHA have given local and regional jurisdictions the option to undertake pre-emptive treatment as they see fit. However, once an official order is given, an immediate response will be required of all responsible jurisdictions.

The City of Surrey has been actively preparing for the arrival of WNV since 2004. Over this period the City has conducted regular mosquito surveillance programs to determine the distribution, species composition and relative abundance of potential WNV vector mosquito species. This West Nile Virus Response Plan document builds from this surveillance data, and details the City of Surrey's planned actions in response to the threat of the virus under three different British Columbia Centre for Disease Control WNV Response Levels (IIa, IIb, and III). This Response Plan also outlines a detailed treatment strategy in the event of an Order to Treat from the FHA, reviews mosquito management methods and materials, and provides resources for City of Surrey staff and for members of the public.



## Table of Contents

Executive Summary.....	i
<b>1.0 Introduction.....</b>	<b>1</b>
1.1 History and Spread of West Nile Virus .....	1
1.2 West Nile Virus Statistics (2004-2010).....	1
1.3 West Nile Virus Health Risk .....	4
1.4 West Nile Virus Transmission .....	5
1.5 Life History of Mosquitoes.....	7
1.5 West Nile Virus Monitoring.....	8
<b>2.0 Roles and Responsibilities .....</b>	<b>9</b>
2.1 BC Centre for Disease Control .....	9
2.2 Union of BC Municipalities .....	9
2.3 Public Health Agency of Canada.....	9
2.4 Provincial West Nile Virus Working Group .....	10
2.5 BC Ministry of Health and the Fraser Health Authority.....	10
2.6 Provincial Health Officer.....	10
2.7 Pest Management Regulatory Agency (PMRA) .....	11
2.8 Metro Vancouver.....	11
2.9 Summary of Important Contacts .....	11
<b>3.0 City of Surrey WNV Risk Reduction - Work Done To Date and Treatment Area Overview.....</b>	<b>12</b>
3.1 City of Surrey West Nile Virus Risk Reduction Work Done to Date.....	12
3.2 Historical Mosquito Habitat Survey Information .....	12
3.2.1 Work Completed in 2010.....	12
3.2.2 Work Completed in 2009.....	13
3.2.3 Mosquito Surveillance in 2008.....	13
3.2.4 Mosquito Surveillance in 2007.....	13
3.2.5 Mosquito Surveillance in 2006.....	14
3.3 Treatment Priority for City of Surrey Surface Water Sites and Catch Basins .....	15
3.3.1 Surface Waters.....	15
3.3.2 Catch Basins .....	18
<b>4.0 City of Surrey's West Nile Virus Response Plan.....</b>	<b>20</b>
4.1 BC Centre for Disease Control West Nile Virus Response Levels .....	20
4.2 City of Surrey West Nile Virus Response Plan for BCCDC Level IIa .....	21
4.2.1 Surveillance Activities under Response Level IIa.....	21
4.2.2 Mosquito Management Activities under Response Level IIa.....	22
4.3 City of Surrey West Nile Virus Response Plan for BCCDC Level IIb or Level III .....	24
4.3.1 Additional Surveillance Activities under Response Level IIb or III.....	24
4.3.2 Response Activities under Response Level IIb or III.....	25
4.4 City of Surrey Response Plan Following an Order to Treat .....	25
<b>5.0 Mosquito Management Using Insecticides.....</b>	<b>27</b>
5.1 Larvicides .....	27
5.1.1 Recommended Larvicides and their Permit Requirements .....	27
5.1.2 Availability of Larvicides .....	29
5.1.3 Larviciding License and Permit Requirements .....	29
5.1.4 Larvicide Application Methods.....	29
5.2 Adulticides .....	30
5.2.1 Adulticides Permitted for use in Canada .....	31
<b>6.0 Natural Mosquito Management – Source Reduction and Habitat Manipulation.....</b>	<b>32</b>
6.1 Habitat Enhancement Measures .....	32
6.1.1 Vegetation .....	32
6.1.2 Predators and Competitors.....	34
6.2 Changes in Hydrology.....	35

6.2.1 Water Flow Management .....	35
6.2.2 Water Depth .....	35
6.3 Mechanical Devices.....	36
6.4 Catch Basin Cleaning Program.....	37
<b>7.0 Communications Strategy .....</b>	<b>38</b>
7.1 Communication with Health Authorities .....	38
7.2 Staff Education Regarding West Nile Virus .....	38
7.3 Public Education.....	38
7.3.1 Timing and Content .....	38
7.3.2 Media.....	38
7.3.3 Metro Vancouver Communications Plan .....	39
<b>8.0 References .....</b>	<b>40</b>
<b>9.0 Appendices .....</b>	<b>42</b>
Appendix A: P. Belton (2006), British Columbia Mosquitoes as Vectors of West Nile Virus.....	42
Appendix B: BC Ministry of Health Services Information Bulletin.....	45
Appendix C: West Nile Virus Dead Bird Handling .....	46
Appendix D: West Nile Virus Bird Submission Form .....	47
Appendix E: City of Surrey 2011 Surface Water Sampling Locations (West Nile Virus Program) .....	48
Appendix F: City of Surrey 2011 Catch Basin Sampling Locations.....	49
Appendix G: VectoBac® 200G 18.1kg Restricted Label.....	50
Appendix H: VectoBac® 200G Material Data Safety Sheet .....	53
Appendix I: VectoLex® CG Restricted Label.....	58
Appendix J: VectoLex® CG Material Data Safety Sheet.....	63
Appendix K: Question and Answer Resources.....	65
Appendix L: Metro Vancouver West Nile Virus Communications Plan.....	72

## List of Tables

Table 1: West Nile Virus Human Infections in Canada and the US, 1999-2009 .....	3
Table 2: Canadian West Nile Virus Surveillance Indicators, 2009 .....	3
Table 3: Summary of BC mosquito Species - WNV Vector Risk, WNV Competence Ratings and Female Feeding Preferences ....	5
Table 4: WNV Risk Potential of City of Surrey Surface Water Sites .....	16
Table 5: BCCDC Arbovirus Response Levels .....	20

## List of Figures

Figure 1: West Nile Virus Transmission Pathways .....	6
Figure 2: Mosquito Life Cycle .....	7
Figure 3: High Risk surface water sites for WNV vector mosquito habitat .....	17
Figure 4: Treatment Priority Ranking of City of Surrey Catch Basins .....	19
Figure 5: City of Surrey Surveillance and Response Activities under Response Level IIa .....	21
Figure 6: Surface Water Larvicide Treatment Decision Matrix - BCCDC WNV Response Level IIa .....	22
Figure 7: Catch Basin Larvicide Treatment Threshold Decision Matrix - BCCDC WNV Response Level IIa .....	22
Figure 8: City of Surrey Surveillance and Response Activities Under Response Level IIb or III .....	24
Figure 9: Surface Water Larvicide Treatment Decision Matrix - BCCDC WNV Response Level IIb and III .....	25
Figure 10: Catch Basin Larvicide Treatment Decision Matrix – BCCDC WNV Response Level IIb or III .....	25
Figure 11: Floating-leaved Pondweed ( <i>Potamogeton natans</i> ).....	33
Figure 12: Cattails ( <i>Typha latifolia</i> ) .....	33
Figure 13: Grass Clippings in a Pond .....	34
Figure 14: Aerators and Fountains can maintain Water Flow in Ponds.....	35
Figure 15: Mosquito Magnet™ Liberty Pro Model.....	36
Figure 16: City of Surrey Catch Basin Cleaning Program.....	37

## 1.0 Introduction

### 1.1 History and Spread of West Nile Virus

West Nile virus (WNV) is an emerging infectious disease, spread primarily by mosquitoes and birds, which was first detected in Uganda in 1937. It was considered to be of minimal public health importance until childhood febrile epidemics were recognized in Egypt 20 years after its discovery (Reisen & Brault 2007). Since then a mild strain of the virus became prevalent in parts of Europe, Russia and Israel. The lack of background immunity in resident birds and humans, combined with the evolution of more virulent strains, most likely set the scene for the extensive WNV epidemics documented in northern latitudes in more recent years.

The virus has now spread beyond its traditional boundaries to North America, where it was first detected in New York City in 1999. Despite a rapidly organized and widespread intensive emergency response by New York City, and mosquito control efforts in surrounding areas, the virus was not contained. Since then, the virus has steadily spread across the continent. Within six years, WNV had moved from east to west coasts, spreading across all of the contiguous 48 states of the USA, and invading parts of southern Canada, Mexico and Central and South America.

*"Failure to contain a mosquito-borne tropical zoonotic virus invading inhospitable northern latitudes served as a reminder of the ability of RNA viruses to adapt rapidly to new environments and the importance of local mosquito control and public health infrastructure in dealing with newly emergent epidemics." (Reisen and Brault 2007)*

### 1.2 West Nile Virus Statistics (2004-2010)

West Nile virus poses a significant threat to humans and is of increasing concern across North America, where it continues to spread relentlessly (Table 1). In 2004, there was a serious outbreak of WNV in California and the disease appeared in Oregon for the first time. In 2005, WNV was detected in all continental US states except for Alaska. In 2006, the US reported 4,269 human disease cases, while 154 human symptomatic and asymptomatic infections were detected in Canada, including 24 in Alberta and 20 in Saskatchewan.

West Nile virus activity was particularly high in 2007. The United States reported West Nile virus activity in 43 states, including 3630 human disease cases. Canada had 2401 human cases (symptomatic and asymptomatic) including 1285 in Saskatchewan, 583 in Manitoba, and 318 in Alberta. The incidence of disease dropped in 2008, with the United States reporting positive results in 44 states, and 1356 human cases. Canada reported only 36 human cases, mainly in Saskatchewan (17) and Manitoba (12).

In 2009, British Columbia detected the first locally-acquired human cases of West Nile virus in the province. However, overall disease activity across North America was relatively low in 2009. Only eight human cases were detected in Canada, including three in BC (Table 2). The United States reported 33 states with viral activity, and only 722 human cases. Across Canada, thirty-seven mosquito pools tested positive, including ten in BC. Three of the six positive horses in Canada were in BC (two in the Okanagan and one in the Fraser Valley). Of the 387 birds tested across Canada, nine tested positive for the virus.

Five human cases, 22 birds, one horse, and 85 mosquito pools tested positive in Canada in 2010. The United States had 964 cases with 41 deaths. Activity in states adjacent to British Columbia was comparatively low: Washington State had one human case, 126 positive mosquito pools, and two bird cases. No horses tested positive in Washington. Idaho had one horse case and Oregon had three positive mosquito pools. California had 102 human cases, 19 horses, 412 birds, and 1,305 mosquito pools.

The first human case of West Nile virus in BC in 2010 was detected in Kelowna in September and five birds have now tested positive for the virus in the Okanagan region. In 2010, no indicators of virus activity were detected in the Lower Mainland. However, detecting the virus is difficult when sampling size is small and sampling effort is limited. Detection of positive birds also depends largely on public responses to finding and reporting dead birds. It is therefore quite possible that WNV persists in the Lower Mainland at low levels.

**Table 1: West Nile Virus Human Infections in Canada and the US, 1999-2010**

YEAR	CANADA		UNITED STATES	
	Human Cases*	Fatalities	Human Cases*	Fatalities
1999	0	0	62	7
2000	0	0	21	2
2001	0	0	66	9
2002	414	20	4,156	284
2003	1,495	14	9,862	264
2004	26	0	2,539	100
2005	238	12	3,000	119
2006	154	2	4,269	177
2007	2,401	12	3,630	124
2008	36	0	1,301	34
2009	8	0	608	23
2010	5	0	981	45
<b>Total:</b>	<b>4,777</b>	<b>60</b>	<b>30,495</b>	<b>1,188</b>

\*Including asymptomatic infections

**Table 2: Canadian West Nile Virus Surveillance Indicators, 2010**

Province/Territory	Human Cases	Positive Birds	Positive Horses	Positive Mosquito Samples
British Columbia	1	5	0	0
Alberta	1	0	0	0
Saskatchewan	2	1	1	9
Manitoba	0	0	0	20
Ontario	1	16	0	56
Quebec	0	0	0	0
Newfoundland & Labrador	0	0	0	0
New Brunswick	0	0	0	0
Nova Scotia	0	0	0	0
Prince Edward Island	0	0	0	0
Yukon	0	0	0	0
Northwest Territories	0	0	0	0
Nunavut	0	0	0	0
<b>Total</b>	<b>5</b>	<b>22</b>	<b>1</b>	<b>85</b>

### 1.3 West Nile Virus Health Risk

West Nile virus is a member of the Japanese encephalitis virus family, which includes several medically important viruses associated with human encephalitis, including: Japanese encephalitis, St. Louis encephalitis, Murray Valley encephalitis, and Kunjin virus (an Australian subtype of WNV). The incubation period of WNV ranges from 3 to 14 days but 80% of people bitten by infected mosquitoes remain unaffected. A survey conducted during the 1999 New York City epidemic indicated that approximately 20% of persons infected with WNV developed West Nile fever and only half of them visited a physician for this illness.

The flu-like symptoms which WNV can produce may lead to encephalitis (inflammation of the brain) or meningitis (inflammation of the lining of the spinal cord and brain). The frequencies of symptoms and signs associated with West Nile fever during recent outbreaks are poorly defined because surveillance has focused on patients with neurological disease. In earlier outbreaks, the disease was described as a febrile illness of sudden onset, often accompanied by malaise, anorexia, nausea, vomiting, eye pain, headache, myalgia, rash, and lymphadenopathy; these symptoms generally lasted 3 to 6 days.

Although recent outbreaks of WNV seem to be associated with increased morbidity and mortality, severe neurological disease remains uncommon. According to the Public Health Agency of Canada, West Nile Virus Neurological Syndrome (WNNS) symptoms include:

- Encephalitis (acute signs of central or peripheral neurological dysfunction), or
- Viral meningitis (pleocytosis and signs of infection e.g., headache, nuchal rigidity), or
- Acute flaccid paralysis (e.g., poliomyelitis-like syndrome or Guillain-Barré-like syndrome), or
- Movement disorders (e.g., tremor, myoclonus), or
- Parkinsonism or Parkinsonian-like conditions (e.g., cogwheel rigidity, bradykinesia, postural instability)

Two surveys conducted in New York City in 1999 and 2000 showed that approximately 1 in 150 infections resulted in meningitis or encephalitis, a result consistent with a 1996 Romanian survey indicating that 1 in 140 to 320 infections led to these diseases. Advanced age is by far the most significant risk factor for severe neurological disease after infection; risk increases markedly among persons 50 years or older (Petersen & Marfin 2002).

There are indications that mosquito abatement programs are reducing WNV risk in some municipalities and cities. For example, a delegation from Idaho that attended the British Columbia Centre for Disease Control (BCCDC) annual WNV meeting in 2007 made reference to a community without a mosquito abatement program, Ada County, which suffered high human case rates and 22 fatalities. Other counties in Idaho that implemented pro-active programs had lower incidences of disease and lower fatalities. It is recommended that municipalities take responsible action to manage populations of potential mosquito vectors of West Nile virus on their land.

## 1.4 West Nile Virus Transmission

West Nile virus spreads to humans through the bites of infected mosquitoes, which have in turn acquired the virus by feeding on the primary disease carrier, migratory birds. Of the approximately 50 mosquito species found in British Columbia, less than 20 feed on both birds and humans, and only a small percentage of these are liable to be highly competent vectors of WNV (Table 3, Appendix A).

The competency rating of potential WNV vector mosquito species is set out by the BC Centre for Disease Control (BCCDC) and ranges from non-vectors (0) such as *Aedes provocans* or *Culex territans* through to highly competent (++++) vectors such as *Culex tarsalis* and *Aedes togoi*.

**Table 3: Summary of BC mosquito Species - WNV Vector Risk, WNV Competence Ratings and Female Feeding Preferences**

Potential Vector Species	Authority	WNV Vector Risk	Competence Rating <sup>1</sup> (+)	Feeding Preference
<i>Culex tarsalis</i>	Coquillet	High	++++	Birds, mammals
<i>Aedes togoi</i>	Theobald	High	++++?	Birds, mammals
<i>Aedes dorsalis</i>	Meigen	High	+++	Mammals, occasionally
<i>Aedes hendersoni</i>	Cockerell	High	+++?	Birds?
<i>Aedes melanimon</i>	Dyar	High	+++	Mammals, occasionally
<i>Culex pipiens</i>	L.	High	+++	Mostly birds
<i>Culiseta inornata</i>	Williston	High	+++	Birds, mammals
<i>Aedes canadensis</i>	Theobald	Moderate	++	General feeder
<i>Aedes vexans</i> *	Meigen	Moderate	++	Mostly mammals
<i>Culiseta incidens</i>	Thomson	Moderate	++?	Mostly mammals
<i>Culiseta morsitans</i>	Theobald	Moderate	++?	Birds?
<i>Aedes cinereus</i>	Meigen	Low	+?	Mammals
<i>Aedes sierrensis</i>	Ludlow	Low	+	Mammals
<i>Aedes sticticus</i>	Meigen	Low	+?	Mammals
<i>Anopheles earlei</i>	Vargas	Low	+?	Mammals, birds?
<i>Anopheles punctipennis</i>	Say	Low	+?	Mammals, birds?
<i>Mansonia (Coq.) perturbans</i>	Walker	Low	+	Birds, mammals
<i>Aedes fitchii</i>	Felt & Young	NIL	0?	Mostly mammals
<i>Aedes provocans</i>	Walker	NIL	0?	Mostly mammals
<i>Culiseta impatiens</i>	Walker	NIL	0?	Mostly mammals
<i>Culex territans</i>	Walker	NIL	0?	Mostly amphibia

<sup>1</sup> Belton (2006)



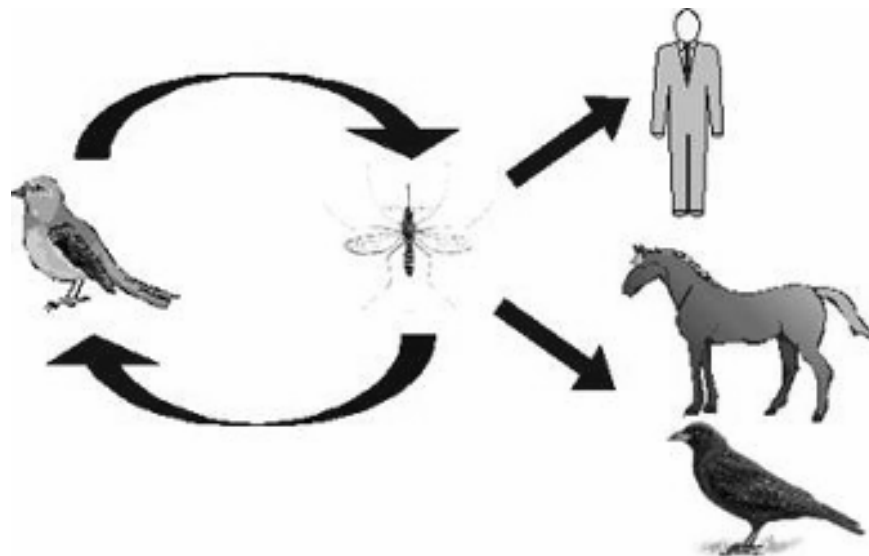
Mosquito species can utilize a wide range of habitats. Floodwater and seepage water habitats can support (0), (+) (++) and/or (+++) species such as *Aedes vexans* (++) , *Aedes sticticus* (+) and *Aedes dorsalis* (+++).

*Culex pipiens* (+++) and *Culiseta incidens* (++) are typically found together, preferring human-made larval development habitats, including ditches, tire ruts and containers including tires, livestock watering troughs, buckets, stored boats or equipment and catch basins.

*Culex tarsalis* (++++) can tolerate a high degree of pollution and uses similar habitat to *Culex pipiens* with high organic content including flooded fields, ditches, borrow pits and sewage lagoons. Both *Culex tarsalis* and *Culex pipiens* can pass through a number of generations each year.

Viral amplification occurs in the bird-mosquito-bird cycle until early fall, when female mosquitoes become dormant and infrequently bite their hosts. Many environmental factors affect this viral amplification cycle (for example, weather, host and vector predators and parasites, and host immune status). When environmental conditions promote significant amplification, sufficient numbers of "bridge vector" mosquitoes - mosquitoes that bite both humans and birds - become infected in late summer, posing an infection threat to humans.

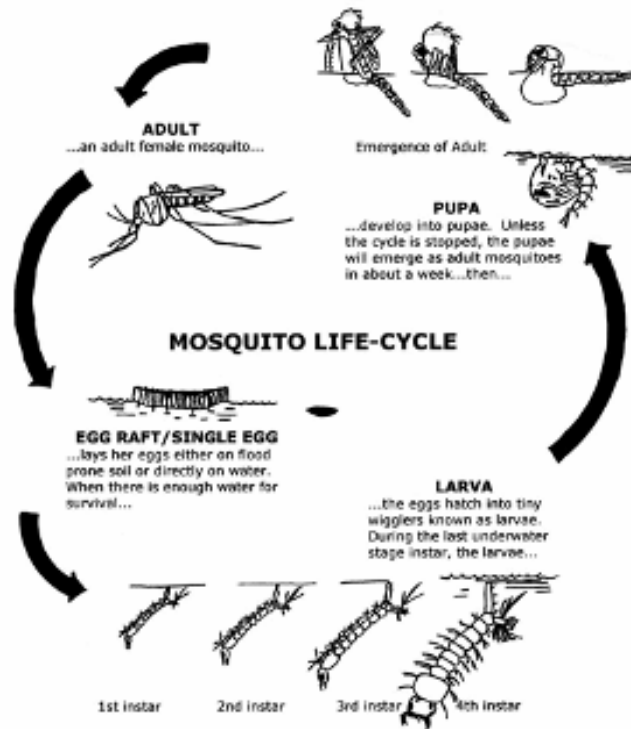
Mammals appear to be less important than birds in the transmission cycle because virus levels in the blood are generally not high enough to maintain transmission back to the mosquitoes. WNV has been confirmed in a number of different mammals, including horses, cats, dogs, domestic rabbits and in several species of squirrel. Domesticated animal cases are generally rare, although horses are known to be susceptible (Figure 1). There are now two vaccines available in Canada specifically for horses.



**Figure 1: West Nile Virus Transmission Pathways**

## 1.5 Life History of Mosquitoes

Mosquitoes are insects belonging to the order Diptera, the True Flies. There are over 2500 different species of mosquitoes throughout the world. Mosquitoes pass through the egg, larval, pupal and adult stages during their life cycle (Figure 2). All stages except the egg stage are mobile.



**Figure 2: Mosquito Life Cycle**

### Eggs

Female mosquitoes lay eggs on the surface of still water or just above the waterline. In addition to water bodies, such as ponds and lagoons, these can include pools in tree holes, discarded containers, or depressions in the ground that hold water. Eggs laid in water either attach to one another to form a raft, or float individually on the surface. For example, *Culex* mosquitoes usually lay their eggs at night on the surface of fresh or stagnant water to form a raft of 100 to 300 eggs. Females may do this many times during their life span. *Anopheles* mosquitoes lay their eggs singly on the water surface. Eggs laid in damp ground above the water line can remain dormant for several years, and will hatch when flooded by rainfall. For example, *Aedes* mosquitoes usually lay eggs singly in damp soil that are highly resistant to drying out (some require complete drying out before the eggs will hatch) and hatch only when flooded with water (e.g. salt water high tides, irrigated pastures, tree holes flooded by rains, flooded stream bottoms) at a particular temperature.

### Larvae

Mosquito eggs usually hatch within 24-48 hours. Emergent larvae live in water from four to 14 days depending on water temperature and food resources. During this time they must come to the surface at frequent intervals to breathe oxygen through a tube called a siphon. They are constantly feeding on food such as algae, plankton, fungi, bacteria and other microorganisms since maturation requires significant energy. During this growing phase, the larvae molt (shed skin) four times. The stages between molts are called instars, and it is at the 4th instar that a larva usually reaches a length of almost 1/2 inch.

The abundance of larvae varies throughout the mosquito breeding season. In early spring (i.e., before May 1<sup>st</sup>), populations of larval mosquitoes are generally low in surface water sites and always absent from catch basins, where they are seldom found until the middle of June. Larval populations tend to peak in July or early August, before declining steadily to very low numbers by late September. Larvae are rarely found in catch basins past the end of September.

### **Pupae**

The larvae molt for a final time about four to 14 days after the eggs hatch to emerge as pupae. Development continues inside the pupae, with legs and wings forming in preparation for adult life. Mosquito pupae live in water from two to seven days, depending upon species and temperature.

### **Adult**

After the pupa splits, the adult emerges and rests on the water's surface until it is strong enough to fly. Male mosquitoes mate with females one to two days after the females emerge. Female mosquitoes then seek a host animal to feed on to obtain the blood meal they require for the production of fertilized eggs. Stimuli that influence their biting (blood feeding) include a combination of carbon dioxide, temperature, moisture, smell, colour and movement. Male mosquitoes do not bite, but feed on the nectar of flowers or other suitable sugar sources.

Different mosquito species differ in their blood feeding behaviour and hosts. *Aedes* mosquitoes are commonly highly persistent human biters. They usually search for a blood meal early in the morning, at dusk and into the evening, although some are diurnal (daytime biters), especially on cloudy days and in shaded areas. They usually do not enter dwellings, and they prefer to bite mammals like humans. *Aedes* mosquitoes are strong fliers and are known to fly many miles from their breeding and development sources.

*Culex* mosquitoes are occasional human biters, but prefer to attack only at dusk and after dark late in the season when they will readily enter dwellings. They usually prefer domestic and wild birds over humans and other mammals. *Culex* mosquitoes are generally weak fliers when compared to other species, and do not move far from where they develop, although they have been known to fly up to ten miles from where they emerge. *Culex* mosquitoes go through numerous generations each year but usually live for only a few weeks during the warm summer months. Females that emerge in late summer search for sheltered areas where they "hibernate" until spring. Warm weather in the spring brings them out again in search of a blood meal after which they seek out water on which to lay their pre-fertilized eggs.

*Culiseta* mosquitoes are moderately aggressive biters, attacking in the evening hours or in the shade during the day. *Psorophora*, *Coquillettidia* and *Mansonia* mosquitoes are becoming more common pests as an ever-expanding human population invades their natural habitats. *Anopheles* mosquitoes are relatively rare in Canada but are persistent biters and are the only mosquitoes which transmit malaria to humans.

