



## EXECUTIVE SUMMARY

This report presents the results of the 2006 West Nile virus (WNV) vector mosquito survey and sampling program for the City of Qualicum Beach. The Provincial government funded municipalities to prepare for the control of WNV vector mosquitoes. This program is consistent with the BC Centre for Disease Control (BCCDC) WNV Alert Level Response 2a that calls for public education and information, mosquito habitat surveys and mapping, local species identification and assessment of risk posed to the public by the mosquito disease vectors. The Emergency Response Plan presented in Appendix 3 of this report will assist with development of site-specific local responses to minimize the threat posed should WNV actually arrive in BC and present a Health Alert Level 3 with human cases. For current background information on mosquitoes and WNV in British Columbia, visit the Vancouver Island Health Authority (VIHA) website at [http://www.viha.ca/health\\_info/health\\_topic\\_index/west\\_nile\\_virus.htm](http://www.viha.ca/health_info/health_topic_index/west_nile_virus.htm)

The methodologies employed in this study involved ground surveying to locate and monitor larval mosquito development habitats and adult mosquito populations. The public information and education program involved the creation of brochures and these will likely be distributed in the following season. Residents offered information and registered concerns about potential mosquito production sites.

Catch basins and a total of 20 natural or manmade open water mosquito development sites were located and monitored within Qualicum Beach this season. Dry weather conditions during the summer of 2006 may have reduced the number of other undisturbed wetlands that produced WNV vector mosquitoes in years of average to above precipitation. Some catch basins and a drainage ditch produced the most widespread source of WNV mosquitoes in Qualicum Beach. About 70% of all monitored catch basins remained wet throughout the summer of 2006.

The local risk posed by monitored WNV vector mosquitoes to people in Qualicum Beach has been prioritized according to larval vector competency and resident proximity to larval development habitat. There were numerous occurrences of high competency vector *Culex* (++) larvae in about 74% of monitored catch basin cluster sites. In addition, there was one open water sites near many residences that pose a potentially high WNV risk.

It would be prudent for Qualicum Beach to continue to prepare for the arrival of WNV and to remain current with the BCCDC Health Alert recommendations. Mosquito habitat surveys should continue next season and a public education and information program should accompany the mosquito monitoring work. The Qualicum Beach public information brochure about WNV mosquitoes should be distributed to residents, along with the VIHA brochure. Qualicum Beach should also actively solicit input from the public concerning potential mosquito development sites.

The Emergency Response Plan included in Appendix 3 of this report advises the implementation of larval control treatments with permitted pesticides, such as *Bacillus thuringiensis* var. *israelensis* (*Bti*), to both open-water and catch basin development habitats. There should be a review of Municipal bylaws and policies to facilitate the administration and operation of a future mosquito control program.

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## **1.0 INTRODUCTION**

Contained in this report are the results of the 2006 West Nile Virus (WNV) vector mosquito survey and sampling program completed for the City of Qualicum Beach. The report identifies where WNV mosquito vectors are developing. With this information the City is in a greater state of readiness to implement measures to help limit the potential impact of WNV on local residents and visitors.

The Provincial government, through the BC Union of Municipalities (UBCM), made funding available to municipalities and regional districts to enable preparation for the control of WNV vector mosquitoes in the event of disease arrival in the province. The surveys and assessments conducted in this program are consistent with the BC Centre for Disease Control (BCCDC) WNV Alert Level Response 2a (Fyfe, 2004) that calls for public information and education, mosquito habitat surveys and mapping, local species identification and assessment of risk posed to the public by the mosquito disease vectors.

This report will assist with development of site-specific local responses to minimize the threat posed should WNV arrive in BC and present a Health Alert Level 3.

## **2.0 STUDY DESIGN AND METHODS**

Methodologies employed in this study involved ground surveying of mosquito development habitats and sampling of larval populations occurring in Qualicum Beach. Ground-based surveys and mapping of potential mosquito development habitat were completed by D.G. Regan and Associates Ltd. (*DGRA Ltd*) using maps provided by Qualicum Beach. These maps were used as a baseline to produce mosquito development site field maps with information that may include streets, topography, storm water catch basin locations and surface water or other environmental features.