## **1.5 West Nile Virus Monitoring**

Many different species of birds may act as reservoirs for West Nile virus (up to 138 different species of birds have been reported with WNV infection in North America). Bird surveillance has focused mainly on the Corvidae family that includes crows, ravens, blue jays and magpies. These birds tend to be very susceptible to infection and often become very ill and/or die as result of an infection. In most jurisdictions in North America, dead birds (of the corvid family) and mosquito populations are monitored for WNV during the mosquito breeding season, and act as an early warning system against human infection. In BC, the mosquito monitoring program operates between the months of May and October and is coordinated by the BC Centre for Disease Control (BCCDC). Dead corvids and adult mosquitoes from across the province are collected during this time and tested for WNV. Surveillance data in the form of tables, maps and reports are available on the BCCDC website (see section 2.1). In the United States, results of WNV surveillance are summarized by the US Geological Survey (USGS) and updated weekly.

## 2.0 Roles and Responsibilities

The City of Surrey is responsible for mosquito management and WNV Risk Reduction on all public lands within its boundaries. Private land is the responsibility of individual landowners, but the City will help inform the public about mosquito management options available to them.

To respond to the threat posed by West Nile virus, the City of Surrey is working closely with the following authorities and committees responsible for managing WNV risk:

### 2.1 BC Centre for Disease Control

The BC Centre for Disease Control (BCCDC) coordinates the provincial response to WNV and provides information to guide the public and health and municipal officials in addressing the identified health risks associated with the virus. The BCCDC has established guidelines for surveillance and response that categorize levels of WNV alert. Throughout the mosquito breeding season, the BCCDC provides regular up-to-date summaries of surveillance results in British Columbia, Canada and the United States, including surveillance of humans, birds, mosquito pools and horses.

For more information:

BCCDC, 655 W 12th Ave, Vancouver, BC, V5Z 4R4; Phone: (604) 707-2400; Fax: (604) 707-2401; <http://www.bccdc.ca>

### 2.2 Union of BC Municipalities

Under agreement with the Ministry of Health, the Union of BC Municipalities (UBCM) administers a program to assist communities in planning and implementing programs designed to control mosquito populations. The program provides financial assistance to local governments wishing to implement programs directed at WNV vector mosquito control and is intended to complement existing programs, or to implement new mosquito control initiatives.

For more information:

Danyta Welch, Programs Officer, UBCM/Municipal House, 545 Superior Street, Victoria, BC V8V 1X4 Phone: (250) 356-5193; Email: [dwelch@ubcm.ca](mailto:dwelch@ubcm.ca)

### 2.3 Public Health Agency of Canada

The Public Health Agency of Canada (PHA) coordinates the national approach to WNV including surveillance, blood screening, pesticide regulation, information and First Nations involvement.

For more information:

Visit the Health Canada West Nile virus website - [http://www.phac-aspc.gc.ca/wn-no/index\\_e.html](http://www.phac-aspc.gc.ca/wn-no/index_e.html)

## 2.4 Provincial West Nile Virus Working Group

BC's West Nile Virus Working Group has helped to develop the provincial WNV strategy. The group includes public health inspectors, physicians, veterinarians, wildlife experts, entomologists and pesticide officers. Representation also includes those from the BC Centre for Disease Control, regional health authorities and the provincial ministries of Health, Environment and Agriculture.

## 2.5 BC Ministry of Health and the Fraser Health Authority

From 2004 to 2008, the Ministry of Health obtained a blanket permit under the Pesticide Control Act for pesticide application for mosquito control in BC as part of the provincial WNV strategy. The permit provided a legal mechanism to allow pesticide application if health officials determine the virus poses a public health threat. If local governments or other agencies engaged in mosquito control programs did not have their own pesticide permit in place, they applied to act as an agent for the Ministry of Health Services.

In 2009 and going forward, a Pest Management Plan (PMP) is needed to be able to apply pesticides. The Fraser Health Authority has created a PMP under which the municipalities in the Health Authority such as Surrey will be able to operate.

The Fraser Health Authority (FHA) is one of Canada's largest health authorities, providing health services for communities in Abbotsford, Agassiz, Burnaby, Chilliwack, Delta, Harrison Hot Springs, Hope, Kent, Langley, Maple Ridge, Mission, New Westminster, Pitt Meadows, Surrey, Tri Cities and White Rock. The FHA gives information on WNV symptoms, treatment, prevention, and what private properties and residents can do to minimize mosquito breeding on their land.

The FHA operates a West Nile virus Toll Free Hotline: 1-888-WNV-LINE (1-888-968-5463). Functions of the Toll Free Hotline include:

- Public reporting of dead corvids (crows, ravens, jays)
- Public reporting of stagnant water problems
- Source of up-to-date information about West Nile Virus in BC
- General questions

For more information:

Fraser Health, Corporate Office, 300, 10334 - 152A Street, Surrey, BC, V3R 7P8; Phone: (604) 587-4600; Fax: 604 587-4666; [www.fraserhealth.ca](http://www.fraserhealth.ca)

## 2.6 Provincial Health Officer

The Provincial Health Officer (PHO) is the senior medical health officer for BC. The PHO works with Medical Health Officers and the BC Centre for Disease Control in affected regions.

For more information:

Dr. Perry Kendall (PHO), Office of the Provincial Health Officer, 4th Floor, 1515 Blanshard Street, Victoria BC V8W 3C8; Phone: (250) 952-1330; Fax: (250) 952-1362; <http://www.hls.gov.bc.ca/pho/index.html>

## 2.7 Pest Management Regulatory Agency (PMRA)

Health Canada's Pest Management Regulatory Agency (PMRA) is the federal agency responsible for the regulation of pest control products in Canada. As the federal authority under the *Pest Control Products Act* (PCPA), the PMRA also:

- Develops pest management policies and guidelines
- Promotes sustainable pest management
- Looks to improve the regulatory process to increase efficiency
- Enforces compliance with the PCPA
- Distributes pest management information to the general public and key stakeholders

For more information:

Visit the PMRA website - <http://www.pmra-arla.gc.ca/english/aboutpmra/about-e.html>

## 2.8 Metro Vancouver

Metro Vancouver is taking a proactive approach to mosquito management on lands that it owns, including wastewater treatment plants, waste transfer stations, regional parks and greenways, housing facilities and Electoral Area A public lands. The City of Surrey has worked on a joint communications plan with Metro Vancouver. Metro Vancouver hosts a website with more information about its WNV program:

[www.metrovancouver.org/services/wnv/Pages/default.aspx](http://www.metrovancouver.org/services/wnv/Pages/default.aspx)

To comply with new regulations, Metro Vancouver has created a Pest Management Plan which will be active from 2009 to 2013, which Surrey is eligible to use as a member municipality. Surrey also works with Metro Vancouver in implementing a comprehensive nuisance mosquito control program each year.

## 2.9 Summary of Important Contacts

BC Nurses Hotline: 8-1-1 or for deaf and hearing-impaired assistance (TTY), call 7-1-1.

BC Centre for Disease Control: [www.bccdc.ca](http://www.bccdc.ca) or call (604) 707-2400

Fraser Health Authority: [www.fraserhealth.ca](http://www.fraserhealth.ca) or call 1-888-WNV-LINE / 1-888-968-5463

City of Surrey Mosquito Control Program: [www.culex.ca](http://www.culex.ca) or call 604-872-1912

## 3.0 City of Surrey WNV Risk Reduction - Work Done To Date and Treatment Area Overview

### 3.1 City of Surrey West Nile Virus Risk Reduction Work Done to Date

The City of Surrey has been actively preparing for the arrival of West Nile virus since 2004 when it initiated annual mosquito surveillance and control programs on public lands for WNV risk reduction (Lewis 2006; Jackson et al. 2007, Jackson et al. 2008, Jackson et al. 2009, Jackson et al. 2010). Appendices E and F show City of Surrey 2010 WNV surface water and catch basin sampling locations.

In preparation for the arrival of WNV to the region and in anticipation of the receipt of recommendations or a Health Order mandating treatment from Fraser Health Authority, the City of Surrey has also prepared a comprehensive West Nile Virus Response Plan.

The City of Surrey provides public communication through its website, which includes a page on mosquito control and WNV that highlights the disease, the City of Surrey's WNV prevention efforts, as well as suggestions for personal protection and reduction of mosquito breeding areas:

<http://www.surrey.ca/city-government/3438.aspx>

### 3.2 Historical Mosquito Habitat Survey Information

#### 3.2.1 Work Completed in 2010

Between June 3<sup>rd</sup> and August 26<sup>th</sup>, 2010, the mosquito monitoring program included 196 larval sampling events at 15 surface water sites and five catch basin surveillance rounds of 50 catch basins each. In total, 1,734 larvae were sampled from surface waters and 641 larvae were collected from catch basins.

Where numbers of WNV vector larvae in surface waters exceeded threshold levels, sites were treated with the bacterial larvicide *Bacillus sphaericus* (Bsph). A total of six surface water sampling sites in the City of Surrey contained sufficient numbers of late instar WNV vectors to require treatment on at least one occasion. In total, 12 larvicide applications totalling 4.45 kilograms of VectoLex® CG were applied to 4,450 square metres of surface water. The average number of mosquito larvae sampled in surface water in 2010 was higher than in all previous years' surveillance. This increase in the average was attributed at least in part to the prioritized selection of sites based on their historical production of high numbers of potential high risk vector larvae.

Catch basin larval numbers peaked in late June when 27% of wet catch basins were occupied with an average of nine larvae per basin. Compared with previous years, the number of larvae in catch basins across the City of Surrey and the Lower Mainland remained low in 2010. On June 30<sup>th</sup>, six of the 50 basins contained more than ten larvae, triggering the widescale treatment of catch basins in the City of Surrey. Of the 43,843 catch basins on the municipal roads (Figure 5), 36,441 were discovered to be holding water, and were treated with one pouch (10 g) of VectoLex® WSP between July 8<sup>th</sup> and July 24<sup>th</sup>, 2010. An additional 2,743 catch basins were visited in Surrey Parks from August 16<sup>th</sup> to 25<sup>th</sup>. A total of 1,921 of the parks catch basins held water and were treated.

### 3.2.2 Work Completed in 2009

In 2009, surveillance data from 2007 and 2008 were used to create a priority hierarchy for surface water and catch basin treatment (see section 3.3). This exercise was conducted to be prepared in the event an Order to Treat was issued, and funding released. Eight surface water sites from the Surrey WNV program were identified as High Risk, while seven surface water sites ranked Moderate. To prioritize catch basin treatment, population data from the City of Surrey was obtained from the City's GIS department. Using a prioritization scheme, catch basins were classified into high, moderate, and low risk. All catch basins within 800 meters of high density populated areas were ranked as highest priority for treatment.

### 3.2.3 Mosquito Surveillance in 2008

In 2008, six rounds of surface water and four rounds of catch basin larval sampling were carried out between June 30<sup>th</sup> and August 22<sup>nd</sup>. Also, six rounds of adult trapping were conducted from July 3<sup>rd</sup> to September 12<sup>th</sup>. In total, 390 larvae were sampled from surface waters, 2111 larvae were collected from catch basins, and 2333 adults were collected in CDC light traps.

Twenty one percent of the 52 surface water sites monitored in 2008 contained high risk WNV vector species. Of those larval samples identified to species, 38% were the high risk WNV vector mosquito *Culex pipiens*. In total, 47% of the larvae identified were high risk WNV vector mosquitoes. The remaining 53% were low or nil risk WNV vector species. One mosquito-positive surface water sites (SUR-78) contained sufficient numbers of late instar WNV vectors to require treatment with the larvicide VectoLex<sup>®</sup> CG. In total, 80 grams of VectoLex<sup>®</sup> CG were applied to 80m<sup>2</sup> of surface waters on July 31, 2008.

The number and distribution of larvae present in City of Surrey catch basins peaked in mid July when larval numbers reached an average of 8.3 larvae per wet catch basin, 53% of which were occupied. Numbers of larvae detected in City of Surrey catch basins in 2008 were higher than those found in 2007 (maximum 17% occupied; 1.7 larvae per wet basin). As a pre-emptive measure, all 28 047 wet, sumped catch basins were treated with 280kg of the larvicide VectoLex<sup>®</sup> WSP from July 19<sup>th</sup> to August 5<sup>th</sup> 2008.

Of those adult samples identified to species from the 72 trap nights of sampling with CDC light traps, most of these (57%) were high risk WNV vectors of which the majority were the high risk WNV vector species, *Culex pipiens* (51%). In addition, 36% were moderate risk WNV vector species, with only 7% low to nil risk WNV vectors.

To reduce numbers of WNV vectors breeding in City of Surrey public lands in 2009, Culex Environmental recommends ongoing monitoring of surface waters and catch basins.

### 3.2.4 Mosquito Surveillance in 2007

Sampling activities carried out between July 6<sup>th</sup> and September 28<sup>th</sup> 2007 included seven rounds of surface water larval sampling, five rounds of catch basin larval sampling, and multiple rounds of adult mosquito trapping. In total, 141 larvae were sampled from surface waters and 599 larvae were collected from catch basins. In addition, between three and eight rounds of adult trapping conducted at 12 sites trapped a total of 2651 adult mosquitoes.

Eleven of the 75 surface water sampling sites monitored throughout the summer were found to harbour high risk WNV vector larvae. Of those larval samples positively identified to species, 21% were identified as *Culex tarsalis* and 4% as *Culex pipiens*, both highly competent WNV virus vectors. Two of the mosquito positive surface water sites (SUR 22 and SUR 47) contained sufficient numbers of late instar WNV vector larvae to require treatment with the larvicide VectoLex<sup>®</sup> CG.

For City of Surrey catch basins, occupancy rates increased from a low of 0.6% of wet catch basins occupied by mosquito larvae in late June to 16% occupied in early July. Widescale treatment of City of Surrey catch basins occurred between July 12<sup>th</sup> and August 14<sup>th</sup> 2007. In total, 43,667 catch basins were treated with the 437 kg of the larvicide VectoLex<sup>®</sup> WSP. Sampling continued during and after this treatment, over which period occupancy rates



decreased to between 5 and 7%. The generally low numbers of mosquitoes sampled from City of Surrey catch basins in 2007 is in accord with a declining trend seen across the Vancouver Southern Lower Mainland and North Shore over the past four years. The reduction in larval abundance last year was likely due, at least in part, to heavy rainfall in June and July flushing catch basins and suppressing larval survival.

Of the 2651 adult mosquitoes trapped, the majority (59%) belonged to four high risk WNV vector species: *Culex pipiens* (45%), *Culex tarsalis* (11%), *Culiseta inornata* (1%) and *Aedes dorsalis* (2%).

Both short-term and long-term recommendations for control of breeding WNV vector mosquitoes in surface water sites and catch basins were detailed, including increasing or maintaining water movement to discourage egg-laying, and increasing water depth to greater than 60cm to encourage predators and help maintain water temperatures at less than 25°C. Also, vegetation management was recommended to encourage predators and increase shade. Where short-term measures were required, treatment using biological larvicides was recommended.

### 3.2.5 Mosquito Surveillance in 2006

Building on the work of 2004 and 2005, the City of Surrey contracted Morrow Bioscience to continue monitoring and control of mosquitoes throughout the 2006 breeding season (Lewis 2006). Sampling activities carried out between the weeks of June 12<sup>th</sup> and September 18<sup>th</sup> 2006 included biweekly larval sampling of surface water sites and 196 catch basins. In total, 673 larvae were sampled from surface waters and 11794 larvae were collected from catch basins. In addition, the Fraser Health Authority conducted multiple rounds of adult mosquito trapping at four sites.

Of the 673 larvae collected from surface water sites, the majority were identified as the highly competent WNV virus vector *Culex pipiens*, although another highly competent vector, *Culex tarsalis*, was also found. All sites containing these species were treated with Aquabac® 200G, with 11.4kg being used over 2.71ha. The larval total was a decrease from the number of larvae sampled from surface water sites in 2005, when 1100 larvae were collected.

For City of Surrey catch basins, larvae began to appear in catch basins during the week of July 2<sup>nd</sup> 2006, and peaked the week of July 10<sup>th</sup> 2006. More than 90% of the larvae sampled were identified as the highly competent WNV virus vector *Culex pipiens*. Widescale treatment of City of Surrey catch basins occurred between the weeks of July 15<sup>th</sup> and August 20<sup>th</sup> 2006. In total, 30,444 catch basins were treated with the larvicide VectoLex® WSP. Post-treatment monitoring showed that larval production terminated in treated catch basins for the remainder of the surveillance season. The increase in total number of larvae sampled from the same series of catch basins from 2005 (n = 5700) to 2006 (n = 11794) may in part be attributed to the longer sampling season in 2006, when sampling effort began a month earlier than in previous years.

The increase in numbers of adult mosquitoes trapped in 2006 from 2005 included an increase in the number of the highly competent WNV vector species, *Culex pipiens* (n = 2860) and *Culex tarsalis* (n = 736).

### 3.3 Treatment Priority for City of Surrey Surface Water Sites and Catch Basins

In years where funding is available to conduct wide-scale treatments, such as in 2011, all catch basins should be visited, and the basins that contain water should be treated. To optimize the effectiveness of treatment, co-ordination with the catch basin cleaning schedule is required so that treatment occurs after cleaning as much as possible. In years where there is insufficient funding for treatment, basins can be prioritized based on their proximity to highly populated areas and highly public areas (parks).

#### 3.3.1 Surface Waters

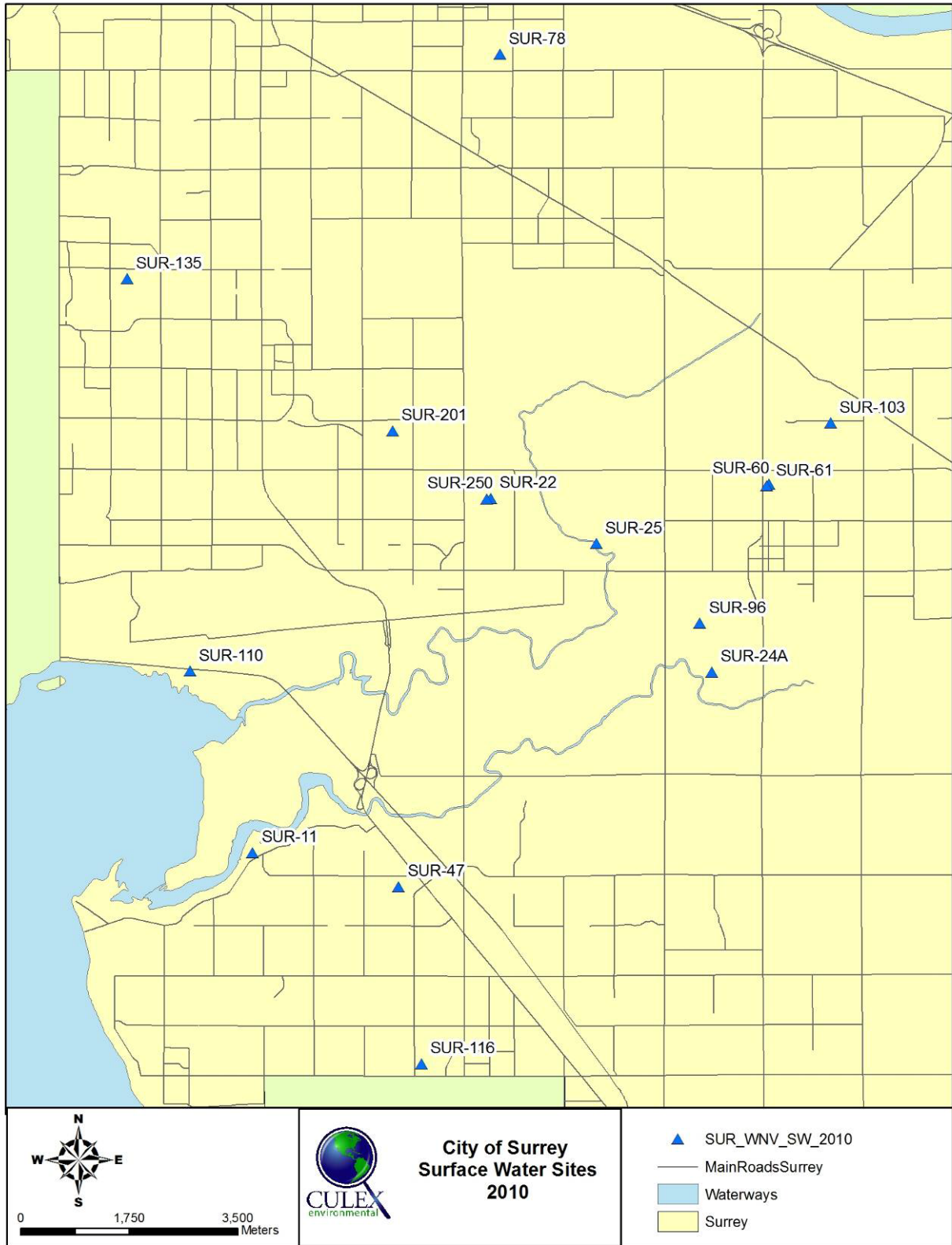
In 2009, surveillance data from 2007 and 2008 were used to create a priority hierarchy for surface water treatment. The most current data were used; as areas where standing water is found can vary from year to year with construction, development, drainage and rainfall. The prioritization scheme should be revisited within the next couple of years to ensure that the basis of prioritization has not changed. The WNV Risk Rating for each site was assessed based on the species composition and larval numbers at a site. Each site's rating was based on the mosquito species found with the highest WNV vector competency. This weighting of species enables sites with few high risk species to receive a WNV Competency Score higher than that of sites with more abundant low risk species, thus reflecting the risk of a site's breeding potential specifically for WNV vectors.

If more than five high risk mosquitoes were detected at a site, the site was assessed as a High Risk site. If five or fewer high-risk mosquitoes were collected at a site, the site WNV Risk Rating was lowered to Moderate as the site was not considered to be a significant breeding site. If moderate risk species were detected at a site, it was considered a Moderate Risk site, and if only low risk species were detected, it was ranked as a Low Risk site. Eight sites from the Surrey WNV program were identified as High Risk, while seven sites ranked Moderate (Table 4). These fifteen sites are shown in Figure 3.

Twenty-one sites from around Mud Bay, which are currently part of the Metro Vancouver Nuisance Mosquito Control Program, were also included in the assessment and were ranked as High Risk (Table 4). These sites can contain high numbers of *Aedes dorsalis*, a salt-tolerant mosquito that can cause large nuisance problem but is also ranked high on the WNV vector competency scale.

**Table 4: WNV Risk Potential of City of Surrey Surface Water Sites**

<b>Program</b>	<b>Site ID</b>	<b>Habitat Type</b>	<b>Site Potential</b>	<b>Risk 2007</b>	<b>Risk 2008</b>	<b>Priority 2009</b>
<b>Surrey WNV</b>	SUR-24A	Ditch	Permanent	Nil	High	High
	SUR-25	Ditch	Semi-Permanent	High	N/S	High
	SUR-110	Depression	Semi-Permanent	N/S	High	High
	SUR-116	Pond	Permanent	N/S	High	High
	SUR-60	Pond	Permanent	Moderate	High	High
	SUR-61	Marsh	Permanent	Moderate	High	High
	SUR-78	Marsh	Semi-Permanent	Moderate	High	High
	SUR-96	Ditch	Permanent	Moderate	High	High
	SUR-11	Ditch	Semi-Permanent	Moderate	Nil	Moderate
	SUR-47	Ditch	Semi-Permanent	Moderate	Nil	Moderate
	SUR-103	Marsh	Permanent	Moderate	Nil	Moderate
	SUR-135	Ditch	Semi-Permanent	Moderate	Nil	Moderate
	SUR-201	Ditch	Permanent	N/S	Moderate	Moderate
	SUR-22	Ponded Stream	Permanent	Moderate	Low	Moderate
	SUR-250	Ditch	Semi-Permanent	Moderate	N/S	Moderate
<b>Metro Vancouver Nuisance Mosquito Program</b>	SR-610	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-609	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-611	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-614	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-615	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-612	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-616	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-618	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-621	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-620	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-619	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-613	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-624	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-628	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-629	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-622	Saltwater Marsh	Semi-Permanent	N/S	High	High
	SR-617	Saltwater Marsh	Semi-Permanent	N/S	High	High
SR-627	Saltwater Marsh	Semi-Permanent	N/S	High	High	
SR-625	Saltwater Marsh	Semi-Permanent	N/S	High	High	
SR-626	Saltwater Marsh	Semi-Permanent	N/S	High	High	
SR-622	Saltwater Marsh	Semi-Permanent	N/S	High	High	



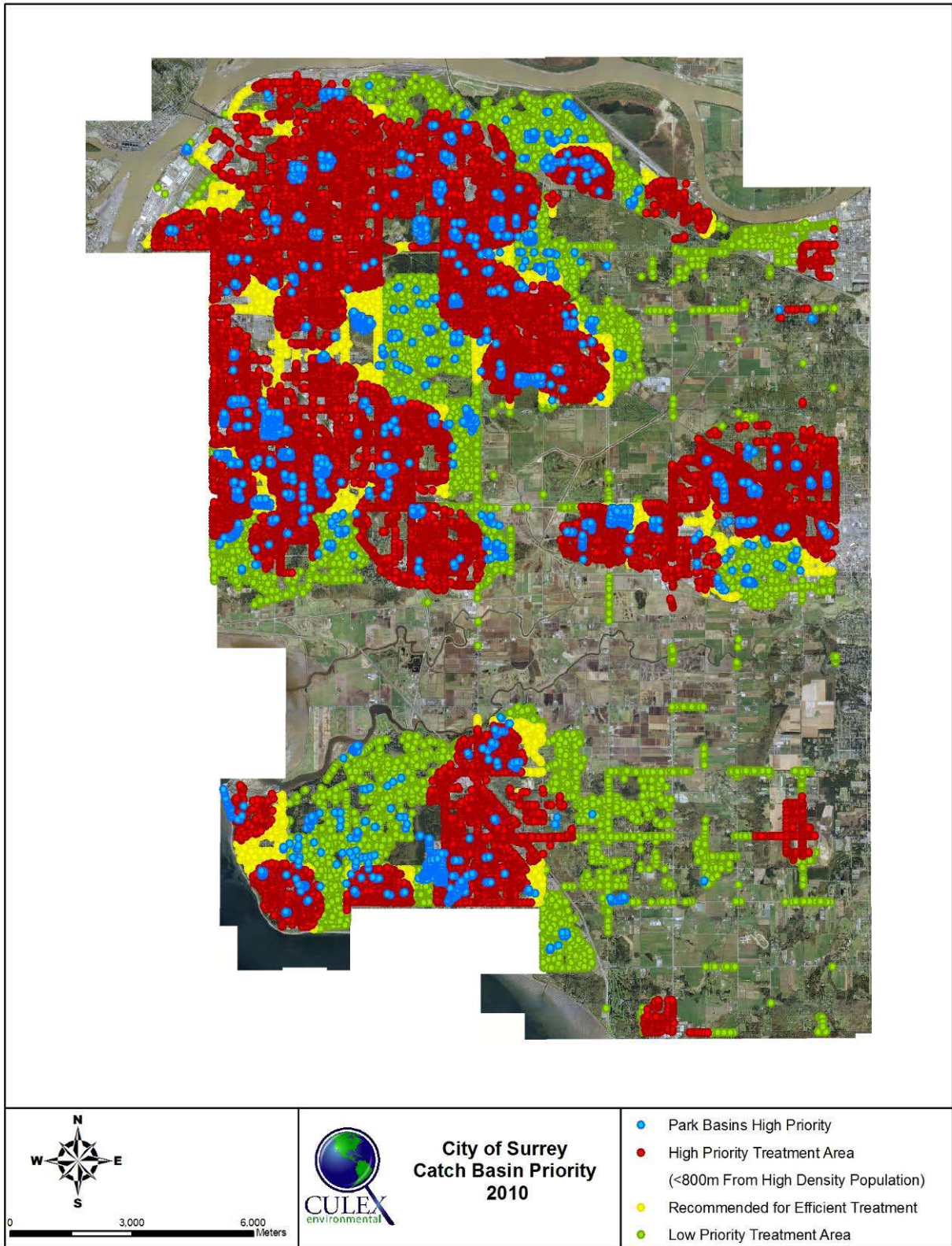
**Figure 3: High Risk surface water sites for WNV vector mosquito habitat**

### 3.3.2 Catch Basins

The City of Surrey has 50,030 basins associated with the road system, and 2,576 basins located in parks for a total of 52,606 basins according to the 2011 GIS data. In years where funding is available to conduct wide-scale treatments, such as in 2011, all catch basins should be visited, and the basins that contain water should be treated. To optimize the effectiveness of treatment, co-ordination with the catch basin cleaning schedule is required so that treatment occurs after cleaning as much as possible. In years where there is insufficient funding for treatment, basins can be prioritized based on their proximity to highly populated areas and highly public areas (parks).

To prioritize catch basin treatment priority, population data from the City of Surrey was obtained from the City's GIS department. Density values (per acre) within the City ranged from zero to 1366. Any areas with a value of 100 or greater were classified as high density. The flight range of *Culex pipiens* has been observed to be up to 800 metres (Virginia Mosquito Control Assoc. 2003). On this basis, all catch basins within 800 meters of high density populated areas were ranked as highest priority for treatment. All park basins were included in the high priority ranking as these basins are located in areas often frequented by the public, and near grassy or treed areas. Mosquitoes are found significantly more often in basins that have trees or grass adjacent to them.

In total, 30,071 catch basins were identified as High Priority road basins, and were coloured red on the map (Figure 4). The blue dots represent the 2,576 basins located in parks. Select basins which are located outside the high density areas were included to increase efficiency of a treatment operation and are coloured yellow (4,271). Therefore, the total number of basins visited when treating high priority basins (roads and parks) would be 36,918. The remainder of the basins (15,688) are in less densely populated areas and are shown in green.



**Figure 4: Treatment Priority Ranking of City of Surrey Catch Basins**



## 4.0 City of Surrey's West Nile Virus Response Plan

The City of Surrey has developed a WNV response plan based on the BCCDC's (2005) arbovirus surveillance and response guidelines for BC. This section details these guidelines, the City of Surrey's response plan for the BCCDC Response Levels IIa, IIb, and III, and the City's response plan under an Order to Treat from the FHA.

### 4.1 BC Centre for Disease Control West Nile Virus Response Levels

In July 2005, the BC Centre for Disease Control developed Arbovirus Surveillance and Response Guidelines for BC (BCCDC 2005). The guidelines outline five response levels that represent increasing risk of human infection (ranging from 0 to I, IIa, IIb and III) and are based on the type (i.e. mosquito, avian, human or other mammal) and geographic location of WNV activity (Table 5). The levels are intended to help decide what surveillance and control activities should take place in an area for a given arbovirus (e.g., West Nile virus).

**Table 5: BCCDC Arbovirus Response Levels**

Level 0:	Absence of confirmed arbovirus infection in a bird, animal or mosquito pool, AND arbovirus activity is unlikely.
Level I	Absence of confirmed arbovirus infection in a bird, animal or mosquito pool, AND arbovirus activity is possible or the risk is unknown.
Level IIa:	Detection of arbovirus activity in a jurisdiction <sup>1</sup> during the previous year, OR in a neighbouring jurisdiction in Canada or the United States in the current year or previous year, based on laboratory confirmed identification in a bird, mammal, mosquito pool or human.
Level IIb:	Detection of arbovirus activity <u>within</u> a jurisdiction, in the current year, based on laboratory confirmed identification in a bird, mammal, or mosquito pool.
Level III:	Detection of a single or multiple <sup>2</sup> laboratory confirmed human case(s) of arbovirus infection (with no history of travel to an area with confirmed activity of the arbovirus within 21 days of onset of symptoms), in the current year, within a jurisdiction.

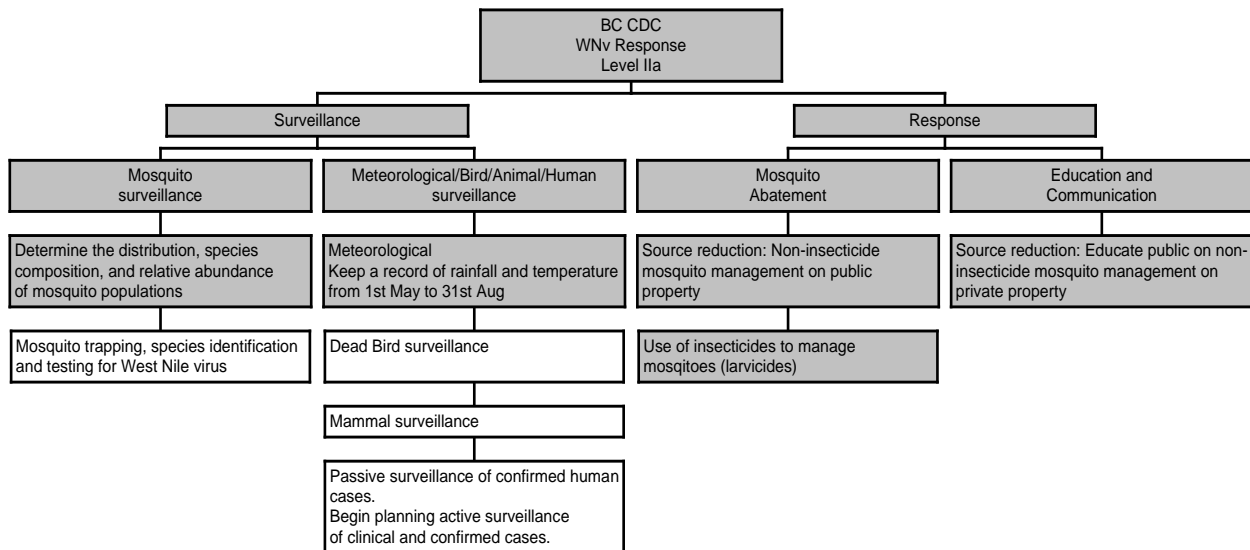
As of May 2011, the BCCDC Response Level in British Columbia is IIa, due to WNV activity in British Columbia (Aldergrove) in the previous year. Sections 4.2 and 4.3 list the activities that occur under these BCCDC response levels.

<sup>1</sup> Jurisdiction can be defined as a Health Service Delivery Area or any area administered by a legally-defined authority.

<sup>2</sup> In some jurisdictions/provinces/territories the identification of a single versus multiple laboratory-confirmed human case(s) of WNV virus infection, may have an impact on the kinds of mosquito abatement and control measures that are implemented.

## 4.2 City of Surrey West Nile Virus Response Plan for BCCDC Level IIa

Figure 5 identifies the surveillance and response activities that are to take place in the City of Surrey under response level IIa. The shaded boxes identify the areas in which the City can play an active role.



**Figure 5: City of Surrey Surveillance and Response Activities under Response Level IIa**

### 4.2.1 Surveillance Activities under Response Level IIa

#### *Mosquito Surveillance*

BCCDC guidelines for Response Level IIa recommend that the City of Surrey determine the distribution, species composition and relative abundance of potential WNV vector mosquito species within their jurisdiction. The City of Surrey conducted a program each year from 2004-2008 by monitoring mosquito populations through larval and adult sampling. Except for 2009, a detailed assessment was conducted each year, and sites classified as high, medium, or low risk based on the distribution and abundance of species present.

#### *Meteorological, Bird, Animal and Human Surveillance*

The City of Surrey is not responsible for undertaking the BCCDC Response Level IIa surveillance activities of bird, animal or human surveillance. Throughout the mosquito breeding season, the BCCDC will provide regular up-to-date summaries of surveillance results in British Columbia, Canada and the United States. The City of Surrey will monitor this data as it becomes available.

The BCCDC WNV response guidelines recommend monitoring rainfall and temperature for conditions conducive to survival of vector mosquito populations. For example, wet conditions early in the summer, followed by hot weather could lead to a spike in the mosquito population. The City of Surrey has kept a record of rainfall and temperature from 1<sup>st</sup> May to 31<sup>st</sup> August. Mosquito abundance data from the City of Surrey's mosquito monitoring program is being compared with climatic data to explore possible correlations.



## 4.2.2 Mosquito Management Activities under Response Level IIa

### Mosquito Abatement

Under BC CDC Response Level IIa, broad approaches for the City of Surrey to consider in the management of mosquitoes include:

- Use of insecticides (larvicides) to control mosquitoes.
- Source reduction: non-insecticide control of mosquitoes on public lands
- Education and communication

### Use of Insecticides (Larvicides) to Control Mosquitoes

The BCCDC WNV response for Level IIa recommends the use of larvicides to control potential WNV mosquito populations. Section 5.1 details the use of larvicides to manage mosquito populations. Based on recommendations from the Fraser Health Authority, the City of Surrey will follow the larviciding guidelines for surface waters and catch basins laid out in Figures 6 and 7, respectively.

Mosquito stages present?	Eggs or pupa only →	Do not treat. Set a return inspection date.
1 <sup>st</sup> to 4 <sup>th</sup> instar or pupa – take sample to lab to ID unless historical records show consistent presence of WNV species. ↓		
Apply larvicide		

**Figure 6: Surface Water Larvicide Treatment Decision Matrix - BCCDC WNV Response Level IIa**

Mosquito stages present?	Eggs or pupa. →	Do not treat. Set a return inspection date.
1 <sup>st</sup> to 4 <sup>th</sup> instar. ↓		
Apply larvicide.		

**Figure 7: Catch Basin Larvicide Treatment Threshold Decision Matrix - BCCDC WNV Response Level IIa**

### Source Reduction: Non-Insecticide Control of Mosquitoes on Public Lands

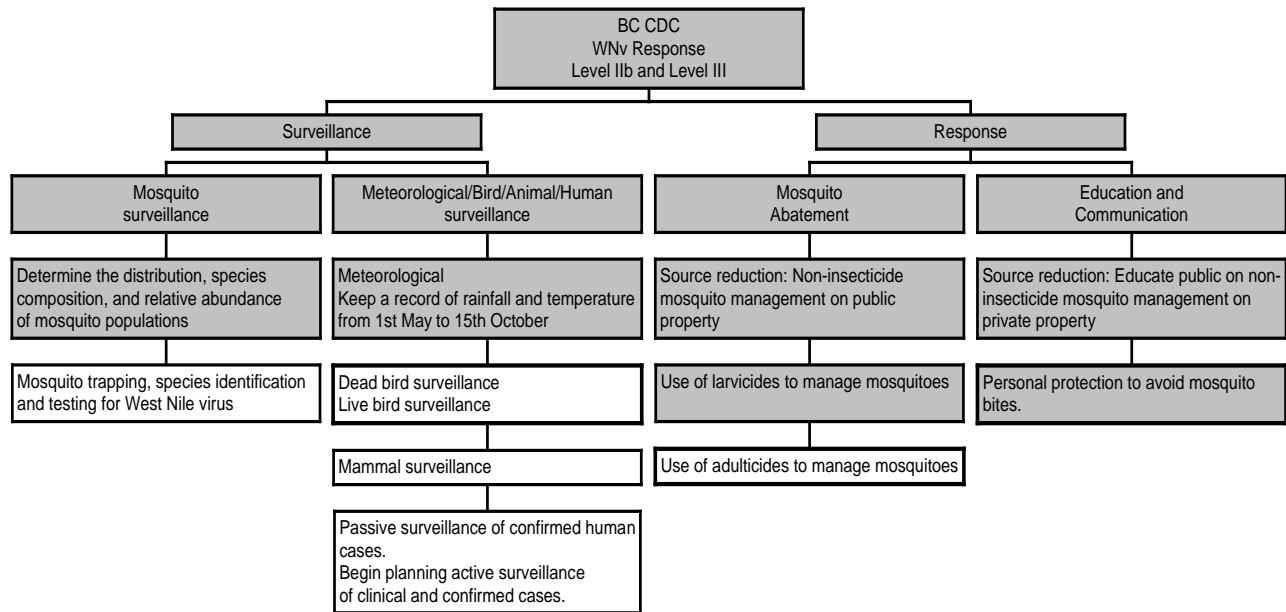
Section 6 describes a number of natural methods to manage mosquito populations. These are all long-term management options and should be considered in combination with larviciding options.

### Education and Communication

A detailed communication and education strategy for the City of Surrey is outlined in Section 7. In brief, the BCCDC WNV Response guidelines for Level IIa suggest that the City of Surrey educate the public on (i) non-insecticide control (source reduction) of mosquitoes on private land and (ii) personal protective measures to avoid mosquito bites. Education should be reinforced as necessary throughout the season. It is important to use personal protective measures through to the end of the mosquito season as the risk of contracting WNV remains high into fall.

### 4.3 City of Surrey West Nile Virus Response Plan for BCCDC Level IIb or Level III

Should the BCCDC increase the WNV Response Level to IIb or to Level III, there will be some additional recommendations made to the City of Surrey from those issued under a Level IIa. Figure 8 identifies the surveillance and response activities that are to take place in the City of Surrey under response level IIb or III. The shaded boxes identify the areas in which the City can play an active role.



**Figure 8: City of Surrey Surveillance and Response Activities Under Response Level IIb or III**

#### 4.3.1 Additional Surveillance Activities under Response Level IIb or III

In addition to the recommendations listed in sections 4.2.1 to 4.2.2, further recommendations include:

##### *Meteorological, Bird, Animal and Human Surveillance*

The duration over which the City of Surrey will keep a record of rainfall and temperature will be extended from 1<sup>st</sup> May to 30<sup>th</sup> September for Level IIb, and from 1<sup>st</sup> May to 15<sup>th</sup> October for Level III.

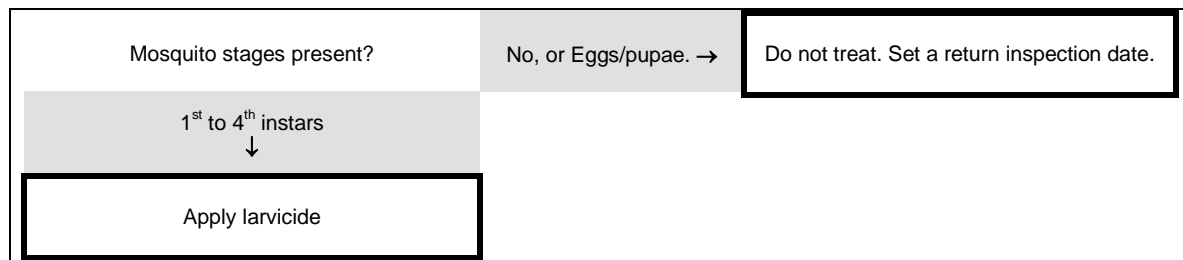
### 4.3.2 Response Activities under Response Level IIb or III

#### *Mosquito Abatement*

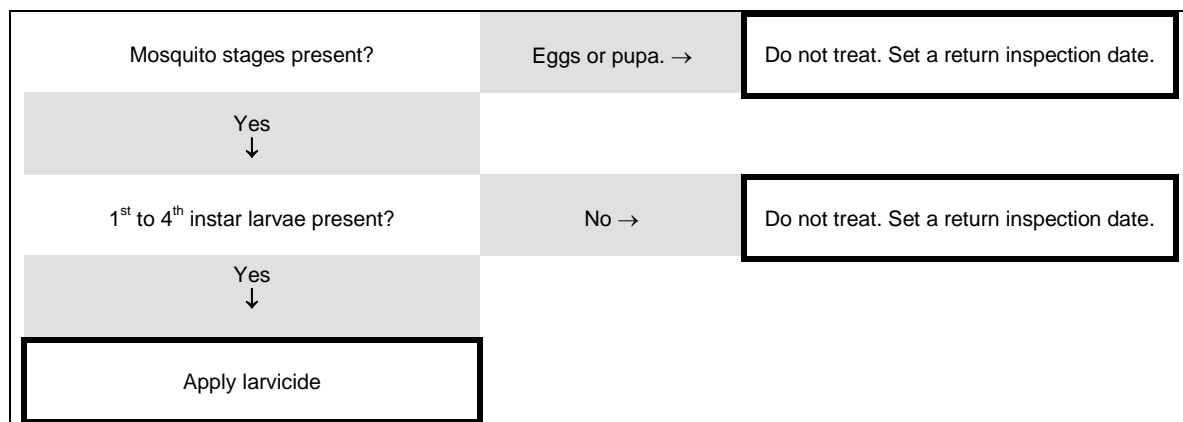
The City will not use adulticides as this responsibility falls under the Fraser Health Authority. The City of Surrey will, however, identify sensitive areas for consideration during an Adult Mosquito Control Event.

#### Use of Insecticides (Larvicides) to Control Mosquitoes

Under level IIb and III and based on recommendations from the Fraser Health Authority the City of Surrey will follow the larviciding guidelines for surface waters and catch basins laid out in Figures 9 and 10.



**Figure 9: Surface Water Larvicide Treatment Decision Matrix - BCCDC WNV Response Level IIb and III**



**Figure 10: Catch Basin Larvicide Treatment Decision Matrix – BCCDC WNV Response Level IIb or III**

### 4.4 City of Surrey Response Plan Following an Order to Treat

With the detection of WNV in British Columbia in 2010, it is likely that the Fraser Health Authority will act to mandate wide-scale larviciding of surface waters and catch basins in the City of Surrey in 2011. To date, alerts and recommendations circulated by Health Authorities have given local and regional jurisdictions the option to undertake pre-emptive treatment as they see fit. However, should an official order be given, an immediate response will be required by all responsible jurisdictions.

If an Order to Treat is issued from the FHA, the City of Surrey will follow the recommendations of the Health Authority. Wide-scale treatment of surface waters and catch basins will occur in a prioritized sequence according to designated WNV Risk Levels (as described in Section 3.3 above). These levels are based on the most up-to-date WNV surveillance data at the time of treatment. The City will generally treat the most highly populated urban areas first and then work their way through the rest of the catch basins in a structured sweep. Treatment will occur within seven days of the Health Order to treat and will be complete within two weeks of this date. The method of larvicide application used will depend upon conditions and the speed at which treatment must be completed. Any larviciding that has already occurred will be taken into consideration as route plans are prepared. Ground assessments will be made at the time of the treatment and regular evaluation will be made of the effectiveness of the treatment. Post treatment evaluation, recording, reporting and compliance with all federal, provincial and municipal regulatory requirements will be met.

## 5.0 Mosquito Management Using Insecticides

Aquatic mosquito stages (larvae and pupae) are considerably more vulnerable to pesticide treatment than adult mosquitoes. This is particularly the case with *Culex* species, such as *Culex pipiens* and *Culex tarsalis* – two of the most competent vectors of WNV. Their habitat - still, stagnant water bodies - are usually discrete so can be managed relatively easily with a series of larvicide treatments. Once the adults emerge, however, they disperse over a much greater area, from a radius of four to twenty miles depending on the species. For example, *Culex pipiens* and *Culex tarsalis* have flight ranges between 4 and 10 miles (Bailey et al. 1965; Teitze et al. 2003). Although it is questionable that adult WNV vectors can be managed to reduce incidence of WNV in humans, and there are known to be serious flaws in this approach (Reisen & Brault 2007), some jurisdictions advocate the use of products that control adult mosquitoes as a reactive measure, but usually only once all else fails.

Provincial and local health authorities are responsible for deciding whether to allow the use of pesticides to control the spread of WNV. Some of the factors that are considered include:

- the number of mosquitoes in the area
- the extent of WNV activity in local mosquito populations
- the degree of risk the mosquitoes pose to people in the area
- the size of the area to be treated
- the number of people who live nearby
- whether it is early or late in the mosquito season
- whether other options for mosquito control would be effective in reducing risks to people
- how the community feels about pesticide programs
- the extent of local WNV activity in birds, horses, other animals and people

### 5.1 Larvicides

Larvicides are chemical or biological agents that are applied directly to standing water where mosquito larvae are found. Larvicides control mosquito populations by preventing the larvae from developing into adults. Larvicide use depends on the time of year and the current stage of development for local mosquito populations. Larviciding has the advantage of: (i) targeting discrete mosquito breeding areas, (ii) reducing mosquito numbers before they become blood feeding adults and (iii) reducing the need for adulticides, and so, decreasing overall pesticide use.

#### 5.1.1 Recommended Larvicides and their Permit Requirements

Ellis (2004) provides a complete and comprehensible review of all of the alternative larvicide products registered for sale in Canada for the control of WNV vector mosquitoes. There are a number of larvicides on the market that target the early larval stages of mosquitoes.

##### Bacillus Larvicides:

The active ingredient in two of the most popular and environmentally-sensitive products is a *Bacillus* bacteria. The bacterial cells of *Bacillus thuringiensis israelensis* (Bti) produce a spore and a crystalline protein toxin (endotoxin) as they develop. When the mosquito larvae ingest the spores, the endotoxin is activated by alkaline conditions and enzyme activity in the larval gut. The activated endotoxin attaches to specific receptor sites resulting in larval paralysis and destruction of the gut wall. Larvae usually die quickly from the activity of the toxin or stop feeding and die within 2 or 3 days from the effects of septicemia (blood poisoning). Because the majority of aquatic invertebrates do not have alkaline guts, Bti has no effect on the majority of potential non-target organisms, although it might affect some other dipteran larvae. Bti treatments are inactivated within a few days in most outdoor situations, since Bti

bacteria neither reproduce nor persist in the environment in sufficient quantities to provide continuing control of target pests. This often necessitates repeated applications within a window of 3 to 14 days (see detailed label instructions in Appendix G and H) depending upon the results of monitoring.

Another bacterial agent, *Bacillus sphaericus* (Bsph), is certified for use in Canada (see PMRA <http://www.hc-sc.gc.ca/cps-spc/pubs/pest/decisions/reg2006-02/index-eng.php>). Bsph is known to be particularly effective in controlling *Culex* larvae, especially in highly organic water (see detailed label instructions in Appendix I and J). Several different varieties of Bsph have been found to occur naturally in soil and aquatic habitats, one of which is particularly effective against the larvae of pathogenic mosquitoes. During sporulation, these varieties produce parasporal bodies that contain larvicidal toxins. Following ingestion of the parasporal bodies by mosquito larvae, a protoxin is released. This is broken down into an active toxin by the midgut enzymes of the larvae, which generally die within 24 - 48 hours of infection. Bsph persists longer than Bti in the waterbody, so it does not have to be reapplied as frequently. Both products affect only organisms with alkaline stomachs (e.g. mosquito and black fly larvae) and not those with acidic stomachs (e.g. mammals, birds, fish and most other aquatic invertebrates).

Bti and Bsph are the most widely used control agents in the fight against mosquito nuisance and WNV. They are used throughout North America in all the areas infected with the virus. At present there are no alternatives that offer such a rapid response and that do so little damage to the environment. Bti has been researched for many years and is probably one of the most stringently researched pesticides in North America. To date, only minimal effects have been discovered on non-target organisms.

In Canada Bti products are marketed under the trade names of Vectobac® and Aquabac®. For the treatment of surface waters, Culex Environmental recommends using VectoBac® 200G, which contains the active ingredient *Bacillus thuringiensis* var. *israelensis* (Bti), as well as VectoLex® CG, which contains the active ingredient *Bacillus sphaericus* (Bsph). For treatment of catch basins Culex Environmental recommends using VectoLex® WSP (Water Soluble Pouch), which contains the active ingredient *Bacillus sphaericus* (Bsph). Within minutes of application the pouch dissolves, releasing the larvicide directly into the sump water. The stated period of effective control is four weeks, but there is evidence that the product may continue to be effective for 60 days or more (Fiona Hunter, pers. comm.). However, if the catch basin dries up during this period it may disable the active ingredient.

Directions for the use, precautions, storage and disposal of VectoLex® and VectoBac® are summarized in Appendices G to J. Further accounts are available for *Bacillus sphaericus* from PMRA (2006a) and *Bacillus thuringiensis* from PMRA (2006b), as well as for the more environmentally damaging larvicide, methoprene (PMRA 2007), the use of which is not recommended.

#### Chemical Larvicides:

Methoprene is an insect growth regulator that interferes with mosquito metamorphic midgut remodelling, and prevents them from emerging from the pupa as adults. Exposure of zebrafish embryos to sunlight-induced photolytic products of the pesticide methoprene results in developmental defects. However, there is considerable debate whether field applications will result in doses sufficient to induce these effects. Methoprene has recently been re-evaluated by the PMRA and found to have serious effects on non-target organisms and has been relabelled as 'Toxic to Aquatic Organisms'. Diflubenzuron is an insect growth regulator that disrupts the moulting process by inhibiting the synthesis in the insects' exoskeleton, leading to desiccation and death. Freshwater fish are resistant to acute exposures of DFB, as 96-h LC50s were generally >50,000-µg/l. Fish are also reported to accumulate DFB rapidly during acute exposures but are capable of eliminating this insecticide within 7 days.