### **2.1 Monitoring Larval Mosquito Development**

During the months of July and August, 2006, any wetland identified by *DGRA Ltd.* personnel or brought to our attention (by municipal staff or the public) was surveyed and sampled for mosquito development. In most cases mosquito larvae at the site confirmed the habitat, and in other cases where habitat was dry, suitability of the habitats were inferred through vegetation. In this latter case, confirmation of mosquito development habitat must await wet conditions in future years of monitoring. Upon initial survey, mosquito habitat was mapped for size, shape, and variety.

Once identified, mosquito development habitats were monitored every 2 weeks in order to assess the relative abundance and species of larval mosquitoes collected.

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## 2.2 Mosquito Species Occurrence and Distribution

Larval mosquito populations were assessed to determine the local species complex and to focus on potential WNV vector species. The assessment was made for all monitored sites. The relative abundance and species of larval mosquitoes occurring in the habitats were determined.

Larval mosquitoes in open water sites were sampled using a standard 500 ml white plastic dipper. Larval monitoring and sample collections from catch basins were completed using a standard, fine mesh, aquarium fish net (10x12 cm) attached to a pole. It is able to slide between the grates and eliminated the need for removal of the drain cover.

Larval specimens retrieved from all mosquito development sites were preserved in 50% ethyl alcohol and forwarded to our laboratory for enumeration and taxonomic identification. Mosquitoes collected were identified according to the taxonomic keys of Darsie and Ward (1981) and Wood, *et. al.* (1979).

## 2.3 Public Education, Information and Response

A start has been made to contact local public about mosquitoes and WNV in Qualicum Beach. Due to lateness of the start of the project this year the progress on public information has been limited.

Brochures customized to the needs of Qualicum Beach were developed for public distribution. *DGRA* staff during their survey work discussed the program with interested public. During the discussion we solicited information about wetland areas that should be investigated.

Staff were available to respond to residents who reported a mosquito development site tip or an annoyance concern.

## 2.4 Data Reporting and Formats

*DGRA Ltd* collected a variety of information about the located mosquito development sites on behalf of Qualicum Beach for the BCCDC. The attributes collected for the BCCDC included:

- Latitude
- Longitude
- Address/location
- Source (manmade or natural)
- Status (permanent, semi-permanent, or temporary)

- Habitat type (for example drainage ditch, lake shore or reed marsh)
- Habitat size (m<sup>2</sup>)
- Site ownership status (public or private)

The site data were submitted in July to the BCCDC in an Excel® spreadsheet format. The results of larval development monitoring for all the sites were also submitted to the BCCDC, in an Excel® spreadsheet format, each week through the summer.

## **2.5 West Nile Virus Risk Assessment**

Each mosquito species has a unique capacity, known as its competence to vector WNV and various habitats can support one or more species (Belton, 2004). For the purpose of this report, these competencies are organized in a graduated scale ranging from (0), no confirmed vector capacity, to (+++) species that have the greatest ability for transmission of WNV. As species with a consistently high competency to transmit WNV, *Culex* mosquito larvae are given a high rating (++ or +++). As a result, sites close to many residences or facilities that contain *Culex* larvae, with at least one larva occurring per dip on average during any sampling in the season, are classified as a high priority. Moderate priority sites may also produce the same number of WNV mosquitoes, but are not located close to residences or facilities. Low priority sites have not been shown to produce mosquitoes with high competency.

## **2.6 Planning for Risk Reduction**

Planning for risk reduction normally involves an Emergency Response Plan and is included in Appendix 3. The Emergency Response Plan is a strategy undertaken to rapidly reduce the number of WNV mosquitoes in the face of an introduction of WNV to the province or an expected appearance locally. This plan is designed to be applied immediately and is concerned with larviciding.

## **3.0 RESULTS AND DISCUSSIONS**

In this section the results of the 2006 WNV mosquito monitoring program for the City of Qualicum Beach are presented. Tables of the WNV site locations are included for both open water and storm-water catch basins. The local risk posed by WNV mosquitoes that could vector the disease is estimated and monitored habitat is prioritized accordingly. Finally, the public information and education initiative to prepare the public to limit their exposure to WNV mosquitoes is described.