### 5.1.2 Availability of Larvicides

The cost of treating high-risk sites will vary according to the larvicide product used, product costs and frequency of reapplication. Also, the amount of larvicide required may differ from year to year due to interannual variations in mosquito populations. It is estimated that in a medium to high mosquito population year, applications using Bti would be required weekly and Bsph, weekly or bi-weekly. For large treatment areas (i.e. > 5 ha), the use of VectoBac® is preferred as its cost is significantly less than VectoLex®. VectoBac® is equally effective as VectoLex® in most environments, except in highly nutrient enriched waters, although its shorter residual time may require it to be re-applied more frequently.

To conduct a wide-scale treatment of all surface waters and catch basins on City of Surrey properties within the timeframe outlined under a worst case scenario, the City of Surrey would have to have an adequate quantity of larvicide at its immediate disposal. If the larvicide had to be ordered and delivered, the timeframe would be extended as availability of larvicide depends upon the stocks and delivery time from the manufacturer. Generally speaking the products are only manufactured once the orders are placed and so there is liable to be a three to four week time lag in obtaining the product.

### 5.1.3 Larviciding License and Permit Requirements

Metro Vancouver created a Pest Management Plan in 2009 to comply with new permitting requirements. For other municipalities in the Lower Mainland, the FHA has also created a Pest Management Plan under which they can operate. Different permitting may be required depending on the type of pesticide to be applied, the purpose treatment (i.e. nuisance mosquito control or WNV risk reduction) and where treatment is to occur (e.g. public land vs. private land). Also, regulations regarding the application of pesticides to fish-bearing streams are to be adhered to.

The application of larvicide on public land must be conducted or supervised by an individual that holds a valid B.C. pesticide applicator certificate. A certified applicator can supervise up to four uncertified assistants. To be certified, individuals must pass a written exam, administered by the Provincial Government. Certification information, including study materials, can be obtained through the B.C. Ministry of Environment's Integrated Pest Management Program.

### 5.1.4 Larvicide Application Methods

There are four standard methods of applying granular formulations of *Bsph* and *Bti*: by hand, backpack blower, Truck/ATV mounted blower or aerially (helicopter). The choice of application method will depend on the size and accessibility of the treatment area.

**Hand Application** - This application of larvicide is most suitable for catch basins and small bodies of water that are accessible by foot. Larvicide can either be scattered by hand or by a manually-operated grass seed spreader.

**Backpack Blower** - Larger bodies of water with larval habitat up to 10 metres from the shoreline require application of larvicide with a backpack blower. Marshy areas with relatively firm bottoms where the water level is low can also be treated using this method.

**Truck Sprayer or ATV Mounted Blower** - A truck-mounted device is most suitable for applying larvicide to roadside ditches and water bodies alongside dykes. This is usually carried out using a liquid application, although a granular application may also be administered using a backpack blower mounted on the truck. Larger marshes and fens are best treated by ATV mounted backpack blower units.

**Helicopter** - For more extensive areas (i.e. > 5 ha) and/or where vehicle accessibility is limited, aerial larvicide



application is commonly used and is often the most effective. The granular form of Bti is applied from a hopper that hangs below the helicopter with a regulator that can be adjusted to set the application rate from within the aircraft. Helicopter applications are monitored by GPS units in the aircraft and treatment areas can be pre-programmed for the pilot.

## 5.2 Adulticides

The City will not be responsible for applying adulticides as this responsibility falls under the FHA. The City of Surrey will, however, identify sensitive areas for consideration during an Adult Mosquito Control Event.

Adulticides are chemical agents, and include a range of different compounds such as the organophosphate malathion and pyrethrins. They may be applied as residual sprays to vegetation where mosquitoes rest or may be sprayed into the air as fine droplets. Truck-mounted ULV (Ultra-Low Volume) foggers are used to apply adulticides in low concentrations. Fogging is typically carried out during the evening and early in the morning, when mosquitoes are most active and most people are indoors. Adulticides may also be applied by air, either from a helicopter or a fixed-wing aircraft.

Adulticides should not be considered as an integral part of an integrated approach to mosquito control. They are used only as a reactive measure when all else has failed, and there is evidence to suggest that there may be major flaws in this approach to reducing WNV in humans (Reisen & Brault 2007). The main platform of the integrated approach is to undertake regular monitoring, surveillance and risk reduction of larvae living in standing waters. It is only necessary to use adulticides where there are large numbers of potentially infected adult mosquitoes causing an imminent risk of human infection.

All workers who carry out mosquito control programs are licensed by provincial authorities and are trained in the safe use of pesticides. If local authorities decide that the risk of WNV infection warrants the use of pesticides in a certain area, they will notify the public in advance. This will enable people to take precautions and minimize their exposure to pesticide products. Pesticides are carefully regulated and must be registered by Health Canada's Pest Management Regulatory Agency (PMRA) before they can be used in Canada. As part of the registration process, the products undergo a rigorous scientific assessment to determine whether they can be used safely when used according to label directions. The assessment looks into many areas, including risks to human health and the environment and whether the product is effective. The PMRA does not register pesticide products that they consider to be ineffective or that pose unacceptable risks.

Adulticide Free Zones for any adult treatment areas will include:

- Provincially listed wells
- Schools
- Permitted adult and child care facilities
- Hospitals
- Senior's group homes
- Registered apiaries (bee keepers)
- Registered organic farms
- Environmentally sensitive areas

### 5.2.1 Adulticides Permitted for use in Canada

There are several mosquito adulticides permitted for use in Canada. They include organophosphate insecticides (malathion, chlorpyrifos and naled), a carbamate insecticide (propoxur), pyrethrins, and a pyrethroid (permethrin). In adult mosquito control programs, the insecticide product is typically dispersed by truck or airplane mounted ULV (ultra low volume) equipment which disperses tiny droplets of insecticides over the target area.

Malathion is an organophosphate insecticide that has been registered for use in Canada since 1953. It is a broad-spectrum insecticide (kills a large number of unrelated species). It is the preferred choice for adulticiding operations in the City of Winnipeg.

Chlorpyrifos is a broad spectrum, non-systemic insecticide with contact, ingestion (as stomach poison) and vapour activity. Chlorpyrifos inhibits acetylcholinesterase enzyme and interrupts the transmission of nerve impulses. For freshwater aquatic organisms (both fish and aquatic invertebrates) acute and chronic effects from the use of chlorpyrifos range from very high to extremely high hazard.

Naled is a fast acting, nonsystemic contact and stomach organophosphate insecticide used to control aphids, mites, mosquitoes, and flies on crops and in greenhouses, mushroom houses, animal and poultry houses, kennels, food processing plants, and aquaria and in outdoor mosquito control.

Propoxur is a carbamate pesticide registered for use against mosquitoes in outdoor areas, for fleas and ticks on pets, as an acaricide, on lawns and turf for ants, on flowering plants, and in private dwellings and public buildings. It is also used as a molluscicide, a chemical that kills snails. It is effective against cockroaches, aphids and leafhoppers. It is an insecticide with contact and stomach action that has longstanding residual poisonous or toxic activity when it is in direct contact with the target pest (Hayes and Laws 1990).

Pyrethrins are insecticides derived from the chrysanthemum flower (pyrethrum). They were declared an effective mosquito control agent for reducing malaria in 1942. Pyrethrin works by disrupting the nervous system, via contact and/or ingestion, through the inhibition of the sodium ion channels in the nerve cell membrane (National Pesticide Information Centre, 1998). Pyrethrins are not cholinesterase inhibitors like organophosphate or carbamate insecticides.

Pyrethroids are synthetic derivatives of naturally occurring pyrethrins. They were designed by humans to have increased stability in light, resulting in longer residual effects (Gosselin et al. 1984). Like the pyrethrins, the pyrethroids act by keeping the sodium channels open in the neuronal membranes of an organism, paralyzing the nervous system. Pyrethroids are usually combined with the synergizing agent, piperonyl butoxide. Compared to pyrethrins, pyrethroids are more toxic to insects (and to mammals).

The efficacy of adulticiding in disrupting the WNV disease cycle has yet to be proven. While many studies demonstrate that ULV treatments kill caged mosquitoes in the spray zone, these studies also show that many mosquitoes sheltered by vegetation, buildings, and other objects escape the spray and survive. Additional factors including weather and time of application have been shown to reduce efficacy of treatment. To date, studies of free flying populations have show population reductions far lower than desired for mosquito control.

## 6.0 Natural Mosquito Management – Source Reduction and Habitat Manipulation

Habitat plays a major role in mosquito distribution and abundance. Single factors are unlikely to reliably predict the variation in mosquito abundance, but many species choose specific habitats for egg laying, and microclimatic conditions in different vegetation types seem to favour larval development to varying degrees for different species. Altering the habitat in surface water sites can discourage WNV vector species from breeding and offer the potential of long-term control. Management solutions to consider include:

- Source removal, such as filling in of stagnant pools
- Annual catch basin cleaning program
- Habitat enhancement measures, such as alterations in vegetation or introduction of predators and competitors
- Changes in hydrology such as improved ditch maintenance and water flow management
- Mechanical mosquito attractant devices

### 6.1 Habitat Enhancement Measures

#### 6.1.1 Vegetation

Vegetation, both terrestrial and aquatic, can have an important effect on the suitability of habitat for WNV vector mosquitoes. Vegetation around the perimeter of water bodies provides habitat for adult mosquito predators, such as amphibians, insectivorous birds and spiders. Aquatic vegetation also provides habitat for larval predators, such as dragonfly nymphs, water beetles and fish, as well as their competitors, such as *Daphnia* and other filter feeders.

Many studies have shown that female mosquitoes can detect light differences (Bates 1949), and many vector mosquito species (e.g. *Anopheles*) seem to prefer laying eggs in sunlit areas. Hasler and Jones (1949) found that artificial ponds densely planted with large aquatic plants had significantly lower densities of phytoplankton and rotifers than did plant-free ponds, thus limiting food availability for larval mosquitoes. Furthermore, studies by Culex Environmental indicate that the high risk vectors *Culex pipiens* and *Culex tarsalis* prefer to breed in open, non-vegetated water bodies.

Areas cleared for development in southeast Asia and South America have successfully controlled problem mosquitoes by landscaping waterbodies to produce shade. Two of the most appropriate native plant species to introduce in BC ponds are the yellow pond lily (*Nuphar polysepalum*) and the floating-leaved pondweed (*Potamogeton natans*, Figure 11). Both are floating-leaved, rooted perennial species. Culex Environmental has discovered that mosquitoes are rarely found in beds of water lilies and these plants also provide an aesthetic value. All newly planted vegetation should be monitored regularly to ensure long-term survival and growth. Survival rates of new plantings can be increased by maintaining water levels at the recommended depth.

Many ponds and wetlands have cattails (*Typha latifolia*, Figure 12) along their edges. Although they may seem like appropriate plants, they have the potential to harbour larvae and pupae of the WNV vector mosquito *Mansonia perturbans*, which attaches to the roots and stems of cattails to obtain oxygen directly from the plant. To avoid creating habitat for this species, cattails can be cut back and maintained at a much reduced level. Alternately, mechanical devices, such as Mosquito Magnet Traps, can be used to attract and capture adult mosquitoes near ponds containing cattails.

On golf courses and other landscaped areas, problems can arise when grass clippings from greens accumulate in nearby ponds (Figure 13). This can create floating mats of decaying vegetation, which provide quiescent, predator-free, nutrient rich areas for larval mosquito development. It is essential that grass clippings be skimmed from water features and, where possible, that grass not be allowed to grow right up to the edges of ponds.



**Figure 11: Floating-leaved Pondweed (*Potamogeton natans*)**



**Figure 12: Cattails (*Typha latifolia*)**



**Figure 13: Grass Clippings in a Pond**

### 6.1.2 Predators and Competitors

Many natural predators feed on mosquitoes, both as larvae and adults, and competition from other organisms may also affect mosquito distribution and abundance, particularly in the aquatic stages. Potential mosquito competitors include: insects, such as chironomids and corixids; molluscs; anuran larvae; amphipods, cladoceran and copepod zooplankton. Common mosquito predators include: birds, such as ducks and shorebirds; small fish, such as Cyprinidae and Gasterosteiridae; larval salamanders, such as Ambystomatidae and Salamandridae; hydra; water spiders and many types of insects, including the Hemiptera (Notonectidae, Naucoridae and Corixidae), Coleoptera (particularly Dytiscidae) and Odonata, including the Libellulidae, Aeshnidae, Coenagrionidae and Lestidae.

One example of a small native larvivorous fish is the fathead minnow, which has been used as a successful means of controlling mosquito populations in many areas. Fathead minnow show particular potential as control agents because they continue to feed on larvae even when other food is available and they are also able to survive relatively harsh winters, thus reducing the need for annual restocking. Many other fish species may be used for control including native sticklebacks, perch and goldfish. Mosquito fish (*Gambusia* sp.) have been used in many northern states of the US, but they have caused the elimination of many native species in these areas and they are, therefore, considered to be an undesirable invasive species for introduction into BC waters.

Competitive interactions can have a significant effect in mosquito population dynamics particularly when resources are in short supply. For example, tadpoles compete with mosquito larvae for algal resources as well as preying on the larvae directly (Mokany & Shine 2003a). In addition, tadpoles may reduce growth and survival of mosquito larvae due to associated pathogens (Mokany & Shine 2003b). Promoting the abundance of anurans can, therefore, have a significant effect on the reproductive success of adult mosquitoes and mortality of their larvae. The abundance of amphibians is often related to increased vegetative cover, both submergent and emergent, which provides shade and refuge from predation.

Promoting the presence of mosquito predators and competitors may also contribute indirectly to an overall reduction in mosquito density because mosquito habitats become less attractive to females. For example, studies have demonstrated that given a choice, females tend to lay eggs in sites without tadpoles (Mokany and Shine 2003b).



## 6.2 Changes in Hydrology

### 6.2.1 Water Flow Management

Surface water flow is a crucial factor in determining mosquito egg laying sites. Females of most species are reluctant to lay eggs in running or agitated water, particularly if the water temperature is too cool. Additionally, the air-breathing larvae may not be able to survive for long periods if the water surface is constantly disturbed, presumably because the water movement interferes with their capacity to breathe through their siphon that uses the surface tension at the air/water interface. There are a number of ways to increase surface water movement artificially, including the installation of fountains and/or water agitators. For purely aesthetic reasons, fountains may be more appropriate in ornamental ponds and lakes (Fig 14), whereas water agitators might be better employed in more natural wetland surroundings.



**Figure 14: Aerators and Fountains can maintain Water Flow in Ponds**

With the advancement of green technologies in pond maintenance, cost-effective solar and wind driven aeration and water circulation devices are now available.

### 6.2.2 Water Depth

Water depth in a pond greatly influences its suitability as a mosquito oviposition site. High water levels have been shown to reduce mosquito survival and encourage a diverse aquatic community. While mosquitoes prefer the warmer waters associated with shallow ponds, many mosquito predators require cooler water. Therefore, ponds should be deep enough to keep the water at less than 25°C. In general, we recommend that the ponds be maintained at a constant minimum water depth of 60cm. If needed, a supplementary water supply should be used to maintain these levels during times of low precipitation.

Problems can arise during the mosquito season when changes in water levels cause the marginal vegetation around the edge of the pond to become waterlogged or to topple over into the water. This can create a floating mass of vegetation amongst which small shallow pools can form, providing ideal refuge for mosquito larvae from predators, such as fish and macroinvertebrates. The water that gathers in these shallow depressions rapidly warms up under direct sunlight and the decaying vegetation provides a rich source of nutrients for algal growth upon which the larvae can feed. In such cases, it is advisable to cut back the vegetation annually around the edge of the pool.

## 6.3 Mechanical Devices

The use of a mechanical mosquito attractants such as the Mosquito Magnet™ (Figure 15) may provide an alternative to the use of foggers to control mosquito numbers in some circumstances, such as prior to and during outdoor events like soccer games or agricultural shows. Different species of mosquito can fly from two to 25 miles from where they emerge (Bailey et al. 1965) and dispersal usually occurs along humid corridors, such as wooded areas, marshes and creeks where the insects can avoid desiccation. Mosquitoes flying in from surrounding areas can be intercepted by Mosquito Magnets™ if they are placed strategically in these known flight paths.



**Figure 15: Mosquito Magnet™ Liberty Pro Model**

The Mosquito Magnet™ mimics a human by emitting a plume of carbon dioxide (CO<sub>2</sub>) and a short-range pheromone attractant, octenol. As the mosquito approaches the trap, it is vacuumed into a net where it dehydrates and dies. In 2008, Culex Environmental conducted an experiment testing the Mosquito Magnet™ and found a significant reduction in the number of mosquitoes in the area with the devices than in the control area (Jackson et al. 2008).

### 6.4 Catch Basin Cleaning Program

As a best management practice, annual cleaning of catch basins is recommended. Ideally catch basins cleaning should be completed early in the mosquito breeding season. Cleaning immediately removes larvae, as well as organic materials that provide a food source for the developing larvae. Standing waters that are nutrient poor are also less attractive to female adult mosquitoes for egg laying.

The City of Surrey annual catch basin program breaks the city down into a grid based on streets (Figure 16). The City is broken down into 149 squares - each of which is either designated to be treated on odd years or even years. There are also a number of major roads, such as King George Hwy, that are treated annually.

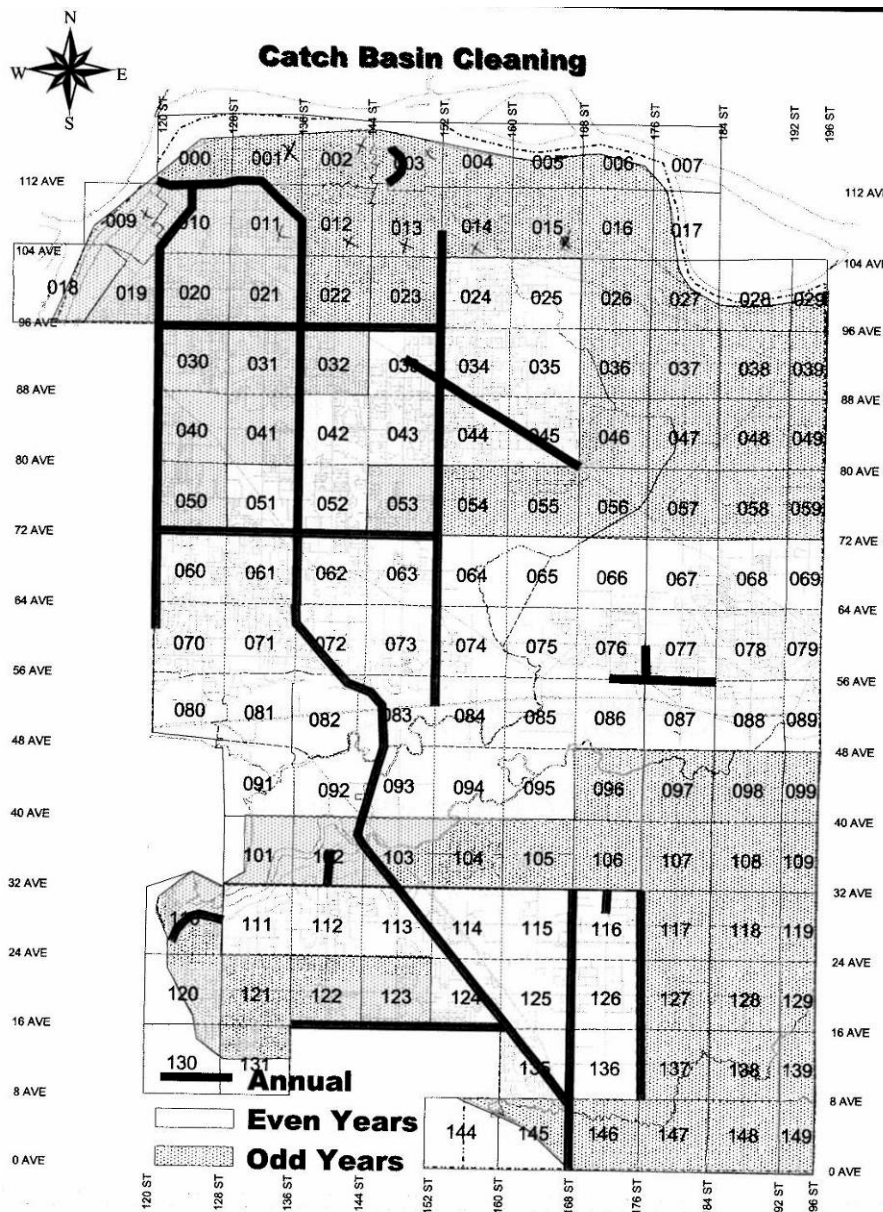


Figure 16: City of Surrey Catch Basin Cleaning Program



## 7.0 Communications Strategy

### 7.1 Communication with Health Authorities

The City will maintain communication with the BC Centre for Disease Control (BCCDC) and the Fraser Health Authority (FHA) throughout the season. The BCCDC and FHA will have current updates on results of WNV activity in humans, birds, horses and mosquito pools in the province and will provide response recommendations/orders in the event that the virus arrives in the region.

### 7.2 Staff Education Regarding West Nile Virus

Staff will be kept updated and advised of WNV information. Further training/briefing of City of Surrey staff can be planned regarding implications for park and ditch maintenance etc as necessary based on new information available from agencies and/or the City's contractors. Appendix K lists a number of questions and answers about WNV.

### 7.3 Public Education

Public education should focus on WNV awareness and risk level, what the City and other authorities are doing, how people can reduce mosquito numbers on their private property, and what personal protective measures people can use to avoid mosquito bites. The FHA will take the primary role in educating the public, whereas the City of Surrey will provide support in the following areas:

- Newspaper advertisements in partnership with BCCDC and FHA.
- City of Surrey website updates.
- Existing brochure distribution to local residents with emphasis on WNV, in partnership with BCCDC and FHA.

#### 7.3.1 Timing and Content

Public education should occur early on in the mosquito breeding season (early-June), followed by reinforcement throughout the summer until the end of September. Upon the arrival of WNV in the region, a heightened education campaign should be conducted.

#### 7.3.2 Media

The dissemination of public education materials and WNV updates can be accomplished through several types of media:

- **Mail outs** – Mass mail outs of education packages to business and residents in order to reach a broad audience.
- **Website** – An updated WNV section on the City of Surrey's web page that includes links to WNV resources, such as the BCCDC and FHA websites, and information on the City's WNV Response Plan.
- **Newspapers** – Regular newspaper notifications could be submitted to the local newspapers, with the goal of educating residents about WNV and personal protective measures, as well as the WNV Response Plan being implemented by the City of Surrey.

- **Public Meetings** – The Health Authority will take the lead on public meetings. A meeting of this type may be necessary upon the initial detection of WNV to the region, as public concern will likely heighten at this time.
- **WNV Risk Reduction Task Force** – Although mail outs and newspaper articles are an important education tool, they are a passive means of educating the public. In other words, it is the onus of the resident to take the time to read the information provided to them. A more active means for public education is to assemble a task force that can visit homes and businesses to assess their properties for potential risk and encourage source reduction and personal protective measures. Community events, such as festivals, provide an opportunity for public education by a WNV Risk Reduction Task Force, through information booths that incorporate interactive activities and displays. Such activities can also be effective in other venues such as shopping centres, home and garden centres, and at elementary and high schools.

### 7.3.3 Metro Vancouver Communications Plan

In 2005, Metro Vancouver created an internal Communications Plan for use within Metro Vancouver and in neighbouring municipalities (Appendix L). The Communications Plan outlines a detailed series of steps, tactics, target audiences and responsibility for the following 10 scenarios:

- Scenario #1: No cases of WNV in the province and/or region
- Scenario #2: First positive bird in the province and/or region
- Scenario #3: First positive mosquito pool in the province and/or region
- Scenario #4: First positive human case in Alberta, Idaho or Washington
- Scenario #5: First positive human WNV illness in BC and/or region due to travel outside of the province or region
- Scenario #6: First positive human WNV illness from a BC source, including within the municipality
- Scenario #7: Additional human cases
- Scenario #8: Death due to WNV
- Scenario #9: No cases of WNV in the regional/city by November 1<sup>st</sup>
- Scenario #10: BC CDC/HA Announce Adulticiding

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## 9.0 Appendices

### Appendix A: P. Belton (2006), British Columbia Mosquitoes as Vectors of West Nile Virus

#### British Columbia Mosquitoes as Vectors of West Nile Virus

P. Belton, PhD ARCS, Biological Sciences, Simon Fraser University (Retired)

West Nile Virus (WNV) is transmitted between birds and mammals and maintained in endemic areas by mosquitoes (Diptera: Culicidae). It is occasionally found in reptiles and amphibia. Bird-biting species in the culicine group (*Culex*, *Culiseta*, *Aedes/Ochlerotatus*) evidently amplify the virus in endemic areas of Africa, S. Europe and W. Asia, and since 2000 in N. America. Mosquitoes develop in water, many of them, including most *Anopheles*, *Culex* and *Culiseta* species, have several generations a year, and almost all of these overwinter as mated but unfed adult females. WNV has been identified in a few males and overwintering females and it may therefore pass from adult ovary to egg.

The virus has been isolated from over 80 species of mosquito world wide since its discovery in the West Nile district of Uganda in 1937. It may multiply to a greater or lesser extent in the body cavity of infected mosquitoes and the virus must then migrate to their salivary glands ready to be injected into a host, if and when the mosquito takes a second blood meal. This, together with the biology of the species, leads to a scale of 'vector competence'.

Turell *et al.* (2005) ranked 25 potential WNV vectors with ratings from ++++ to 0 competence, and the Center for Disease Control lists another 27 North American species known to carry the virus (positive, indicated with a P in my table below) (CDC 2004, 2005). We have about 50 different species of mosquitoes in BC (Belton 1983) and I arbitrarily rated those included by CDC following Turell's criteria (taking into account their biology and ability to transmit other viruses), with a question mark for the species Turell *et al.* (2005) did not rate. I include the competent virus vector *Aedes togoi*, not yet studied in detail, but which is found commonly in rockpools around Georgia Strait and on Gulf Islands here and in WA. At the time of writing (May 2006), WNV has not been identified in any resident host in our Province.

Potential Vectors in BC	Positive (P)	Competence (+)	Feeding preference, biology
<i>Culex tarsalis</i>	P	++++	Birds, mammals <sup>3</sup>
<i>Cx. pipiens</i>	P	+++	Mostly birds <sup>3</sup>
<i>Cx. territans</i>	P	0?	Mostly amphibia <sup>3</sup>
<i>Culiseta impatiens</i>	P	0?	Mostly mammals <sup>5</sup>
<i>Cs. incidens</i>	P	++?	Mostly mammals <sup>3</sup>
<i>Cs. inornata</i>	P	+++	Birds, mammals <sup>3</sup>
<i>Cs. morsitans</i>	P	++?	Mostly birds <sup>1</sup>
<i>Aedes cinereus</i>	P	+	Birds? Mammals <sup>1</sup>
<i>Ae. vexans</i>	P	++	Mostly mammals <sup>1</sup>
<i>Aedes (Ochlerotatus) canadensis</i>	P	++	General feeder <sup>1</sup>
<i>Ae. (Oc.) dorsalis</i>	P	+++	Mammals, occasionally birds <sup>1</sup>
<i>Ae. (Oc.) fitchii</i>	P	0?	Mostly mammals <sup>1</sup>
<i>Ae. (Oc.) hendersoni</i> *		+++?	Birds? mammals <sup>1</sup>
<i>Ae. (Oc.) melanimon</i>	P	+++	Mammals, occasionally birds <sup>1</sup>
<i>Ae. (Oc.) provocans</i>	P	0?	Mostly mammals <sup>1</sup>
<i>Ae. (Oc.) sierrensis</i>		+	Mammals <sup>4</sup>
<i>Ae. (Oc.) sticticus</i>	P	+	Mammals <sup>1</sup>
<i>Ae. (Oc.) togoi</i>		++++?	Birds, mammals <sup>4</sup>
<i>Mansonia (Coquilletidia) perturbans</i> P		+	Birds, mammals <sup>2</sup>
<i>Anopheles punctipennis</i>	P	+	Mammals, birds <sup>3</sup>
<i>An. earlei</i>	P	+	Mammals, birds <sup>3</sup>

<sup>1</sup> Eggs overwinter, one or two generations / year.

<sup>3</sup> Females overwinter, several generations / year.

<sup>5</sup> Females overwinter, one generation / year.

<sup>2</sup> Larvae overwinter, one generation / year

<sup>4</sup> Eggs and larvae overwinter, several generations / year

\* Biology very similar to P +++ *Ae. triseriatus* in eastern N. America.

• Though common and a competent vector, *Ae. vexans* has never been found with significant amounts of WNV in Canada. Mortality of birds and infection of horses will probably be our first notification of WNV in the Province. Nevertheless humans sharing the habitat of any of the species listed above might expect bites from them in a normal season and we should be prepared to confirm the mosquitoes' distribution and verify their blood feeding habits before then. Traps are being set out across the Province and picture keys to the genera of immature and adult mosquitoes of BC are available from the British Columbia Centre for Disease Control (BCCDC) where tests for viral RNA in the more competent mosquito species are being done.

Names of the genera of mosquitoes follow Wood *et al.* (1979).

### Biology and Distribution

++++ *Culex tarsalis* is a native species, widely distributed in ditches and permanent and semipermanent pools in grassland and open woodland in the southern third of the Province. Specimens have recently been found in southern Vancouver Island. It is a proven virus vector, implicated in our human cases of Western Equine Encephalomyelitis (WEE) in the 1970's. They are present and bite mostly in the early morning and evening all summer. All our *Culex* and *Anopheles* species and most *Culiseta* overwinter as mated females and emerge in early spring for blood meals.

+++ *Cx. pipiens* was probably introduced to the west coast of North America in the late 1800's. Since the 1920's it has spread across the southern margin of the Province and into Vancouver Island and is now one of the commonest mosquitoes in artificial containers (e.g. rain barrels and paddling pools) drainage ditches and storm sewers, particularly those contaminated with organic matter. It feeds primarily on birds but comes indoors to bite on warm summer nights, often making itself heard in the bedroom. It is a proven vector of WNV, WEE and St Louis Encephalitis (SLE). It was found in Prince George in 2004 and may be widely distributed in the southern half of the Province.

++++ *Cx. restuans*, which may not be a native species, is an important amplifying vector of WNV. There are unconfirmed records of a female from Esquimalt and others from northern ID, but adults could be misidentified *Cx. pipiens*. Larvae, which have never been found in BC, are unmistakable. It is less 'domestic' than *Cx. pipiens*, but larvae can be found in artificial containers around homes, as well as other sites with some organic content. Primarily a bird feeder, females will also feed on reptiles and mammals.

*Cx. territans* is widely distributed in BC but has nowhere been seen or persuaded to bite a mammal. It is occasionally infected, perhaps from a bird or reptile but its preferred hosts are amphibians.

*Culiseta impatiens*, also widely distributed, is a human biter early in the season. Primarily a woodland species, it is long-lived, with just one generation a year. Its vector capacity and its host preferences later in the year are not known.

++ *Cs. incidens* is our commonest mosquito with many generations a year and very well adapted to domestic sites. It has recently been found with WNV (CDC 2005) and in laboratory tests it transmitted several other viruses (Reeves and Hammon 1946).

++ *Cs. inornata* is widely distributed across the western Provinces and into the arctic with several generations a year in the south of the Province. Egg rafts are laid in almost any slow moving or stagnant water but seldom in artificial containers and females are known to be competent vectors of WEE, feeding readily on birds and mammals. Its transmission rates were moderate in tests with WNV in CA but it is active earlier and later in the year than *Culex pipiens* and *tarsalis* both there and in BC.

++ *Cs. morsitans* is a widely distributed northern species. Most of its blood meals are from birds and it is known to bite mammals but its vector ability has not been investigated. It is our only member of the genus that overwinters in the egg stage.

+ *Aedes cinereus* is found throughout the Province and is known to bite humans even during the day. It is a late hatching species with several generations a year in southern BC. Its vector capacity is unknown.

++ *Ae. vexans* is a notorious early summer floodwater pest over the entire Province. With favourable early warm flooding, it may produce 2 generations a year. Females bite man and domestic mammals indiscriminately but seem to feed on birds less often. Most bite between dusk and dawn and are proven virus vectors. Despite being a common pest, it has never been found to contain significant amounts of WNV in Canada and it is unlikely to be a significant vector in the Province.

++ *Ae. (Ochlerotatus) canadensis* is a fairly common species found in the late summer throughout the Province. In the south it may produce two generations a year and is a very general feeder on animals ranging from amphibia to mammals. They have not yet been found with virus in Canada.

+++ *Ae. (Oc) dorsalis* and *melanimon* are very similar species producing up to two generations a year in saline pools and flooded pastures in the interior of the Province. *Ae. dorsalis* is also found in coastal salt marshes around the Georgia Strait and south to CA. It is known to feed on birds occasionally. Both are confirmed vectors of other viruses.

*Ae. (Oc) fitchii* is a widely distributed human pest of woodland and open pools often up to high altitudes in mid and late summer. Its vector ability is not known.

+++? *Ae. (Oc) hendersoni* is an uncommon tree cavity and shaded artificial container breeder known from Vernon to Kootenay Lake. It can be a significant local pest but its vector capacity is not known. It has been confused in the past with

*Ae. (Oc) triseriatus*, a proven vector with a +++ rating, that evidently can transmit WNV in eastern North America.

*Ae. (Oc) provocans* is an early man-biting snowmelt species collected mostly in the east of the Province. Its vector capacity has not been investigated.

+ *Ae. (Oc) sierrensis* can be a significant pest on the west coast and the south of the Province, biting during the day and entering houses. It develops in tree cavities and shaded artificial containers, overwintering in the larval stage or as eggs if the late summer is dry. Its WNV infection and transmission rates were low in California tests (Goddard *et al.* 2002). It has not been found with WNV in the wild and, because it seems not to bite birds, may not be an important virus vector.

+ *Ae. (Oc) sticticus* is, after *Ae. vexans*, our second most important flood-plain pest, hatching after extensive flooding or prolonged rainfall. It has been shown to transmit SLE in the laboratory (Hammon and Reeves 1943).

++++? *Ae. (Oc) togoi* could be as important a vector as the two other species introduced from Asia, *Ae. albopictus* and *Ae. (Oc) japonicus* established in the east. The last is now also established in western WA not far from our border. All 3 feed during the day on a variety of hosts. Fortunately our species has not spread inland from its favoured coastal rock pools but it is distributed widely around the Georgia Strait, the Gulf Islands and the Washington coast. In Asia, *Ae. togoi* is an important vector of Japanese Encephalitis, a virus of the same serotype, (B), as WNV. It breeds year round, overwintering as 4th stage larvae or eggs, feeds on birds and mammals and is often common enough to be a pest to seaside homeowners.

+ *Mansonia (Cq) perturbans* typically develops in permanent 'cat tail' marshes where the larvae and pupae attach to the air-filled roots of marsh plants and resist conventional control methods. It overwinters in the larval stage and is widely distributed in the southern half of the Province, there are records of it on Vancouver Island, in the Georgia Strait and in 2004 it was found near Prince George. Females bite birds and mammals readily day and night, enter houses and inflict a bite that is painful and long lasting on most victims. It is a proven virus vector in the east. Present but not tested for competence as a vector in CA.

+ *Anopheles punctipennis* can develop in almost any open water and is occasionally found in tree cavities and artificial containers. All three of our *Anopheles* species are potential virus vectors; this one is generally distributed in the southern half of the Province. *An. freeborni*, an efficient vector of human malaria, is restricted to dryer southern regions. *Anopheles punctipennis* is the only anophelene confirmed from Vancouver Island (Centre for Coastal Health 2003).

+ *Anopheles earlei* extends much farther north than *An. punctipennis* but its biology is similar with several generations a year in the south. It probably feeds mainly on mammals and, often found in beaver lodges, has been called our national mosquito.

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For the latest information on West Nile virus in the Province, visit the BCCDC web site <<http://www.bccdc.org>>.

## Appendix B: BC Ministry of Health Services Information Bulletin




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**INFORMATION BULLETIN**

For Immediate Release  
 2004HSER0051-000594  
 July 23, 2004

Ministry of Health Services

**WEST NILE VIRUS CONTROL REGULATION**

VICTORIA – The West Nile Virus Control Regulation clarifies the authority of local health authorities to reduce the risk of transmission of this virus from mosquitoes to the human population. Government approved the regulation today.

Currently, under the Health Act, public health officials can take what action is required to protect against a health hazard. This new regulation clarifies the authority of Medical Health Officers to issue an order to a local authority to take remedial action to reduce the risk of West Nile virus to the general public. This might include the application of pesticide, which may be intended to cover sections of land, both private and public, within a certain high-risk area.

Under the existing pesticide use permit, the application of pesticides to private or public land without “appropriate authority” is prohibited. This regulation clarifies an authority that was always implicit in the regulations and clearly states Medical Health Officers and the Provincial Health Officer can order pesticide application even if it affects private or public lands.

West Nile Virus has been spreading across the continent since it appeared on the east coast of the United States in 1999. In 2003, thousands of people, particularly in the western prairie provinces and states, became ill due to the virus. Health officials expect it will reach the west coast this summer.

About one in five people who become infected with the virus may experience West Nile fever, characterized by severe headache, fever, body aches and possibly a rash. About one per cent of infections result in a neurological syndrome with symptoms such as neck stiffness, stupor and disorientation, coma and tremors and convulsions. The disease can leave long-term neurological damage and disability. In rare cases it is fatal.

The Union of British Columbia Municipalities has been consulted on the development of this regulation and is aware of the Province’s plans for responding to the potential arrival of West Nile virus in B.C. Government agencies at the municipal, provincial and federal levels have been working together to ensure B.C. is prepared when the virus makes its way into the province.

-30-

Media contact: Public Affairs Bureau  
 Ministry of Health Services  
 250 952-1881

Visit the Province's website at [www.gov.bc.ca](http://www.gov.bc.ca) for online information and services.



## Appendix C: West Nile Virus Dead Bird Handling

There have been rare cases of WNV in persons whose occupations require them to handle live or dead birds, although mosquito-bite infection could not be ruled out in these cases. Persons involved in collecting dead birds and other animals should follow the recommendations of the *Occupational Health Advisory West Nile Virus, Revised May 29, 2003*. At a minimum the following precautions for the field collection of dead birds and other animals should be followed:

- precautions for mosquito avoidance (i.e. wearing long sleeved shirts, full length trousers, socks, light coloured clothing, high boots) and the use of repellants (i.e. 20-30% DEET) should be implemented
- when possible, minimize outdoor activities where and when (e.g. dusk, night, dawn) mosquitoes are likely to be encountered
- bare-handed contact should be avoided when handling dead animals and birds and precautions should be taken to avoid direct contact with excretions
- rubber/nitrile/latex/vinyl/PVC gloves and double plastic bags turned inside out over hands can be used to collect dead birds
- cut-resistant gloves can be worn under rubber/nitrile/latex/vinyl/PVC gloves to avoid cuts or puncture wounds from bills, claws, or instruments during handling and dissection of birds and other animals
- double bag the bird in plastic
- do not bring the bird into your home
- do not eat, drink, smoke or touch your face with the gloves while handling the bird
- hands should be washed after handling dead birds

The British Columbia West Nile virus Bird Submission Form follows:

Appendix D: West Nile Virus Bird Submission Form



British Columbia



**West Nile Virus Bird Submission Form**

This form **MUST** accompany EACH specimen (of the crow family only) submitted for WNV testing.

**Note: Please do not submit specimens in poor condition (i.e. grossly decomposed carcasses). Bird specimen submissions with incomplete information or missing forms will NOT be tested.**

Date Found/Observed: \_\_\_\_\_, 201\_\_  
 Date Specimen Collected: \_\_\_\_\_, 201\_\_  
 Carcass Stored: (circle) *Fresh* or *Frozen*

Species of Bird: (circle)  
*Crow*     *Raven*     *Magpie*  
*Steller's Jay*     *Blue Jay*

Location where bird was found (please complete either urban OR rural location information as appropriate):	
<p style="text-align: center;"><i>Urban Centres</i></p> Street Address:  City/Town:  Postal Code:	<p style="text-align: center;"><i>Rural Areas</i></p> Directions/Distance from Nearest Town: e.g. 40 km W of Kamloops on HWY 197  GPS Coordinates (Lat-Long in Deg/Min/Sec, NAD83): e.g. N50°48'12" W120°54'00"
Local Health Area : _____ (Note: mandatory – testing results will be reported by LHA)	

Finder (person that identified the bird):	Submitter (officer sending the bird for testing):
Name: Telephone: Email:	Name: Agency: City/Town: Telephone: Email:

Please use the back of this form for details of incident and/or other information.

Specimen submissions to:  
**Animal Health Centre**  
 Corvid Surveillance Program  
 1767 Angus Campbell Road  
 Abbotsford V3G 2M3  
 Toll free in BC: 1-800-661-9903  
 Phone: 604-556-3003

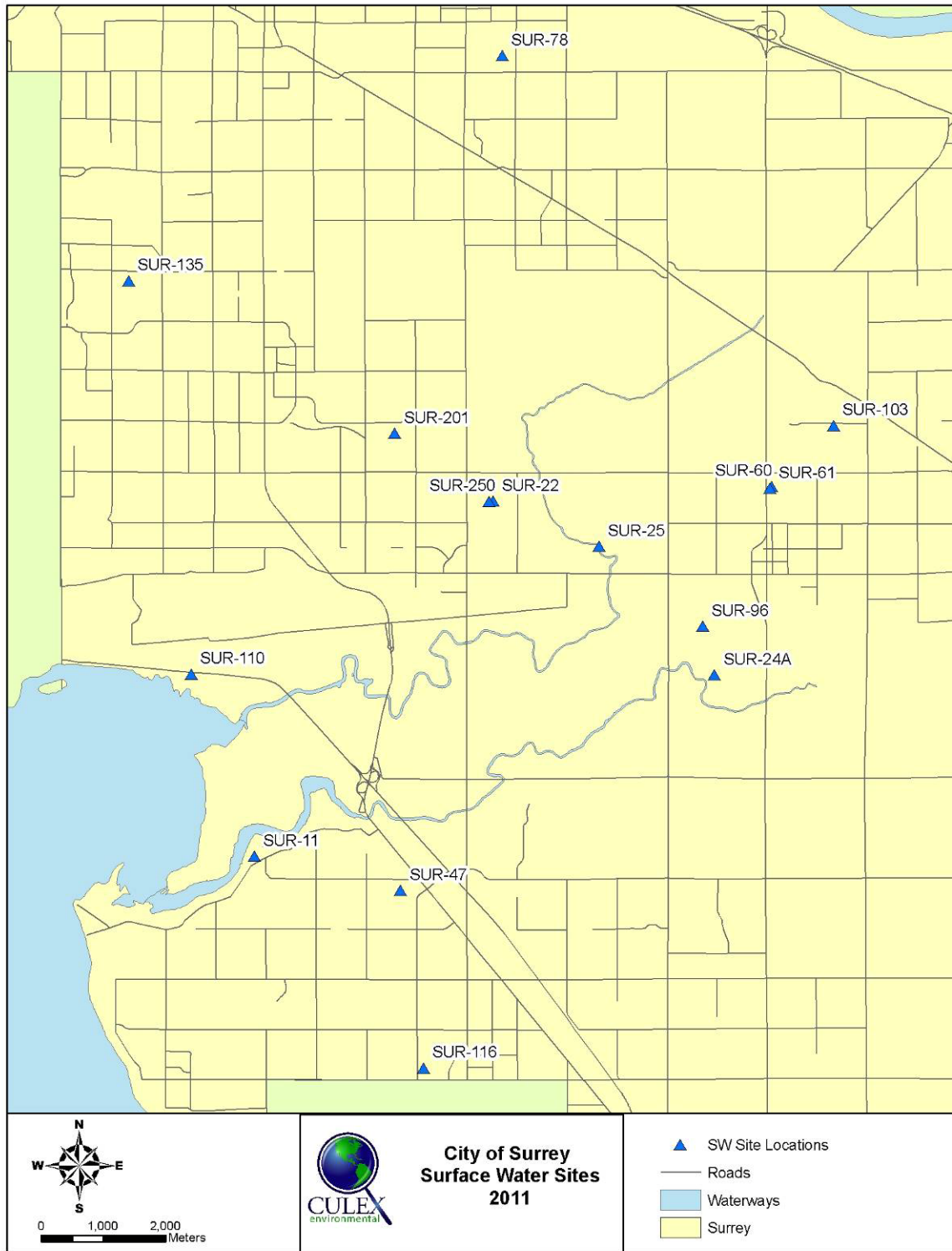


Surveillance inquiries to:  
**BC Centre for Disease Control**  
 Epidemiology Services  
 Vancouver  
 Phone: 604-707-2400  
 Internet: www.bccdc.org

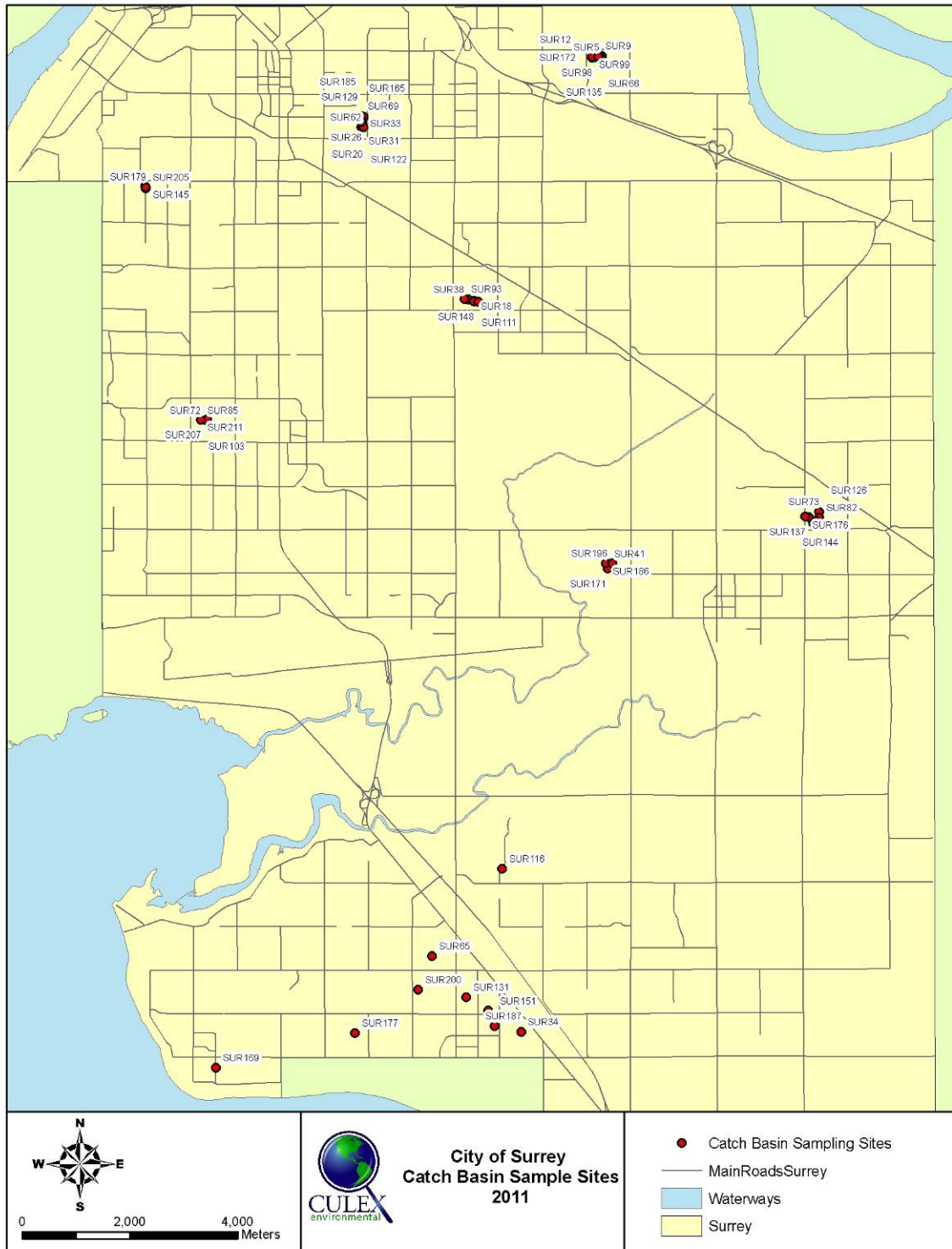
Each completed form should be enclosed in its own waterproof (e.g. Ziplock<sup>®</sup>) bag and attached to the corresponding bird carcass.

*Animal Health Centre use only*  
 Date received by AHC: \_\_\_\_\_, 201\_\_     AHC Specimen ID: \_\_\_\_\_

Appendix E: City of Surrey 2011 Surface Water Sampling Locations (West Nile Virus Program)



### Appendix F: City of Surrey 2011 Catch Basin Sampling Locations



**Appendix G: VectoBac® 200G 18.1kg Restricted Label**

11-JUNE-2002

BIOLOGICAL LARVICIDE

**VECTOBAC, - 200G**

Granule

**RESTRICTED**GUARANTEE: *Bacillus thuringiensis* subsp. *israelensis*, Serotype H-14, strain HD-14, 200 International Toxic Units (ITU) per milligram (0.2 billion ITU/L).KEEP OUT OF REACH OF CHILDREN  
READ THE LABEL BEFORE USING  
POTENTIAL SENSITIZER

REGISTRATION NUMBER. 18158, PEST CONTROL PRODUCTS ACT

NET WEIGHT: **18.1 KG**

Registrant:

**Valent** BIOSCIENCES, Corporation  
870 Technology Way Suite 100  
Libertyville, IL 60048  
U.S.A.

Canadian Agent:

Valent BioSciences Canada, Ltd.  
40 King Street West, Suite 2100  
Toronto, Ontario M5H3C2  
CANADA

Lot No.                      Date of Manufacture

E.P.A. Est No. 33762-1A-001

04-3645/R7

### RESTRICTED USES

**NOTICE TO USER:**

This control product is to be used only in accordance with the directions on this label. It is an offense under the *Pest Control Products Act* to use a control product under unsafe conditions.

**NATURE OF RESTRICTION:** This product is to be used only in the manner authorized; consult local pesticide regulatory authorities about use permits which may be required.

**DIRECTIONS FOR USE:**

**MOSQUITOES**

**Habitat: Standing Water**

Temporary and permanent pools in pastures and woodlots, irrigation or roadside ditches, natural marshes or estuarine areas, waters contiguous to fish-bearing water, catch basins and sewage lagoons.

**Suggested Range Rate**

3-10 kg/ha\* (0.3-1.0 g/m<sup>2</sup>)

\*Use higher rates in deep and/or polluted water, and when late 3<sup>rd</sup> and 4<sup>th</sup> instar larvae predominate.

Apply recommended rate by conventional aerial or ground equipment. Uniform coverage is necessary for best results. For aerial application, apply in uniform non-overlapping swaths when conditions do not favour drift or when wind speeds are less than 10km/h.

A 3 to 14 day interval between applications should be employed. Monitoring will indicate the appropriate retreatment interval. VECTOBAC (or B.t. H-14) does not affect non-target, aquatic, invertebrate predators and parasites which are non-filter feeders. Therefore, longer periods of suppression may result since these beneficials would be conserved to aid in mosquito population management.

**LIMITATIONS: VectoBac 200G may be applied to any water sites except treated, finished drinking water.**

**PRECAUTIONS:**

**KEEP OUT OF REACH OF CHILDREN.**

May cause sensitization. Avoid contact with skin, eyes, and clothing. Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse.

**FIRST AID INSTRUCTIONS:**

If in eyes: Flush with plenty of water.

If on skin: Wash skin with plenty of soap and water.

Obtain medical attention if irritation occurs.

Take container, label, or product name and Pest Control Product Registration Number with you when seeking medical attention.

**STORAGE AND DISPOSAL**

Storage: Store at temperatures between 0° C and 25° C. Store container upright and keep tightly closed when not in use. This product should be used within 24 months of the date of manufacture.