### 3.1 Mosquito Development Habitat

The array of mosquito development sites surveyed within Qualicum Beach included catch basins, drainage ditches, flood water, pasture ponds, rain pools, reed marshes, reservoirs, and woodland pond (Tables 2 and 4).

A total of 10 clusters of catch basins, totaling 40 catch basins, were repeatedly sampled (Table 2) for presence or absence of water and mosquito larvae. A total of 70% of all surveyed catch basins remained wet through the season. These sampled catch basins are representative of the approximately 700 (based on information from City staff) catch basins in the City.

A total of 20 open-water sites were surveyed and monitored through the season (Table 4), 12 of the sites are on public land and cover 13 105 m<sup>2</sup>, and 8 sites were on private land and cover 42 670 m<sup>2</sup>. A few open water locations, such as the one found adjacent to Qualicum Rd. along a trail linking Fern Rd. East would not likely produce mosquitoes.

### Mosquito Species Occurrence and Distribution

A summary of all mosquito monitoring results from within Qualicum Beach is set out in Table 1 below with an assessment of the WNV vectoring competence for the mosquitoes found.

**Table 1: Summary of all Monitoring and Competency to Vector West Nile Virus**

Type of Monitoring	Total Number Sampled	Number of samples Analyzed	Number of Specimens Identified	% composition of samples analyzed with competency rating:			
				% " "	% " + "	% " ++ "	% " +++ "
Catch Basins	120 <sup>1</sup>	20	2	-	26	74	-
Larval Development Site	180 <sup>2</sup>	17	4	-	41	58	1

1: 40 catch basins each sampled X 3 times in the season

2: 20 sites sampled about 3 replicates each X 3 times in the season

Catch basins typically contained a mixture of *Culiseta* (+) and *Culex* (++) larvae (Table 3). The presence of higher competency *Culex sp.* larva is of concern. The other larval

development sites present different circumstances where *Cx pipiens* (++) and *Cx tarsalis* (+++) species form the bulk of species sampled, with some *Anopheles* (+) and *Culiseta* (+) species (Table 5).

### **3.3 Public Education, Information and Response**

A start has been made to contact the public and provide information on mosquitoes and WNV. During the surveys of mosquito habitat people were talked with to pursue finding local wetlands and during these meetings protection from mosquito bites and the potential vectoring of WNV was discussed. Brochures customized to the needs of Qualicum Beach have been created and delivered to the City. Probably, local public may not see the brochures until the start of the 2007 season. Other brochures with information about WNV are available to Qualicum Beach through the Vancouver Island Health Authority (VIHA).

### **3.4 Data Reporting and Formats**

DGRA Ltd. submitted Qualicum Beach mosquito development site location data and updated larval monitoring results to the BCCDC each week following assessment through the summer. This was done using an Excel® spreadsheet format consistent with their data attribute requirements. The following list of tables provides a summary of the data collected:

Table 2 lists the locations of the 10 clusters of catch basins monitored for WNV mosquito larval development through the summer.

Table 3 lists the monitoring results of the catch basin clusters monitored for each street intersection revisited through the season.

Table 4 lists the locations of open water ding sites known to occur in Qualicum Beach. A total of 19 were identified.

Table 5 lists the monitoring results of the open water sites revisited through the season.

The BCCDC uses the information provided to them on behalf of Qualicum Beach to construct a map and to maintain an inventory data-base of the development sites for the province. Once the mapping and data summary is available from the BCCDC it should allow a comprehensive assessment of risk priority for Vancouver Island.

### **3.5 West Nile Virus Risk Assessment**

High priority sites consist of some of 70% the 700 catch basins in Qualicum Beach (Table 2). The following public open water site is also a high priority site:

Site #	Location	Habitat type	Size (m <sup>2</sup> )
QB10	Eaglecrest Dr. & Country Club Dr..	Drainage ditch	50

This one location had a consistently sampled high population of *Culex pipiens*, and is located close to many residences or facilities (Table 4). The water quality at this site suggests the presence of considerable organic material.

The other catch basins and open water sites are considered medium or low priority as they did not demonstrate a large population of higher competence WNV mosquitoes.