Disposal: Triple- or pressure-rinse the empty container. Add the rinsings to the spray mixture in the tank. Follow provincial instruction for any required additional cleaning of the container prior to its disposal. Make the empty container unsuitable for further use. Dispose of the container in accordance with provincial requirements. For information on disposal of unused, unwanted product, contact the manufacturer or the provincial regulatory agency. Contact the manufacturer and the provincial regulatory agency in case of a spill, and for clean-up of spills.

**NOTICE TO BUYER**

Seller's guarantee shall be limited to the terms set out on the label and subject thereto, the buyer assumes the risk to persons or property arising from the use or handling of this product and accepts the product on that condition.

\*\*\*\*\*

This label transcript service is offered by the Pest Management Regulatory Agency to provide efficient searching for label information. This service and this information do not replace the official hard-copy label. The PMRA does not provide any guarantee or assurance that the information obtained through this service is accurate, current or correct, and is therefore not liable for any loss resulting, directly or indirectly, from reliance upon this service.

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## Appendix H: VectoBac® 200G Material Data Safety Sheet

## MATERIAL SAFETY DATA SHEET

PAGE 1

VectoBac® 200G

MSDS# BIO-0308 Rev. 1

ISSUED 11/10/04

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATERIAL NAME: **VectoBac® 200G**

Code Number: 60214, 60213

List Number: 60214, 60213

PCP Number : 18158, 19466

MANUFACTURER: Valent BioSciences Corporation  
 870 Technology Way, Suite 100  
 Libertyville, Illinois 60048

## EMERGENCY TELEPHONE NUMBERS

Emergency Health or Spill:

Outside the United States: 651-632-6184

Within the United States: 877-315-9819

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT NAME: Bacillus thuringiensis, subsp. israelensis  
 CONCENTRATION: 2.80 %  
 CAS NUMBER: 68038-71-1  
 OSHA-PEL 8HR TWA: N/L  
                   STEL: N/L  
                   CEILING: N/L  
 ACGIH-TLV 8HR TWA: N/L  
                   STEL: N/L  
                   CEILING: N/L  
 OTHER 8HR TWA: N/A  
 LIMITS STEL: N/A  
           CEILING: N/A

INGREDIENT NAME: Inert/Other Ingredients - identity withheld as a Trade  
 Secret  
 CONCENTRATION: 97.20 %  
 CAS NUMBER: N/A  
 OSHA-PEL 8HR TWA: N/L  
                   STEL: N/L  
                   CEILING: N/L  
 ACGIH-TLV 8HR TWA: N/L  
                   STEL: N/L  
                   CEILING: N/L  
 OTHER 8HR TWA: N/A  
 LIMITS STEL: N/A  
           CEILING: N/A



## MATERIAL SAFETY DATA SHEET

PAGE 2

VectoBac® 200G

MSDS# BIO-0308 Rev. 1

ISSUED 11/10/04

-----  
3. HAZARDS INFORMATION  
-----

EMERGENCY OVERVIEW: Product is non-toxic by ingestion, skin contact, or inhalation. Direct contact with eyes or skin may cause mild irritation.

ROUTE(S) OF ENTRY:       Skin: No  
                                  Inhalation: No  
                                  Ingestion: No

SKIN CONTACT: Non-irritant

SKIN SENSITIZATION: N/D

EYE CONTACT: Non-irritant

TARGET ORGANS: N/D

CARCINOGENICITY RATING: NTP: N/L IARC: N/L OSHA: N/L ACGIH: N/L  
None

SIGNS AND SYMPTOMS: Direct contact with eyes or skin may cause mild irritation.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: N/D.

-----  
4. FIRST AID MEASURES  
-----

EYES: Remove from source of exposure. Flush with copious amounts of water. If irritation persists or signs of toxicity occur, seek medical attention. Provide symptomatic/supportive care as necessary.

SKIN: Remove from source of exposure. Flush with copious amounts of water. If irritation persists or signs of toxicity occur, seek medical attention. Provide symptomatic/supportive care as necessary.

INGESTION: Remove from source of exposure. If signs of toxicity occur, seek medical attention. Provide symptomatic/supportive care as necessary.

INHALATION: Remove from source of exposure. If signs of toxicity occur, seek medical attention. Provide symptomatic/supportive care as necessary.

## MATERIAL SAFETY DATA SHEET

PAGE 3

VectoBac® 200G

MSDS# BIO-0308 Rev. 1

ISSUED 11/10/04

-----  
5. FIRE FIGHTING PROCEDURES  
-----

FLASH POINT: N/A  
FLASH POINT METHOD: N/D  
LOWER EXPLOSIVE LIMIT(%): N/D  
UPPER EXPLOSIVE LIMIT(%): N/D  
AUTOIGNITION TEMPERATURE: N/D

FIRE &amp; EXPLOSION HAZARDS: Non-flammable and no explosive properties.

EXTINGUISHING MEDIA: Use appropriate medium for underlying cause of fire.

FIRE FIGHTING INSTRUCTIONS: Wear protective clothing and self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES  
-----

SPILL OR RELEASE PROCEDURES: Recover product. Place into appropriate container for disposal. Avoid dust. Ventilate and wash spill area.

7. HANDLING AND STORAGE  
-----

HANDLING: N/D.

STORAGE: Store in a cool, dry place.

SPECIAL PRECAUTIONS: N/A

8. EXPOSURE CONTROLS/PERSONAL PROTECTION  
-----

ENGINEERING CONTROLS: Use local exhaust.

RESPIRATORY PROTECTION: Not usually required.

SKIN PROTECTION: Impervious gloves, clothing to minimize skin contact.

EYE PROTECTION: Not usually required. If necessary, use safety glasses or goggles.

OTHER PROTECTION: Wash thoroughly with soap and water after handling.

## MATERIAL SAFETY DATA SHEET

PAGE 4

VectoBac® 200G

MSDS# BIO-0308 Rev. 1

ISSUED 11/10/04

-----  
9. PHYSICAL AND CHEMICAL PROPERTIES  
-----

APPEARANCE/PHYSICAL STATE: Granular solid.  
 ODOR: Mild  
 BOILING POINT: N/A  
 MELTING/FREEZING POINT: N/A  
 VAPOR PRESSURE (mm Hg): N/A  
 VAPOR DENSITY (Air=1): N/A  
 EVAPORATION RATE: N/D  
 BULK DENSITY: 27 ± 4 lb/cu.ft.  
 SPECIFIC GRAVITY: N/D  
 SOLUBILITY: N/A  
 pH: 5.4 ± 1.0 (10% slurry)  
 VISCOSITY: N/A

-----  
10. STABILITY AND REACTIVITY  
-----

CHEMICAL STABILITY: Stable  
 INCOMPATIBILITIES: Alkalinity inactivates product.  
 HAZARDOUS DECOMPOSITION PRODUCTS: N/D.  
 HAZARDOUS POLYMERIZATION: Will not occur.

-----  
11. TOXICOLOGICAL INFORMATION  
-----

## Acute Toxicity

ORAL LD50: LD50 (rat) &gt; 5,000 mg/kg

DERMAL LD50: LD50 (rabbit) &gt; 5,000 mg/kg

INHALATION LC50: N/D. No lethality was observed in rats after a 4 hour exposure at the highest obtainable inhalation exposure chamber concentration (2.84 mg/l) to VectoBac® Technical Powder.

CORROSIVENESS: N/D. Not expected to have any corrosive properties.

DERMAL IRRITATION: N/D. Transient, slight or mild irritation noted in a dermal toxicity study with VectoBac® Technical Powder.

OCULAR IRRITATION: N/D. VectoBac® Technical Powder was mildly irritating in an eye irritation test in rabbits.

## MATERIAL SAFETY DATA SHEET

PAGE 5

VectoBac® 200G

MSDS# BIO-0308 Rev. 1

ISSUED 11/10/04

-----  
11. TOXICOLOGICAL INFORMATION, continued  
-----

DERMAL SENSITIZATION: N/D

SPECIAL TARGET ORGAN EFFECTS: N/D

CARCINOGENICITY INFORMATION: N/D. None of the components are classified as carcinogens.

-----  
12. ECOLOGICAL INFORMATION  
-----

ECOLOGICAL INFORMATION: N/D

-----  
13. DISPOSAL CONSIDERATIONS  
-----

Do not contaminate potable water, food or feed by storage or disposal.  
Dispose of product in accordance with federal, state, and local regulations.

## WASTE DISPOSAL METHODS:

**Pesticide Disposal:** Wastes resulting from use of this product may be disposed of on site or at an approved waste disposal facility.

**Container Disposal:** Completely empty bag into application equipment. Then dispose of empty bag in a sanitary landfill or by incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.

-----  
14. TRANSPORTATION INFORMATION  
-----

DOT STATUS: Not Regulated  
PROPER SHIPPING NAME: N/A  
HAZARD CLASS: N/A  
UN NUMBER: N/A  
PACKING GROUP: N/A  
REPORTABLE QUANTITY: N/A

IATA/ICAO STATUS: Not Regulated  
PROPER SHIPPING NAME: N/A  
HAZARD CLASS: N/A  
UN NUMBER: N/A  
PACKING GROUP: N/A  
REPORTABLE QUANTITY: N/A

## Appendix I: VectoLex® CG Restricted Label

Vectolex CG Canada 03/30/05

Group 11A2 Insecticide

PMRA APPROVED - JD - 3-MAY-2005

### VECTOLEX® CG BIOLOGICAL LARVICIDE

RESTRICTED

READ THE LABEL BEFORE USING  
KEEP OUT OF REACH OF UNAUTHORIZED PERSONNEL  
POTENTIAL SENSITIZER  
CAUTION EYE IRRITANT

REGISTRATION NO. 28008 PEST CONTROL PRODUCTS ACT

GUARANTEE:

*Bacillus sphaericus* Strain 2362, 50 BsIU/mg

Registrant:  
Valent BioSciences Corporation  
870 Technology Way  
Libertyville, Illinois, USA  
60048

Canadian Agent:  
Valent BioSciences Canada, Ltd.  
40 King Street West, Suite 2100  
Toronto, Ontario  
M5H 3CH

Net Contents:

Date of Manufacture:

VectoLexCG  
03/30/05

**NOTICE TO USER:**

This control product is to be used only in accordance with the directions on this label. It is an offence under the *Pest Control Products Act* to use a control product under unsafe conditions.

**NATURE OF RESTRICTION:**

This product is to be used only in the manner authorized; consult provincial pesticide regulatory authorities regarding appropriate use permits that may be required.

**LIMITATIONS:**

**DO NOT** apply directly to treated, finished drinking water reservoirs or drinking water receptacles.

**RESTRICTED USES: DIRECTIONS FOR USE:**

VectoLex CG is a mosquito larvicide to be applied, without mixing or dilution, by conventional ground or aerial application equipment. Apply to mosquito breeding sites when sampling indicates that mosquito larvae are present. For best results, apply when young larval stages are present. Reapply at a minimum interval of one week as needed, if monitoring indicates that further applications are required. Do not reapply within one week of application.

**Aerial Application Instructions:**

Apply only by fixed-wing or rotary aircraft equipment which has been functionally and operationally calibrated for the atmospheric conditions of the area and the application rates and conditions of this label. Label rates, conditions and precautions are product specific. Apply only at the rate recommended for aerial application on this label. Where no rate for aerial application appears for the specific use, this product cannot be applied by any type of aerial equipment. Ensure uniform application by employing appropriate marking devices and/or electronic tracking equipment.

**Use Precautions:**

Apply only when meteorological conditions at the treatment site allow for complete and even coverage. **DO NOT** apply when wind speed is greater than 16 km/h at flying height at the site of application. Apply only under conditions of good practice specific to aerial application as outlined in the *Basic Knowledge Requirements for Pesticide Education in Canada: Applicator Core and Aerial Module*, available from the Federal/Provincial/Territorial Committee on Pest Management.

**Operator Precautions:**

Do not allow the pilot to mix product to be loaded onto the aircraft. Loading of premixed product with a closed system is permitted. It is desirable that the pilot has communication capabilities at each treatment site at the time of application.

The field crew and the mixer/loaders must wear the personal protective equipment described in the PRECAUTIONS section of this label. All personnel on the job site must wash hands and face thoroughly before eating and drinking. Protective clothing, aircraft cockpit and vehicle cabs must be decontaminated regularly.

**Product Specific Precautions:**

Read and understand the entire label before opening this product. If you have questions, call the manufacturer at 1-800-323-9597 or obtain technical advice from the distributor or from your provincial agricultural or forestry representative. Application of this specific product must meet and/or conform to the aerial uses and rates on this label.

Rinse and flush spray equipment thoroughly following each use.

VectoLexCG  
03/30/5

**MOSQUITO LARVAL CONTROL**

VectoLex CG is a mosquito larvicide. It is not effective against mosquito adults and pupae. Apply to mosquito larval breeding sites when sampling indicates that mosquito larvae are present. For best results, apply when young larval stages are present.

For use in:	Mosquito species controlled	Application rate and interval	Application methods
Water bodies: freshwater marshes, salt marshes, flood plains, flooded fields and pastures, wetlands, ponds, storm water detention/retention and seepage ponds, wastewater sewage effluent, sewage lagoons, oxidation ponds, log ponds, impounded waste water, septic ditches, drainage ditches including open storm sewers and irrigation ditches	<i>Culex</i> spp. <i>Culiseta</i> spp. <i>Aedes vexans</i> (Other <i>Aedes</i> spp. and <i>Ochlerotatus</i> spp. have variable degrees of susceptibility to VectoLex CG)	5.6 -16.8 kg product /ha (0.56-1.68 g product /m <sup>2</sup> ) of water surface area.  Use the higher rate in water polluted with sewage, water with high organic content and water with a high level of suspended solids.  Do not reapply within one week of application. Reapply at a minimum interval of one week as needed, if monitoring indicates that further applications are required.	Apply by ground or aerial application equipment capable of uniform delivery of VectoLex CG over the water surface.
Waste tires	<i>Culex</i> spp. <i>Culiseta</i> spp. <i>Aedes triseriatus</i>	0.56-1.68 g product / m <sup>2</sup> of water surface area. Use the higher rate in water with high organic content and water with a high level of suspended solids.  Do not reapply within one week of application. Reapply at a minimum interval of one week as needed, if monitoring indicates that further applications are required.	Apply by hand or ground application equipment to individual tires which contain standing water.  Use with other mosquito management techniques such as shredding waste tires, removing standing water and covering the stacked tires.



Vectolex CG Canada 03/30/05

#### RESISTANCE MANAGEMENT RECOMMENDATIONS:

Mosquito populations may contain individuals naturally resistant to VectoLex CG. The resistant individuals may dominate the mosquito population if VectoLex CG is used repeatedly as the sole means of control in the same geographic location/use area.

To delay/avoid the resistance of mosquito populations to VectoLex CG it is recommended that users:

- Rotate the use of VectoLex CG with other mosquito larvicides currently registered in Canada, which do not contain *Bacillus sphaericus* as the active ingredient, providing they are registered for use in control of the same pests in the same sites.
- Treat a portion of the target area with a *Bti* formulation or an alternative insecticide ensuring the continual existence of populations of mosquitoes not exposed to VectoLex CG within a given geographic location.
- Insecticide use in mosquito control should be based on an IPM program that includes scouting, record keeping, and considers cultural/habitat, biological and chemical control practices suitable for the area to be treated.
- Monitor treated pest populations for resistance development.
- For further information or to report suspected resistance contact Valent BioSciences Corporation at 1-800-323-9597 or at [www.valentbiosciences.com](http://www.valentbiosciences.com).

#### PRECAUTIONS

**KEEP OUT OF REACH OF UNAUTHORIZED PERSONNEL.** May cause sensitization. May irritate eyes. Avoid contact with skin, eyes or clothing. Mixer/loaders and applicators not in enclosed cabs or aircraft must wear a long-sleeved shirt, long pants, shoes plus socks, eye goggles, waterproof gloves and a dust/mist filtering respirator (MSH/NIOSH approval number prefix TC-21C) or a NIOSH approved respirator with any N-95, R-95, P-95 or HE filter for biological products when handling, mixing/loading or applying the product and during all clean-up/repair activities. Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse.

#### FIRST AID

**IF SWALLOWED:** Rinse mouth and throat with plenty of water.

**IF ON SKIN/CLOTHING:** Take off contaminated clothing. Wash exposed skin with plenty of soap and water.

**IF INHALED:** Move to fresh air.

**IF IN EYES:** Hold eye open and rinse slowly and gently with water. Remove contact lenses, if present, then continue rinsing eye.

**GENERAL: IMMEDIATELY** seek medical attention if irritation or signs of toxicity occur and persist or are severe. Take container, label or product name and Pest Control Product Registration Number with you when seeking medical attention.

VectoLexCG  
03/30/05



Vectolex CG Canada 03/30/05

**STORAGE:** Store at temperatures between 0°C and 25°C. Store container upright and keep tightly closed when not in use. Material must be used within 12 months of the Date of Manufacture.

**DISPOSAL:**

1. Completely empty the bag into the application equipment.
2. Follow provincial instruction for any required additional cleaning of the container prior to its disposal.
3. Make the empty bag unsuitable for further use.
4. Dispose of the bag in accordance with provincial requirements.

For information on disposal of unused, unwanted product, contact the manufacturer or the provincial regulatory agency. Contact the manufacturer and the provincial regulatory agency in case of a spill, and for clean-up of spills.

**DO NOT** contaminate irrigation or drinking water supplies or aquatic habitats by cleaning of equipment or disposal of wastes.

**NOTICE TO BUYER:**

Seller's guarantee shall be limited to the terms set out on the label and, subject thereto, the buyer assumes the risk to persons or property arising from the use or handling of this product and accepts the product on that condition.

©2005

VectoLexCG  
03/30/05

## Appendix J: VectoLex® CG Material Data Safety Sheet

MATERIAL SAFETY DATA SHEET		UPDATES AVAILABLE AT WWW.GREENBOOK.NET 1
<b>VECTOLEX® CG</b>		
MSDS# BIO-0042 Rev. 1 ISSUED 08/15/03		
<b>1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION</b>		
<b>MATERIAL NAME:</b> VectoLex® CG VectoLex® G VectoLex® WSP EPA Registration No. 73049-20 List Number: 5722 <b>MANUFACTURER:</b> Valent BioSciences Corporation 870 Technology Way, Suite 100 Libertyville, Illinois 60048 <b>EMERGENCY TELEPHONE NUMBERS</b> <b>Emergency Health or Spill:</b> Outside the United States: 651-632-6184 Within the United States: 877-315-9819		
<b>2. COMPOSITION/INFORMATION ON INGREDIENTS</b>		
<b>INGREDIENT NAME:</b> Bacillus sphaericus Serotype H-5a5b, strain 2362 <b>CONCENTRATION:</b> 7.50% <b>CAS/RTECS NUMBERS:</b> N/A / N/A <b>OSHA-PEL</b> 8HR TWA: N/L STEL: N/L CEILING: N/L <b>ACGIH-TLV</b> 8HR TWA: N/L STEL: N/L CEILING: N/L <b>OTHER LIMITS</b> 8HR TWA: N/A STEL: N/A CEILING: N/A <b>INGREDIENT NAME:</b> Inert Ingredients - identity withheld as Trade Secret <b>CONCENTRATION:</b> 92.50 % <b>CAS/RTECS NUMBERS:</b> N/A / N/A <b>OSHA-PEL</b> 8HR TWA: N/L STEL: N/L CEILING: N/L <b>ACGIH-TLV</b> 8HR TWA: N/L STEL: N/L CEILING: N/L <b>OTHER LIMITS</b> 8HR TWA: N/A STEL: N/A CEILING: N/A <b>EEC (European Community):</b> N/A <b>Symbol Designation:</b> N/A <b>Risk Phrases:</b> N/A <b>Safety Phrases:</b> N/A		
<b>3. HAZARDS INFORMATION</b>		
<b>EMERGENCY OVERVIEW:</b> Product is non-toxic by ingestion, skin contact, or inhalation. Direct contact with eyes or skin may cause mild irritation. <b>ROUTE(S) OF ENTRY:</b> Skin: No Inhalation: No Ingestion: No <b>SKIN CONTACT:</b> Non-irritant <b>SKIN SENSITIZATION:</b> Non-sensitizer <b>EYE CONTACT:</b> Non-irritant <b>TARGET ORGANS:</b> N/D <b>CARCINOGENICITY RATING:</b> NTP: N/L IARC: N/L OSHA: N/L ACGIH: N/L None <b>SIGNS AND SYMPTOMS:</b> Direct contact with eyes or skin may cause mild irritation. <b>MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:</b> N/D. Data suggest pre-existing skin or eye lesions.		
<b>4. FIRST AID MEASURES</b>		
<b>EYES:</b> Remove from source of exposure. Flush with copious amounts of water. If irritation persists or signs of toxicity occur, seek medical attention. Provide symptomatic/supportive care as necessary. <b>SKIN:</b> Remove from source of exposure. Flush with copious amounts of water. If irritation persists or signs of toxicity occur, seek medical attention. Provide symptomatic/supportive care as necessary. <b>INGESTION:</b> Remove from source of exposure. If signs of toxicity occur, seek medical attention. Provide symptomatic/supportive care as necessary. <b>INHALATION:</b> Remove from source of exposure. If signs of toxicity occur, seek medical attention. Provide symptomatic/supportive care as necessary.		
<b>5. FIRE FIGHTING PROCEDURES</b>		
<b>FLASH POINT:</b> N/A <b>FLASH POINT METHOD:</b> N/D <b>LOWER EXPLOSIVE LIMIT(%):</b> N/D <b>UPPER EXPLOSIVE LIMIT(%):</b> N/D <b>AUTOIGNITION TEMPERATURE:</b> N/D <b>FIRE &amp; EXPLOSION HAZARDS:</b> Non-flammable and no explosive properties. <b>EXTINGUISHING MEDIA:</b> Use appropriate medium for underlying cause of fire. <b>FIRE FIGHTING INSTRUCTIONS:</b> Wear protective clothing and self-contained breathing apparatus.		
<b>6. ACCIDENTAL RELEASE MEASURES</b>		
<b>SPILL OR RELEASE PROCEDURES:</b> Recover product. Place into appropriate container for disposal. Avoid dust. Ventilate and wash spill area.		
<b>7. HANDLING AND STORAGE</b>		
<b>HANDLING:</b> N/D. <b>STORAGE:</b> Store in a cool, dry place. <b>SPECIAL PRECAUTIONS:</b> Wash thoroughly with soap and water after handling.		
<b>8. EXPOSURE CONTROLS/PERSONAL PROTECTION</b>		
<b>ENGINEERING CONTROLS:</b> Use local exhaust. <b>RESPIRATORY PROTECTION:</b> Not usually required. However, mixers/loaders and applicators not in enclosed cabs or aircraft must wear a dust/mist respirator meeting NIOSH standards of at least N-95, R-95 or P-95. <b>SKIN PROTECTION:</b> Impervious gloves, clothing to minimize skin contact. <b>EYE PROTECTION:</b> Not usually required. If necessary, use safety glasses or goggles. <b>OTHER PROTECTION:</b> Wash thoroughly with soap and water after handling.		
<b>9. PHYSICAL AND CHEMICAL PROPERTIES</b>		
<b>APPEARANCE/PHYSICAL STATE:</b> Granules <b>ODOR:</b> Characteristic odor <b>BOILING POINT:</b> N/A <b>MELTING/FREEZING POINT:</b> N/A <b>VAPOR PRESSURE (mm Hg):</b> N/A <b>VAPOR DENSITY (Air=1):</b> N/A <b>EVAPORATION RATE:</b> N/A <b>BULK DENSITY:</b> 35 ± 3 lb/cu.ft. <b>SPECIFIC GRAVITY:</b> N/D <b>SOLUBILITY:</b> Partially suspends/soluble in water <b>pH:</b> N/A <b>VISCOSITY:</b> N/A		
<b>10. STABILITY AND REACTIVITY</b>		
<b>CHEMICAL STABILITY:</b> Stable. <b>INCOMPATIBILITIES:</b> Alkalinity inactivates product. <b>HAZARDOUS DECOMPOSITION PRODUCTS:</b> N/D. <b>HAZARDOUS POLYMERIZATION:</b> Will not occur.		
<b>11. TOXICOLOGICAL INFORMATION</b>		
<b>Acute Toxicity</b> <b>ORAL LD50:</b> N/D. LD50 (rat) > 5,000 mg/kg for Technical Powder. <b>DERMAL LD50:</b> N/D. LD50 (rabbit) > 2,000 mg/kg for Technical Powder.		
<b>INHALATION LC50:</b> N/D. No lethality in rats after a 4-hour exposure at the maximum obtainable inhalation exposure chamber concentration (0.09 mg/l) to VectoLex® Technical Powder. <b>CORROSIVENESS:</b> N/D. Not expected to have any corrosive properties. <b>DERMAL IRRITATION:</b> N/D. Transient, slight to mild irritation noted in a dermal toxicity study with VectoLex® Technical Powder. <b>OCULAR IRRITATION:</b> N/D. VectoLex® Technical Powder caused mild to moderate eye irritation in tests with rabbits. <b>DERMAL SENSITIZATION:</b> N/D. Results from tests with a similar formulated material were negative. <b>SPECIAL TARGET ORGAN EFFECTS:</b> N/D <b>CARCINOGENICITY INFORMATION:</b> N/D. None of the components are classified as carcinogens.		
<b>12. ECOLOGICAL INFORMATION</b>		
<b>ECOLOGICAL INFORMATION:</b> N/D		
<b>13. DISPOSAL CONSIDERATIONS</b>		
Do not contaminate potable water, food or feed by storage or disposal. Dispose of product in accordance with federal, state, and local regulations. <b>WASTE DISPOSAL METHODS:</b> <b>Pesticide Disposal:</b> Wastes resulting from use of this product may be disposed of on site or at an approved waste disposal facility. <b>Container Disposal:</b> Completely empty bag into application equipment. Then dispose of empty bag in a sanitary landfill or by incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke. For Water Soluble Pouches, dispose of empty outer foil bag in trash.		
<b>14. TRANSPORTATION INFORMATION</b>		
<b>DOT</b> STATUS: Not Regulated PROPER SHIPPING NAME: N/A HAZARD CLASS: N/A UN NUMBER: N/A PACKING GROUP: N/A REPORTABLE QUANTITY: N/A <b>IATA/ICAO</b> STATUS: Not Regulated PROPER SHIPPING NAME: N/A HAZARD CLASS: N/A UN NUMBER: N/A PACKING GROUP: N/A REPORTABLE QUANTITY: N/A <b>IMO</b> STATUS: Not Regulated PROPER SHIPPING NAME: N/A HAZARD CLASS: N/A UN NUMBER: N/A PACKING GROUP: N/A REPORTABLE QUANTITY: N/A <b>FLASH POINT:</b> N/A		
<b>15. REGULATORY INFORMATION</b>		
<b>TSCA STATUS:</b> Exempt <b>CERCLA STATUS:</b> N/D <b>SARA STATUS:</b> N/D <b>RCRA STATUS:</b> N/D <b>PROP 65 (CA):</b> N/D		
<b>16. OTHER INFORMATION</b>		
<b>REASON FOR ISSUE:</b> Updated Hazard Information (Section 3), Disposal Information (Section 13) and added VectoLex® WSP trade name. <b>APPROVAL DATE:</b> 08/15/03 <b>SUPERSEDES DATE:</b> 06/12/01 <b>LEGEND:</b> N/A = Not Applicable N/D = Not Determined N/L = Not Listed L = Listed C = Ceiling S = Short-term ® = Registered Trademark of Valent BioSciences ™ = Registered Trademark of Valent BioSciences		
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**MATERIAL SAFETY DATA SHEET**

**UPDATES AVAILABLE AT [WWW.GREENBOOK.NET](http://WWW.GREENBOOK.NET) 2**

The information and recommendations contained herein are based upon tests believed to be reliable. However, Valent BioSciences does not guarantee their accuracy or completeness nor shall any of this information constitute a warranty, whether expressed or implied, as to the safety of the goods, the merchantability of the goods, or the fitness of the goods for a particular purpose. Adjustment to conform with actual conditions of usage may be required. Valent BioSciences assumes no responsibility for results obtained or for incidental or consequential damages arising from the use of these data. No freedom from infringement of any patent, copyright or trademark is to be inferred.  
August 2003  
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## Appendix K: Question and Answer Resources

### What is West Nile virus?

West Nile virus (WNV) causes an infection that is spread by certain species of mosquitoes that become infected when they bite infected birds. The mosquitoes spread the virus to people. Birds are a reservoir for WNV, meaning that the virus multiplies in them. Infected mosquitoes then may spread the virus to humans and animals, such as horses. However, the virus cannot be spread by these animals to people or from person to person through casual contact. In 2009, the Public Health Agency of Canada (PHAC) reported 8 human cases of West Nile virus infection in Canada. Up-to-date figures are available online at <http://www.phac-aspc.gc.ca/wnv-wnv/index.html>.