### 3.6 Risk Reduction

Currently, the WNV disease does not occur in British Columbia though it occurs in provinces and states surrounding BC. BC is considered by the BCCDC to be in Risk Alert 2a status (Fyfe, 2004) that recommends preemptive larvicide treatments but does not oblige municipal authorities to take immediate action to limit WNV mosquito development. An obligation to treat would exist with Risk Alert 3 status where the disease is in the province.

## 4.0 RECOMMENDATIONS

With the data compiled over the course of this program, Qualicum Beach should continue planning for the eventual arrival of West Nile Virus in BC. The following recommendations will enhance efforts to date and provide direction for the future.

### 4.1 Mosquito Development Habitat

The BCCDC and VIHA are the lead agencies in the WNV containment program. Following their lead it is prudent that the City continue to enhance its preparedness for any increase in the BCCDC WNV Health Alert Levels to 2b or 3 (Fyfe, 2004).

The larval habitats have been delineated, and there should be additional ongoing effort to locate all potential vector habitats. Some sites may not have been present during the summer of 2006 because of dry weather conditions that were not conducive to detecting mosquito infestations.

### 4.2 Mosquito Species Occurrence and Distribution

In order to more accurately determine the species composition, distribution and possible options for control of local mosquito populations it would be valuable to continue with habitat surveys. Using detailed topographic, ortho-photos and related contour and vegetative cover maps, it is important to continue with the identification of areas suitable as WNV mosquito species habitat.

#### **4.3 Public Education, Information and Response**

With the availability of customized informational brochures and their availability to local public in the coming months, and in the 2007 season, the core elements of responding to the BCCDC WNV Health Alert Levels will be fulfilled. Qualicum Beach should distribute brochures produced by the BCCDC and VIHA and those developed for the District by *DGRA Ltd.*

#### **4.4 Data Reporting and Formats**

Qualicum Beach City staff should obtain the summarized information that is being prepared by the BCCDC on behalf of Qualicum Beach and other provincial jurisdictions. This provincial data-base and mapping should assist Qualicum Beach in managing its WNV mosquito sites in the future. It is expected that a similar data collection by the BCCDC will occur next year to refine mosquito development site descriptions and populations.

#### **4.5 West Nile Virus Risk Assessment**

Qualicum Beach staff should review the assigned priority for treatment risk ratings for mosquito development sites. It is possible that some priority rating may be changed based on a wider discussion of the risks posed by individual sites.

It is recommended to work to increase public awareness and knowledge of WNV, local mosquito habitat and encourage discussion about habitat concerns and values. This should assist if and when wetlands must be treated for larval control.

#### **4.6 Risk Reduction**

The Emergency Response Plan submitted by *DGRA Ltd.* provides an outline for action to control WNV mosquito larvae if a greater disease risk to public were determine to exist. (Appendix 3).

**REFERENCES**

Belton, P. *The Mosquitoes of British Columbia*. Victoria: Handbook (British Columbia Provincial Museum) No 41, 1983, 189 pages.

Darsie, R. and Ward, R., 1981. *Identification and Geographical Distribution of the Mosquitoes of North America, North Mexico*, American Mosquito Control Association, 313pp.

Fyfe, M., 2004. Arbovirus Surveillance and Response Guidelines for British Columbia. Draft 4.1, BC Centre for Disease Control, Vancouver, BC, 46p. (contact BCCDC for copies of the document)

Ellis, R., 21 May 2004. *Municipal Mosquito Control Guidelines*, Health Canada Bureau of Infectious Diseases, 57 pages.

Mosquito News, Journal of American Mosquito Control Association, Lake Charles, LA, September 1979, 4 pp

Wood, D.M., Dang, P.T., Ellis, R.A., 1979. *The Insects and Arachnids of Canada; Part 6, Diptera; Culicidae*. Canadian Government Publishing Centre, Ottawa, 390pp.

**TABLES**

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**APPENDICES**

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**Appendix 1:**  
Information Brochure

**Appendix 2:**

Telephone Response Protocol

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## WEST NILE VIRUS

### Addressing Calls From the Public (Sources of Information)

AS MUCH AS POSSIBLE, THE PUBLIC SHOULD BE DIRECTED TO YOUR WEB SITE WHERE WEST NILE VIRUS INFORMATION IS AVAILABLE (this is the preferred means of communicating information to the public).