### What are the symptoms?

About 80% of people who are infected with WNV have no symptoms. When symptoms do appear, they develop 3 to 14 days after infection and can include fever, tiredness, headache, and body aches, occasionally with skin rash and swollen lymph nodes. Symptoms usually last 3 to 6 days in people who have a mild infection. With more severe infections, symptoms can last from weeks to months. People usually recover fully from West Nile virus infection, but permanent problems may develop, especially in children and older people. On rare occasions the infection affects the brain or spinal cord, sometimes causing encephalitis, meningitis, or myelitis. Symptoms may include headache, high fever, stiff neck, reduced attention to surroundings, disorientation, tremors, convulsions, muscle weakness or paralysis, and coma. In rare cases, WNV can cause death.

People with weaker immune systems and people with chronic diseases are at greater risk for serious health effects. Older people infected by WNV have the greatest risk for developing encephalitis and other complications. People ages 50 to 59 are 10 times more likely to develop complications than people younger than age 20, and people 80 or older are 43 times more likely to develop complications. Of the people who develop complications, those older than age 70 have the greatest risk of death.

More information can be found at <http://www.healthlinkbc.ca/kb/content/mini/uf4420.html#uf4421>

### How is West Nile virus treated?

No treatment is needed for mild WNV infection, and no specific treatment is available for severe infection. Treatment involves supportive care in a hospital to help the body fight the illness on its own. Supportive care is often used when no treatment exists for an illness. A WNV vaccine is available for horses only. If you own horses, consider having them vaccinated, because the fatality rate from WNV is much higher in horses than in humans. Researchers are trying to develop a vaccine that prevents WNV infection in humans.

### What is BC doing to watch for and minimize the risk of WNV?

The British Columbia Centre for Disease Control (BCCDC) and regional health authorities are working with local governments, the BC Animal Health Centre, wildlife officials, entomologists, and other agencies to monitor for WNV in BC. Key actions include:

- Providing information to health care providers about WNV illness and what tests to order for diagnosis.
- Providing prompt notification of suspect human cases to Canadian Blood Services (CBS). This helps protect the blood system by making sure no one who has WNV infection has donated blood.
- Monitoring and testing program for dead corvids (includes crows, ravens, magpies, nutcrackers and blue jays). Regional health authorities oversee collection and testing of these birds. As particular programs will vary, please refer to Fraser Health Authority for specific program activities.
- Monitoring and testing program for adult mosquitoes to determine what species are present in BC and where, and to test for presence of the virus in mosquitoes.
- Providing up to date information about WNV to the public through press releases and online at [www.bccdc.ca](http://www.bccdc.ca)

- Working in partnerships with regional health authorities and local governments to help them develop programs to control mosquitoes. This includes taking measures to understand the mosquito species present in a particular area, where their breeding sites are and when they are most likely to be biting humans. Regional health authorities are working with local governments to plan the most appropriate measures to control mosquitoes that carry WNV.

### **How can I protect myself and my family from WNV?**

There are many simple things you can do to protect yourself from WNV. Unlike birds or other insects, most mosquitoes do not fly very far and tend to stay close to their breeding sites. You are most likely to be bitten by a mosquito from your own backyard! There are many ways to lessen the risk of mosquito bites for you and your family:

- When going outdoors, use insect repellents that contain DEET or other approved ingredients.
- Wear protective clothing such as long-sleeved shirts, long pants and a hat. Light coloured clothing is best because mosquitoes tend to be attracted to dark colours.
- Make sure that door and window screens fit tightly and have no holes that may allow mosquitoes indoors.
- If you can, avoid being out from dusk to dawn as mosquitoes that carry WNV tend to be active at these times.
- Wear protective clothing, especially outside in the early evening and at dawn. This includes long-sleeve shirts or jackets and long pants that mosquitoes cannot bite through. Tuck your pants into socks for extra protection.
- Avoid dark coloured clothing as it can attract mosquitoes.
- Use mosquito netting for babies and toddlers in cribs and strollers.
- Use mosquito repellent. Putting on personal insect repellents that are federally registered, such as those that contain DEET (N,N-dethyl-m-toluamide) is an effective way to protect yourself from mosquito bites. There are also many repellents that have been shown NOT to protect against mosquito bites, including bug zappers, devices that give off sound waves and Citrosa plants.
- Eliminate mosquito breeding sites around your home and vacation property:
  - Mosquitoes lay eggs in standing water and it takes about four days for the eggs to grow into adults that are ready to fly. Even a small amount of water, for example, in a saucer under a flowerpot, is enough to act as a breeding ground. As a result, it is important to eliminate as much standing water around your property as possible by:
    - Regularly (twice a week) drain standing water from items like pool covers, saucers under flowerpots, recycle bins, garbage cans, etc.
    - Remove old unused items from around your property (i.e. old tires) which have a tendency to collect water
    - Change the water in wading pools, birdbaths, pet bowls and livestock watering tanks twice a week
    - Cover rain barrels with screens
    - Clean out eavestroughs regularly to prevent clogs that can trap water.
    - Purchase an aerator for ornamental ponds. This will keep the surface water moving which will make the water inhospitable to mosquito larvae.
    - Make sure drains and drainage ditches are not clogged.
    - If you have a swimming pool, immediately remove water that collects on pool covers and make sure the pool's pump is circulating
- Stop mosquitoes from entering your home. Check windows and door screens for holes and make sure they fit snugly into the frames, so mosquitoes cannot get in.

For more information on steps you can take to reduce mosquito breeding grounds on your property, see Health Canada's factsheet: [West Nile Virus: How to Protect Yourself and Your Family](#). For more detailed information

see the Fact Sheet on Effective Control of Mosquitoes Around Your Home at [http://www.hc-sc.gc.ca/cps-spc/pubs/pest/\\_pnotes/mosquitos-moustiques/index-eng.php](http://www.hc-sc.gc.ca/cps-spc/pubs/pest/_pnotes/mosquitos-moustiques/index-eng.php)

#### *General Use Information for All Personal Insect Repellents*

- Always read the entire label carefully before using. Follow all of the label directions, including restrictions for use on young children and the maximum number of applications allowed per day.
- Apply the repellent sparingly, and only on exposed skin surfaces or on top of clothing. Do not use under clothing. Heavy application and saturation are unnecessary for effectiveness. Repeat applications only as necessary.
- Do not get in eyes. If you do get repellent in your eyes, rinse immediately with water.
- Do not use the repellent on open wounds, or if your skin is irritated or sunburned.
- Avoid breathing spray mists and never apply sprays inside a tent. Use only in well-ventilated areas. Do not use near food.
- Wash treated skin with soap and water when you return indoors or when protection is no longer needed.
- Keep all insect repellent containers out of the reach of children.
- Always supervise the application on children.
- Avoid applying repellent to children's hands to reduce the chance of getting the repellent in their eyes and mouths.
- If you suspect that you or your child is reacting to an insect repellent, stop using the product immediately, wash treated skin and seek medical attention. When you go to the doctor, take the product container with you.
- If you are concerned that you are sensitive to a product, apply the product to a small area of skin on your arm and wait 24 hours to see if a reaction occurs.

#### *Choosing an Insect Repellent Product*

Choose a product that meets your needs. For example, if you plan to be outdoors for a short period of time, choose a product with a lower concentration of repellent and repeat application only if you need a longer protection time. Use only personal insect repellents that are registered in Canada. They have a registration number granted under the Pest Control Products Act and are labelled as insect repellents for use on humans. Never use a product labelled as an insecticide on your body. Repellents can be purchased in any good pharmacy.

There are five different active ingredients found in registered personal insect repellents in Canada. The active ingredient, its concentration, protection times and use instructions are all listed on each product label. If using a product containing DEET, please consult the guidelines below.

**P-menthane 3,8-diol:** A product containing this active ingredient was recently registered in Canada and thus meets all the modern safety standards. It provides up to two hours of protection against mosquitoes. This product cannot be used on children under three years of age. It can be applied two times per day.

**Soybean oil:** Registered products containing soybean oil provide between one to 3.5 hours of protection against mosquitoes, depending on the product. Products containing soybean oil were recently registered and thus meet all the modern safety standards.

**Citronella and lavender:** The re-evaluation of citronella-based insect repellents was completed in 2004. This re-evaluation was based on a limited amount of human health data that left a high degree of uncertainty about its safety. This uncertainty was incorporated into the human health risk assessments and subsequently the PMRA was unable to conclude that insect repellents containing citronella were acceptable for continued use.

Because of the uncertainties identified in the re-evaluation, the PMRA is proposing to phase out citronella-based insect repellents unless data to address the uncertainties in the human health risk assessment are generated and submitted by the manufacturers.

The manufacturer of the insect repellent containing lavender oil has decided to discontinue the product as a result of the re-evaluation. As such, the lavender oil product is being phased out in Canada by March 31, 2007.

Registered products containing citronella protect people against mosquito bites from 30 minutes to two hours. The registered lavender product repels mosquitoes for approximately 30 minutes. These products cannot be used on infants and toddlers under two years of age.

Based on animal studies, citronella-based products appear to be potential skin sensitizers. Therefore, allergic reactions may occur in some individuals.

Certain products containing citronella have a limit on the number of applications allowed per day. Read the product label before using.

**DEET:** Using the latest health protection standards, DEET was re-evaluated in 2001 to ensure continued acceptable use and extra protection for children. DEET-based repellents at various concentrations offer different protection times. Examples of protection times based on DEET concentration are as follows:

Concentration of Different Products	Length of time protection provided (approx)
DEET 30%	6 hours
DEET 15%	5 hours
DEET 10%	3 hours
DEET 5%	2 hours
p-menthane-3,8-diol 10%	3 hours

Choose a product that meets your specific needs. For example if you plan to be outdoors for a short period of time, choose a product with a lower concentration of DEET and repeat only if you need a longer protection time.

#### *Updated Information on Using Insect Repellents that Contain DEET*

The following safety tips are based on the PMRA's re-evaluation of DEET. This re-evaluation involved a comprehensive review of the scientific data supporting its registration using the latest health protection standards, including special protection for children. The new use guidelines for using DEET on children were developed in consultation with the Canadian Paediatric Society.

For a complete explanation of the DEET re-evaluation process and its conclusions, please refer to Re-evaluation Decision Document (RRD2002-01) *Personal insect repellents containing DEET (N,N-diethyl-m-toluamide and related compounds)*.

- 1. Children under 6 months of age:** DO NOT use personal insect repellents containing DEET on infants.
- 2. Children aged 6 months to 2 years:** In situations where a high risk of complications from insect bites exist, the use of one application per day of DEET may be considered for this age group the least concentrated product (10% DEET or less) should be used. As with all insect repellents, the product should be applied sparingly and not be applied to the face and hands. Prolonged use should be avoided.
- 3. Children between 2-12 years of age:** The least concentrated product (10% DEET or less) should be used. Do not apply more than three times per day. Prolonged use should be avoided.
- 4. Adults and Individuals 12 Years of Age or older:** Products containing DEET at concentrations above 30% will no longer be acceptable for registration, based on a human health risk assessment that considered daily

application of DEET over a prolonged period of time. Studies show that products with lower concentrations of DEET are as effective as the high concentration products, but they remain so for shorter periods of time. Products containing no more than a 30% concentration of DEET will provide adults with sufficient protection. Re-apply after these protection times have elapsed if necessary.

**Note:** There is no indication that there is a hazard to the unborn or nursing child associated with the use of DEET by pregnant or lactating women. However, there are non-chemical methods to reduce mosquito bites (e.g. protective clothing, avoiding mosquito habitat and times of peak mosquito activity) which could be considered.

**Use of Existing Products That Contain DEET at Concentrations Above 30%:** Since no immediate health concerns were identified during the re-evaluation of DEET, retail sales of products that contain DEET at concentrations above 30% can continue until December 31, 2004. This phase-out will allow existing products to be used up, thereby preventing disposal problems.

If you have any concerns regarding higher-concentration DEET products (cream, liquid or pump spray) you have around the home, you can dispose of them with your regular household garbage. Consult municipal authorities concerning the disposal of aerosol sprays.

Otherwise, you may continue to use any products you have that contain a greater than 30% concentration of DEET on adults or children 12 years of age or older, occasionally and according to label directions (i.e. apply sparingly and only as required). These products should not be used for a prolonged period of time (e.g. daily use for several weeks).

**Using Insect Repellents and Sunscreens at the Same Time:** People can use both sunscreen and insect repellents when they are outdoors to protect their health. Follow the instructions on the package for proper applications of each product. Apply the sunscreen first, followed by the insect repellent.

**Products Containing DEET and Sunscreens:** Some personal insect repellent products contain sunscreen compounds. These products were phased out as of December 31, 2003, because of incompatible label instructions regarding methods of application of each component, i.e. insect repellents should be applied sparingly while sunscreens should be applied liberally and frequently.

If you still have sunscreen/DEET combination products, they may be disposed of in your regular household garbage.

For more information see The Public Health Agency's website at [http://www.phac-aspc.gc.ca/w-n-no/protect\\_e.html](http://www.phac-aspc.gc.ca/w-n-no/protect_e.html), [Safety Tips on Using Personal Insect Repellents](#) from Health Canada and [Statement on Personal Protective Measures to Prevent Arthropod Bites](#) from Public Health Agency of Canada

### Using Pesticides?

Over-the-counter products that are designed to get rid of garden pests aren't effective for overall mosquito control. Regarding the use of other pesticides, only workers who are licensed by provincial authorities and are trained in the safe use of pesticides can carry out mosquito control programs. Decisions on whether or not to use pesticides to control the spread of West Nile virus in your community will be made by local and provincial health authorities.

As a first step, people should try to eliminate standing water on their property by, for example disposing of old tires and containers and cleaning out rain gutters. However, for wholly-contained sources of standing water on private property where draining is not a practical option, there are registered Domestic and Commercial-class mosquito larvicides available. These contain *Bacillus thuringiensis israelensis (Bti)*, a naturally-occurring microbe that has minimal impact to health and the environment. For these products to be effective, users must follow the specific instructions on proper timing for their application.



For more information about larvicides and adulticides, the regulation of pesticides, and reducing mosquito populations, visit the Mosquito Control page of the Pest Management Regulatory Agency Web Site at [www.pmr-arla.gc.ca/english/consum/mosquito-e.html](http://www.pmr-arla.gc.ca/english/consum/mosquito-e.html), or call 1-800-267-6315 (toll-free in Canada).

#### **How can birds help to identify WNV in an area?**

Some species of mosquito and many species of birds can become infected with WNV during the cycle of transmission; members of the crow family (crows, ravens, magpies, nutcrackers and blue jays) are particularly sensitive to the virus and have high death rates if infected. Evidence suggests that crow die-offs precede an increased risk for human illness by 2-6 weeks. Monitoring of dead crows can provide an early warning signal that WNV is moving into an area.

#### **What do I do if I see a dead bird of the Crow Family?**

British Columbia is accepting all members of the corvid family (crow family) for surveillance purposes. This includes crows, ravens, Stellar's jays, and blue jays. Sightings of dead corvids in British Columbia may be reported on the [British Columbia Centre for Disease Control website](#), or by contacting the Fraser Health Authority. A copy of the bird submission form is in Appendix D.

#### **Should I continue to report dead crows after WNV is detected in my area?**

Crows are a useful measure of whether or not WNV is present in an area. However, once WNV has been detected there is no need to keep testing more birds. Although dead birds from *already* positive areas will *not* be tested for virus, their location can still be reported using the on-line form on the BCCDC website. These data will be mapped and used to make assessments about priority areas for mosquito control. Once WNV is detected in an area, increased efforts should be made to collect and test crows from neighbouring areas.

#### **How will the public know if West Nile virus has been found in BC?**

The BC Centre for Disease control and regional health authorities will notify the public if West Nile virus is detected in BC. Graphs and tables that summarize West Nile virus surveillance results are available on the BCCDC website: <http://www.bccdc.ca> and are updated at least once a week between May and October. In addition, a press conference will be held in the event a bird, mosquito or human tests positive for the virus to make sure the public knows what their risk is from West Nile virus and what they can do to decrease the risk.

#### **Canadian Blood Services**

Since 2003, the Canadian Blood Services has had an effective plan in place to deal with the threat of West Nile virus. The CBS tests every unit of blood collected, and has measures including deferring ill donors, withdrawing and destroying infected units, ongoing surveillance, and cancelling of blood donor clinics when necessary. There is no risk of acquiring West Nile virus by donating blood.

#### **Internet West Nile Virus Resources**

##### **Health Information**

BC Nurses Line

Just dial 811 or for the deaf and hearing impaired: 1-866-889-4700

##### **West Nile Virus Information**

Fraser Health Authority

[http://www.fraserhealth.ca/your\\_health/conditions\\_&\\_diseases/west\\_nile\\_virus/west\\_nile\\_virus](http://www.fraserhealth.ca/your_health/conditions_&_diseases/west_nile_virus/west_nile_virus)

**West Nile Virus Surveillance Information**

British Columbia Centre for Disease Control

<http://www.bccdc.ca/dis-cond/a-z/w/WestNileVirus/default.htm>

United States Centre for Disease Control

<http://www.cdc.gov/ncidod/dvbid/westnile/Mapsactivity/surv&control10MapsAnybyCounty.htm>**Mosquito Repellent Information**

Health Canada's Pest Management Regulatory Agency (includes Health Canada's Personal Safety Tips on Using Insect Repellents)

<http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/life-vie/insect-eng.php>**How to Report a Dead Bird**

BCCDC Dead Bird Sighting Form

[http://www.bccdc.ca/NR/rdonlyres/3D471161-CEC2-4BFA-91AA-D5300F9BD19C/0/EPI\\_Form\\_WNVBird\\_2010.pdf](http://www.bccdc.ca/NR/rdonlyres/3D471161-CEC2-4BFA-91AA-D5300F9BD19C/0/EPI_Form_WNVBird_2010.pdf)**West Nile Virus Concern and Livestock**

Ministry of Agriculture and Lands - Animal Health Center

<http://www.agf.gov.bc.ca/ahc/westnilevirus.htm>

## Appendix L: Metro Vancouver West Nile Virus Communications Plan

# Metro Vancouver Regional West Nile Virus Plan

### **Purpose**

The purpose of this communications plan is to tie West Nile Virus (WNV) municipal communications into BC CDC, the Ministry of Health and the Health Authorities strategies. Based on the experiences of the U.S. and other Canadian provinces that have dealt with arrival of WNV, having a unified communications strategy will better meet the public's needs, and reduce the sense of panic that can accompany health-related issues.

In order to not duplicate the efforts of the BC CDC and the Health Authorities, this plan will focus on the operational communications aspect rather than the strategic aspect.

### **Goals**

The goals are:

- a) To accurately and seamlessly communicate consistent messages around various WNV scenarios
- b) To ensure that key internal players, including staff and local government, within the municipalities and the regional district are prepared to answer WNV inquires
- c) To minimize public concern should WNV occur in the area

## **Included in the Plan**

### ***Contact trees and clear guidelines of who to contact and when***

- Confidential contact tree for disseminating positive WNV case information throughout the municipalities
- Information flow chart to show how information should flow through the municipality

### ***Timeline and action steps***

- A scenario-based matrix plan that includes various scenarios, the tactics, target audiences and details
  - Who needs to be contacted, what materials to use based on the scenario, and timeline (all of which will merge with BC CDC document)

### ***Communications materials and templates for internal and external communications***

- Produce pocket tear-pads for regional outdoor staff to distribute to people who inquire about WNV (basic Q/A with referral contacts)
  - With *approximately* 1,000 pads given to each of the 21 municipalities plus 1,000 to Metro Vancouver and UBC approximately 250,000 pads (3”X5”, padded in 50’s) would be required. Some of these pads would be given to other frontline staff, such as municipal staff who deal with public inquires via the phone or office.
- Internal email blast template for each scenario
- Internal Q & A
- Complete fact sheet with key messages
- Media release templates for all scenarios
- On hold and after hours phone script
- “Live read” radio script
- Ad templates
- Poster template
- Frontline speaking points for first human case scenario

### **Communications support tools**

- Dedicated telephone number with automated message referring callers to the appropriate organization or website (i.e. CDC, HA, Nurseline, etc.)

*Please note: based on the outcome of discussions regarding the use of BC Nurseline, this may not be required.*

**\*Update May 2010** – HealthLink BC (8-1-1) – formerly the BC NurseLine – is in place so dedicated telephone line not required. However in the case of an outbreak there may still be many calls to Metro Vancouver and to municipalities, so the automated messages can be used to refer visitors to those numbers

- Secure website (using Metro Vancouver webmaster) that hosts all materials and plans including:
  - This overall communication plan
  - Communication flow chart
  - Scenario based communication tactics
  - News release, email, telephone, and speaking note templates
  - Banner advertisements
  - Media distribution contacts (i.e., CKNW)
  - Media monitoring companies (i.e., Bowdens, Infomart)
  - Tips on working with media (tips on how to improve interview performances and reference materials to aid spokespeople)
  - Contact information for Bill should a municipality be interested in media training

## **Elements of the Plan**

The main issue identified by RRCG and the West Nile Virus Working Group was that the communications plan should address municipal operations, allow for municipalities to be better informed of the arrival of the virus and various stages of WNV positive cases, as well as create a more uniform communications approach among the region. It was also highlighted that a significant number of activities were under the jurisdiction of the Health Authorities, Ministry of Health and the BCCDC, therefore, these activities should be based around providing operational support and used in conjunction with existing efforts and plans.

As time is of the essence, the tactics are simple to use and easy to implement.

### ***Objective: Easy and straightforward access to plans and materials to ensure consistent WNV communications***

With the number of municipalities that are involved in this project, coupled with the unique structure, focus and manpower issues of each, one of the primary challenges has been consistent communication regarding WNV across Metro Vancouver. To address this, we have created a timeline with tactics, which we have included in this plan.

A password protected website is attached to the Metro Vancouver website. The password is distributed to the key WNV contact in each municipality. The website hosts all WNV communications documents and templates, including the plan, Q & A, key messages, ad templates, etc. Postings to the site are done by Metro Vancouver.

This site allows for a “one-stop-shop” approach whereby all municipalities can get the templates and materials they need and the latest information and messages. By having everything on a secure website, gaps, such as staff on holiday time and municipalities who do not have many resources to dedicate to WNV, are filled.

### ***Objective: Notifying municipalities and mayors of the immediate status of WNV in the province***

Contact trees have been developed in an Excel format and are distributed to all municipalities, the Health Authority and the BC CDC. When any one of the issues outlined in the CDC matrix occurs, the BC CDC will contact the Health Authorities.

**The Health Authority’s WNV Coordinator will then contact the affected municipality and the Metro Vancouver key contact by telephone.** Metro Vancouver will contact the affected and neighbouring municipalities by phone, followed by an email to all municipalities.

**The first contact will be via phone, followed by email.** The Health Authority WNV coordinator will phone up to three of the municipal contacts until he/she talks to someone directly. This notification via phone will also be done simultaneously with an email to all primary contacts within the municipalities, as per the contact tree.

Within the municipalities, the primary contact will be responsible for funneling the information to mayor, council, internal staff and the public, if necessary. Please see the guidance chart to get a general sense of who this information may need to be funneled to. Please Note: due to budget restrictions, it is not possible for us to do a detailed guidance chart for each municipality.

Contact trees would be distributed via email to the primary WNV contact in each municipality. As these would be the same individuals that would have access to the secured website, the list would be posted there as well. In order to take further measures to protect privacy, the list will open with a paragraph outlining the correct use of the list and will explicitly state that it is not for distribution.

***Objective: Notifying internal staff***

The staff who will likely be most directly affected by news regarding WNV in the province or community are front-line staff. These range from administration and reception staff who are the first point of contact for the public via the phone or front desk of the municipality, to individuals who run day camps and parks.

In order to minimize public and staff concern, correct information needs to reach these staff in a timely and effective manner. It is also important that each communication they receive contains a proactive element (i.e., “to protect yourself from the risk of WNV, wear insect repellent...”) and provides a clear sense of where to funnel further inquiries (i.e., “for more information about WNV symptoms call the BC Nurseline at...”) This will allow the front-line staff to be an effective voice for the municipality and to direct concerned residents to the right source for their information needs.

Each potential stage will be communicated in a succinct and non-alarming way to staff via email. Managers will be advised to incorporate this update into their staff meetings. Within each communication, the prevention messages will be present, as well as short but specific information on what the municipality is doing to deal with WNV.

***Objective: Supporting internal staff***

Within each municipality, there will be at least one WNV designate who will have access to Metro Vancouver secured website. This website hosts all templates and communications plans relating to WNV. This will allow for ease of access, ensure that messaging is consistent and prevent gaps should the primary contact be on vacation or unavailable during this time. It will also be valuable if the situation does become an “issue” as it will save time in updating all municipalities. Metro Vancouver will be responsible for updating the site and all information will go to David Major to be posted on the site.

At this point, it does not seem necessary to distribute access to the site to all internal staff. Having one contact to direct all staff inquiries to will minimize confusion and misinformation.

***Objective: Notifying the public***

Most municipalities have existing communications tools that they use to notify the public, such as a community page in the newspaper, mail-outs and notice boards. These would be used at the municipality’s discretion during a WNV positive scenario.

Drop-in ads in a PDF format would be posted on the secure website. The ads would feature messaging about what the municipality was doing to manage mosquitoes, basic prevention messages (i.e., the 4 Ds), and a phone line/website for additional inquiries. Municipalities could use these based on their budget and interest.

Metro Vancouver will consider purchasing banner ads for community papers that direct the public to key information lines and websites.

Using the media release templates on the secured website, these would be updated to include specific municipal information and distributed to the media when required.

While notifying the public is important, it should be done in a way as to minimize panic rather than increase it. In each municipality, a release should be considered when the first human cases are identified, but care must be taken not to overlap with the communication efforts of the BCCDC, who will issue press releases and hold press conferences. Messaging should be altered for the community that the first case occurs in and also for the first neighbouring community. These two areas do require extra effort as, if ignored, could inspire panic. Once the first cases have occurred, future human cases do not need to be publicized by any other municipalities other than the ones where the cases are occurring.



Each municipality has a website that can be used as an excellent tool to rapidly inform the public. All websites should have generic information on WNV, prevention methods, who to contact for more information (i.e., HealthLink BC and BC CDC website) and what that municipality is doing to protect the community from WNV. As each scenario unfolds, municipalities should post a brief update on the situation, messaging regarding their activities, and where to go for more information. The additional secured site with the mapping tool will also be useful at this time.

The tear-pads will also be a simple way to inform the public and they should be on hand for all front-line staff to use. Generic posters that detail a few prevention facts should be distributed to parks and community centres. A template should be posted on the website.

Mayor and council members will be a significant point of access for various members of the public. They will need to be briefed of each scenario and the current activities of their municipality. Speaker notes with key points will be on the website to use as a template for addressing questions.

Front-line staff who answer phones will need a key message sheet to deal with each situation. The tear-pads will be an easy way for them to remember where to direct calls but the key WNV contact in each municipality will need to provide the front-line staff with a key message sheet from the secure website to answer basic questions and will need to provide additional information so they can deal with municipality-specific inquiries.

Finally, once WNV arrives in the area, it is likely that constituents will call the municipality for information. While much of the inquiries will not be directly the responsibility of the municipalities, the municipalities can play a significant role in directing people to the correct information source. As in California and other parts of Canada who have dealt with WNV, we recommend an automated information line that would run out of Metro Vancouver and could be expanded if call volume accelerated.

The message on this phone line would cycle through the numbers and websites to contact if you had health related questions, wanted to report a dead bird, or wanted to learn more about what the municipality was doing to protect the community against WNV. The message would end with prevention information and one or two key facts as to what Metro Vancouver and municipalities are doing to protect their residents against WNV. This phone line would need to be promoted on all municipal websites, posters, advertisements and releases. If the BC Nurseline is instead made the designated information line, then it too will have to be promoted on all materials and releases.

\* Update 2010 – HealthLink BC and Fraser Health have automated telephone lines that should be promoted. Municipalities can refer questions on strategy and symptoms to these sources

### **Timeline for all Supporting Materials**

<b>Timeline</b>	<b>Task</b>	<b>Responsibility</b>
Early- End of May	Complete all templates, materials, contact trees and key message documents.	QUAY
Early May	Create password secure website. Distribute password to RRCG.	Metro Vancouver /QUAY
Early May	RRCG to ensure their key municipal contacts also get the password and background on what the site is for.	RRCG
Early May	Internal Q & A distributed to all staff within the region. Upload to website and use as a test of this system.	Metro Vancouver through RRCG/QUAY
Mid-May	All staff to receive tear-pads that will have basic WNV information with a focus on prevention and a phone number/web address for all inquires.	Metro Vancouver through RRCG
Early May	Decision to go with Nurseline or to establish own line.	Metro Vancouver
Mid-late May	If no one number is designated as the main information line, need to get an automated line set up and the speech reel recorded.	Metro Vancouver
Mid-May	Email to all staff informing them that WNV may arrive this year, who they can refer to in their municipality for more information, and the BC CDC website and one information line to funnel staff and public inquiries.	RRCG
Mid-End of May	Using ads in community papers and municipal websites, promote the info line or BC Nurseline, and other relevant information sites.	Metro Vancouver and RRCG
End of May	Post all materials to the secure side.	Metro Vancouver /QUAY
End of May	After hours and on hold phone script distributed and implemented.	RRCG

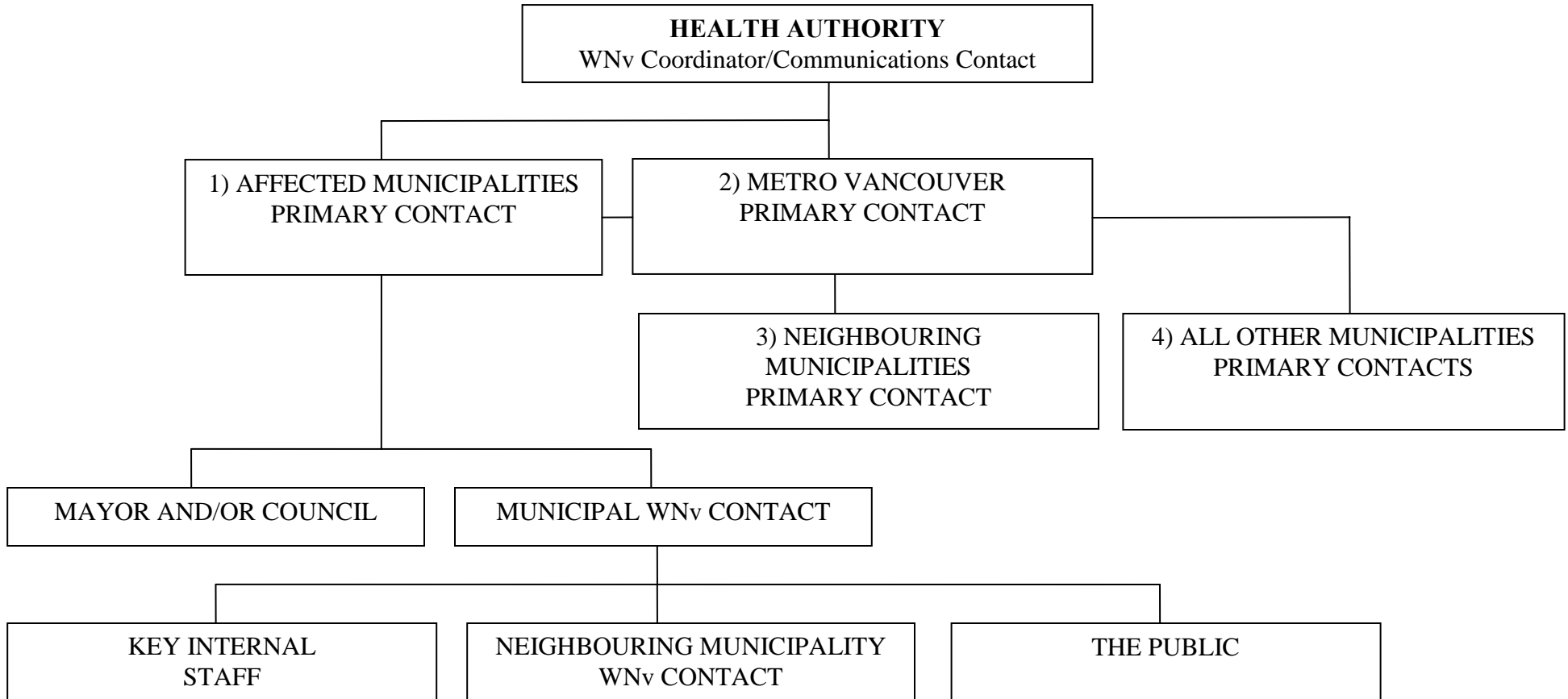
### **Conclusion**

As of May 30<sup>th</sup>, 2005, all communications support materials were posted to the secure website for all participants to access. Municipalities can adjust templates and materials to fit the unique needs and circumstances of their area, however, the templates, scenarios and plans will help ensure municipal communications across the Metro Vancouver are uniform and consistent.

Issues-based communications tend to evolve as a situation unfolds. While it is not possible to be prepared for everything, having a solid plan, clear key messages and an easy and accessible source for your communication needs can be the difference between communicating well and simply communicating.

We hope this communications plan and materials will assist municipalities in responding rapidly to West Nile virus occurrences.

### WNV COMMUNICATIONS FLOW CHART



### Scenario #1: No cases of WNV in the province and/or region – For use by all municipalities

(Templates, scenarios and plans have been developed to help ensure WNV communication across the GVRD are uniform and consistent. Issues-based communications tend to evolve as a situation unfolds. Please adjust this template to fit the unique needs and circumstances of your municipality.)

Timeline	Tactics	Target Audience	Responsibility
Start in May, update info on an as-needed basis	Continue to post prevention and municipal mosquito management information on municipal websites.	Staff and general public	WNV contact and/or communications staff
Once a month until situation alters.	Provide mayor and council with an update on WNV activities via email.	Mayor and council	WNV municipal contact
Once a month until situation alters.	Either the municipal WNV contact or the main municipal contact will email a notice of the situation to relevant internal staff, using the template on the website. This template should include an update on what the municipality is doing around WNV, and a reminder of where to direct public inquiries.	All internal staff	WNV municipal contact
TBD based on relationship with paper and budget, but should be no less than once a month	Place prevention ads in community newspapers that highlight relevant website(s) and the information line.	General public and staff	WNV municipal contact and/or communications staff
Beginning of every month	Place WNV prevention poster in all parks, community centres, etc.	General public	WNV municipal contact
Beginning of every month or as needed	Email to staff reminding them to use the tear-pads, brief update on what the municipality is doing to prevent WNV and personal prevention messages.	Staff	WNV municipal contact and municipal staff
October	If the virus does not arrive this season, email a thank you to staff for their prevention/mosquito management efforts.	Staff	WNV municipal contact
October	If the virus does not arrive this season, an ad thanking the public for their prevention efforts should go in the community newspaper. This can be substituted with a letter in the tax mail-out or any other initiative that meets the realities of the municipality.	General public	WNV municipal contact
October	If the virus does not arrive this season, post a thank you on the website regarding the community and staff prevention efforts.	General public and staff	WNV municipal contact

## Scenario #2: First positive bird in the province and/or region – For use by affected and neighbouring municipalities

(Templates, scenarios and plans have been developed to help ensure WNV communication across the GVRD are uniform and consistent. Issues-based communications tend to evolve as a situation unfolds. Please adjust this template to fit the unique needs and circumstances of your municipality.)

Timeline	Tactics	Target Audience	Responsibility
First action	HA WNV coordinator contacts the municipal contact via the phone. This individual calls mayor and council members to let them know latest status of the virus.	Mayor and council	Key municipal contact and/or municipal WNV contact
Second action	If the individual contacted is not the municipal WNV contact, the individual who did receive the HA call should contact the municipal WNV person to update them on the situation.	Municipal WNV contact	Key municipal contact and/or municipal WNV contact
Third action	Working with the messages posted on the website, mayor and/or councilors should be given speaker notes and briefed for potential media interviews.	Mayor and council	Communications staff or CAO
Fourth action	Either the municipal WNV contact or the main municipal contact will email a notice of the situation to relevant internal staff, using the template on the website. This template should include an update on what the municipality is doing around WNV, and a reminder of where to direct public inquiries.	Internal staff	Key municipal contact and/or municipal WNV contact
Fifth action	An update should be posted on the municipality's website stating the discovery of the virus with prevention messages on how to protect yourself and details on what the municipality is doing.	General public	Communications or web/admin and WNV municipal contact
Sixth action	If the case is in your municipality, a media release to the local media should be considered.	General public	Communications and WNV municipal contact
Seventh action	A courtesy call to the neighbouring municipality to update them on your communications and mosquito management activities should be considered. Please use the mapping site to generate specific information.	Neighbouring municipality's WNV contact	Key municipal contact and/or municipal WNV contact
Eighth action	Municipalities may consider placing posters in parks, community centres, etc. Municipalities may consider placing ads in community newspapers with the info line number and relevant websites.	General public General public	WNV municipal contact and internal staff Communications staff

### Scenario #3: First positive mosquito pool in the province and/or region – For use by only affected and neighbouring municipalities

(Templates, scenarios and plans have been developed to help ensure WNV communication across the GVRD are uniform and consistent. Issues-based communications tend to evolve as a situation unfolds. Please adjust this template to fit the unique needs and circumstances of your municipality.)

Timeline	Tactics	Target Audience	Responsibility
First action	HA WNV coordinator contacts the municipal contact by phone. This individual calls mayor and council members to let them know the latest status of the virus.	Mayor and council	Key municipal contact and/or municipal WNV contact
Second action	If the individual contacted is not the municipal WNV contact, the individual who did receive the HA call should contact the municipal WNV person to update them on the situation.	Municipal WNV contact	Key municipal contact and/or municipal WNV contact
Third action	Working with the messages posted on the website, mayor and/or councilors should be given speaker notes and briefed for potential media interviews.	Mayor and council	Communications staff or CAO
Fourth action	Either the municipal WNV contact or the main municipal contact will email a notice of the situation to relevant internal staff, using the template on the website. This template should include an update on what the municipality is doing around WNV, and a reminder of where to direct public inquiries.	Internal staff	Key municipal contact and/or municipal WNV contact
Fifth action	An update should be posted on the municipality's website stating the discovery of the virus with prevention messages on how to protect yourself and details on what the municipality is doing.	General public	Communications or web/admin and WNV municipal contact
Sixth action	If the case is in your municipality, a media release to the local media should be considered.	General public	Communications staff
Seventh action	A courtesy call to the neighbouring municipality to update them on your communications and mosquito management activities should be considered.	Neighbouring municipality's WNV contact	Key municipal contact and/or municipal WNV contact
Eighth action	Posters should be placed in parks, community centres, etc	General public	WNV municipal contact and internal staff
	Ads should be placed in community newspapers with the info line number and relevant websites	General public	Communications staff

**Scenario #4: First positive human case in Alberta, Idaho or Washington – For use by all municipalities on an as needed basis**

**(Templates, scenarios and plans have been developed to help ensure WNV communication across the GVRD are uniform and consistent. Issues-based communications tend to evolve as a situation unfolds. Please adjust this template to fit the unique needs and circumstances of your municipality.)**

***Note: this should only be implemented if there is sufficient public concern to warrant comment***

<b>Timeline</b>	<b>Tactics</b>	<b>Target Audience</b>	<b>Responsibility</b>
First action	Municipality will likely hear about this through the media. The WNV contact will need to ensure that the mayor and council are updated via phone and email.	Mayor and council	Key municipal contact and/or municipal WNV contact
Second action	Brief mayor and council with key messages about municipal efforts using key messages on secured website.	Mayor and council	Key municipal contact and/or municipal WNV contact
Third action	Brief internal staff via email; reiterate what the municipality is doing and what individuals can do to reduce their risk.	Internal staff	Key municipal contact and/or municipal WNV contact
Fourth action	If public concern is high, issue news release using the template or purchase an advertisement	General public	Communications staff



**Scenario #5: First positive human WNV illness in BC and/or region due to travel outside of the province or region  
- For use by affected and neighbouring municipalities**

**(Templates, scenarios and plans have been developed to help ensure WNV communication across the GVRD are uniform and consistent. Issues-based communications tend to evolve as a situation unfolds. Please adjust this template to fit the unique needs and circumstances of your municipality.)**

<b>Timeline</b>	<b>Tactics</b>	<b>Target Audience</b>	<b>Responsibility</b>
First action	HA WNV coordinator contacts the municipal contact by phone. This individual calls the mayor and council members to let them know the first human case has occurred.	Mayor and council	Key municipal contact and/or municipal WNV contact
Second action	If the individual contacted is not the municipal WNV contact, the individual who did receive the HA call should contact the municipal WNV person to update them on the situation.	Municipal WNV contact	Key municipal contact and/or municipal WNV contact
Third action	Working with the messages posted on the website, mayor and/or councilors should be given speaker notes and briefed for potential media interviews.	Mayor and council	Communications staff or CAO
Fourth action	Either the municipal WNV contact or the main municipal contact will email a notice of the situation to relevant internal staff, using the template on the website. This template should include an update on what the municipality is doing around WNV, and a reminder of where to direct public inquiries.	Internal staff	Key municipal contact and/or municipal WNV contact
Fifth action	An update should be posted on the municipality's website stating the discovery of the virus with prevention messages on how to protect yourself and details on what the municipality is doing with links to other organizations for more information	General public	Communications or web/admin and WNV municipal contact
Sixth action	A media release to the local media should be considered, alerting people to the fact that WNV is in BC, stating what the municipality is doing to protect them and ending with prevention messages.	General public	Communications staff

Seventh action	A courtesy call to the neighbouring municipality to update them on your communications and mosquito management activities should be considered.	Neighbouring municipality's WNV contact	Key municipal contact and/or municipal WNV contact
Eighth action	Posters should be placed in parks, community centres, etc.	General public	WNV municipal contact and internal staff
Ninth action	Install automated phone message for after hours or on-hold calls/inquiries	General Public	WNV municipal contact and internal staff

**Scenario #6: First positive human WNV illness from a BC source, including within the municipality – For use by all municipalities**

**(Templates, scenarios and plans have been developed to help ensure WNV communication across the GVRD are uniform and consistent. Issues-based communications tend to evolve as a situation unfolds. Please adjust this template to fit the unique needs and circumstances of your municipality.)**

<b>Timeline</b>	<b>Tactics</b>	<b>Target Audience</b>	<b>Responsibility</b>
First action	HA WNV coordinator contacts the municipal contact by phone. This individual calls the mayor and council members to let them know the first human case that was not travel-related has occurred.	Mayor and council	Key municipal contact and/or municipal WNV contact
Second action	If the individual contacted is not the municipal WNV contact, the individual who did receive the HA call should contact the municipal WNV person to update them on the situation.	Municipal WNV contact	Key municipal contact and/or municipal WNV contact
Third action	Working with the messages posted on the website, mayor and/or councilors should be given speaker notes and briefed for potential media interviews. Internal preparedness should be ramped up.	Mayor and council	Communications staff or CAO
Fourth action	Either the municipal WNV contact or the main municipal contact will email a notice of the situation to relevant internal staff, using the template on the website. This template should include an update on what the municipality is doing around WNV, and a reminder of where to direct public inquiries.	Internal staff	Key municipal contact and/or municipal WNV contact
Fifth action	An update should be posted on the municipality's website stating the discovery of the virus with prevention messages on how to protect yourself and details on what the municipality is doing.	General public	Communications or web/admin and WNV municipal contact
Sixth action	The WNV coordinator should contact the HA and the CDC to ascertain what media relations activities they are undertaking to avoid duplicating initiatives. A media release to the local media should be considered, alerting people to the fact that WNV is in BC, stating what the municipality is doing to protect them and ending with prevention messages.	General public	Communications staff

Seventh action	A courtesy call to the neighbouring municipality to update them on your communications and mosquito management activities should be considered, particularly if you are the municipality where the case has occurred.	Neighbouring municipality's WNV contact	Key municipal contact and/or municipal WNV contact
Eighth action	Posters should be placed in parks, community centres, etc.	General public	WNV municipal contact and internal staff
Ninth action	Install automated phone message for after hours or on-hold calls/inquiries	General public	WNV municipal contact and internal staff

**Scenario #7: Additional human cases - For use by affected and neighbouring municipalities. Other municipalities to use on an as needed basis**

**(Templates, scenarios and plans have been developed to help ensure WNV communication across the GVRD are uniform and consistent. Issues-based communications tend to evolve as a situation unfolds. Please adjust this template to fit the unique needs and circumstances of your municipality.)**

<b>Timeline</b>	<b>Tactics</b>	<b>Target Audience</b>	<b>Responsibility</b>
First action	HA WNV coordinator should brief municipal WNV contact about each new case that appears in the region. A phone call would go to the municipality directly affected, an email to the rest of the municipalities. This individual would call mayor and council to let them know that a new case had occurred in their municipality.	Mayor and council	Key municipal contact and/or municipal WNV contact
Second action	Working with the messages posted on the website, mayor and/or councilors should be given speaker notes and briefed for potential media interviews.	Mayor and council	Key municipal contact and/or municipal WNV contact
Third action	Either the municipal WNV contact or the main municipal contact will email a notice of the situation to relevant internal staff, using the template on the website. This template should include an update on what the municipality is doing around WNV, and a reminder of where to direct public inquiries.	Internal staff	Key municipal contact and/or municipal WNV contact
Fourth action	A media release to the local media should be considered, alerting people to the fact that WNV is in BC, stating what the municipality is doing to protect them and ending with prevention messages.	General public	Communications staff
Fifth action	An update should be posted on the municipality's website stating the discovery of the virus with prevention messages on how to protect yourself and details on what the municipality is doing.	General public	Communications or web/admin and WNV municipal contact
Sixth action	Install automated phone message for after hour or on-hold calls/inquiries	General public	Communications or web/admin and WNV municipal contact

### Scenario #8: Death due to WNV - For use by all municipalities

**(Templates, scenarios and plans have been developed to help ensure WNV communication across the GVRD are uniform and consistent. Issues-based communications tend to evolve as a situation unfolds. Please adjust this template to fit the unique needs and circumstances of your municipality.)**

Timeline	Tactics	Target Audience	Responsibility
First action	HA WNV coordinator should brief municipal WNV contact about any death in the region that occurs due to WNV. A phone call would go to the municipality directly effected, followed by calls to the rest of the municipalities. This would be followed by an email. The municipal WNV contact would call the mayor and council to let them know about this occurrence.	Mayor and council	Key municipal contact and/or municipal WNV contact
Second action	Working with the messages posted on the website, mayor and/or councilors should be given speaker notes and briefed for potential media interviews. Internal preparedness should be ramped up.	Mayor and council	Communications staff or CAO
Third action	Inform relevant front-line staff and provide information as to where to direct any calls. Install automated phone message for on-hold or after hours calls/inquiries	Internal staff	Key municipal contact and/or municipal WNV contact
Fourth act	The WNV coordinator should contact the HA and the CDC to ascertain what media relations activities they are undertaking to avoid duplicating initiatives. A media release to the local media should be considered, acknowledging the event, reiterating what the municipality is doing to protect people, offering prevention messages and links for more information.	General public	Communications staff
Fifth action	This release should be posted on the municipal website	General public	Communications/web master and WNV municipal contact
Sixth action	Prevention tools, such as ads, radio read scripts, posters and the municipal website should be encouraged and used as necessary.	General public	Municipal WNV contact and/or communications

**Scenario #9: No cases of WNV in the regional/city by November 1<sup>st</sup> – For use by all municipalities**

**(Templates, scenarios and plans have been developed to help ensure WNV communication across the GVRD are uniform and consistent. Issues-based communications tend to evolve as a situation unfolds. Please adjust this template to fit the unique needs and circumstances of your municipality.)**

<b>Timeline</b>	<b>Tactics</b>	<b>Target Audience</b>	<b>Responsibility</b>
First week of November	Issue an email to the mayor, council and all staff thanking them for their efforts regarding WNV.	Mayor, council, and internal staff.	Communications staff and municipal WNV contact
First week of November	Thank you letter to be put in the local paper thanking the public for their efforts.	General public	Communications staff and municipal WNV contact
First week of November	Update website with a thank you and brief recap of municipal activities.	General public	Webmaster and municipal WNV contact

### Scenario #10: BC CDC/HA Announce Adulticiding – For use by all municipalities being sprayed

**(Templates, scenarios and plans have been developed to help ensure WNV communication across the GVRD is uniform and consistent. Issues-based communications tend to evolve as a situation unfolds. Please adjust this template to fit the unique needs and circumstances of your municipality.)**

Timeline	Tactics	Target Audience	Responsibility
First action	HA WNV coordinator contacts the municipal contact by phone. This individual calls the mayor and council members to let them know the adulticiding will occur (where and when).	Mayor and council	Key municipal contact and/or municipal WNV contact
Second action	If the individual contacted is not the municipal WNV contact, the individual who did receive the HA call should contact the municipal WNV person to update them on the situation.	Municipal WNV contact	Key municipal contact and/or municipal WNV contact
Third action	Working with the messages posted on the website, mayor and/or councilors should be given speaker notes and briefed for potential media interviews.	Mayor and council	Communications staff or CAO
Fourth action	Either the municipal WNV contact or the main municipal contact will email a notice of the situation to relevant internal staff, using the template on the website. This template should include an update on what the municipality is doing around WNV, and a reminder of where to direct public inquiries. Directions on post spraying clean up should also be considered.	Internal staff	Key municipal contact and/or municipal WNV contact
Fifth action	An update should be posted on the municipality's website with links and referrals to the local HA and the BC CDC for spraying details.	General public	Communications or web/admin and WNV municipal contact
Sixth action	Municipalities may want to express their own interests regarding adulticiding during media interviews	General public	Communications staff
Seventh action	Install automated phone message for after hours or on-hold calls/inquiries directing callers to the HA or the BC CDC regarding spraying details	General public	WNV municipal contact and internal staff