For those WITHOUT WEB ACCESS:

- (1) Advise of WNV information bulletin (mailed out with the tax notices).
- (2) Use grid (below) for additional contact information.
- (3) See Standard Responses to some of the more difficult questions you may encounter in the event that you end up having to respond to a resident.

If you are unable to redirect the person to the municipal website OR to one of the information sources listed in the table below, OR if the public insists on talking to someone, put them through to “name of contact at 555-5555”. All MEDIA INQUIRIES should be directed to “name of contact at 555-5555”. In the event that I am not available, take their name and phone number and “name of contact” will call them back.

SOURCES OF INFORMATION FOR THE PUBLIC			
Info Requested	Item #	Refer the Public to ...	Information Source
For residents calling to report <b>standing water</b> .	G1.1	“name of contact“	“555-5555”
For <b>general information</b> on WNV.	G2.1	VIHA Info Line	1-866-968-8442
For info on <b>when WNV may arrive</b> on Vancouver Island.	G3.1	VIHA Info Line	1-866-968-8442
For info on <b>what local authorities are doing</b> to monitor for WNV.	G4.1	VIHA Info Line	1-866-968-8442
For questions on how to <b>minimize the risk</b> of acquiring WNV.	G5.1	VIHA Info Line	1-866-968-8442
For questions on <b>symptoms</b> of WNV.	G6.1	VIHA Info Line	1-866-968-8442
	G6.2	BC Nurse Line	1-866-215-4700
For questions on <b>insect repellants</b> .	G7.1	VIHA Info Line	1-866-968-8442
For questions on <b>handling dead birds</b> .	G8.1	VIHA Info Line	1-866-968-8442
For questions on <b>pesticides</b> .	G9.1	VIHA Info Line	1-866-968-8442
	G9.2	Local Garden Centre (Vendor can advise of availability)	N/A
For questions on the risk to <b>animals</b> .	G10.1	VIHA Info Line	1-866-968-8442
	G10.2	Family Veterinarian	N/A

BC CDC  
MWLAP

BC Centre for Disease Control  
Ministry of Water, Land, and Air Protection

N/A  
VIHA  
WNV

Not Applicable  
Vancouver Island Health Authority  
West Nile Virus

## **WEST NILE VIRUS**

### **Addressing Calls From the Public (Questions & Answers)**

- Q1 How to respond if the public asks WHAT THE MUNICIPALITY IS DOING to deal with WNV.**
- .1 Remind the public that WNV has not yet been detected in BC. The public will be advised by health authorities if the virus is detected in the area.
  - .2 The municipality is a member of VIHA's WNV Workgroup and is coordinating WNV-related activities with health authorities and other municipalities.
  - .3 The municipality is in the process of preparing a District-wide mosquito control plan.
  - .4 The municipality is working with the VIHA to provide information to the public on WNV. You can advise the public of the following:
    - Information on WNV has been made available as brochures and through Mosquito Monthly Display Boards.
    - Additional information is also provided on our web site (<http://www.ourtown.ca>).
- Q2 How to respond to requests for the municipality to SPRAY FOR MOSQUITO CONTROL.**
- .1 The municipality does not have plans to engage in mosquito control activities at this stage. WNV has not yet been detected in BC.
  - .2 Health officials will advise the municipality when it is necessary to implement the mosquito control plan.
  - .3 **Avoid mentioning the mosquito control programs underway in other areas.** If the public brings it up you can advise the public that these programs are for nuisance control and not for the control of WNV at this time.
  - .4 If the public insists that spraying is necessary then suggest that they write a letter to mayor and council expressing their concerns.
- Q3 How to respond if the public is calling about a DEAD BIRD SIGHTING.**
- .1 Thank them for informing us. Advise them of the following:
    - The VIHA and BC CDC do **NOT** want the public sending in dead birds or calling in dead bird sightings. The public can report dead bird sightings using an on-line form available at the BC CDC web site at [www.bccdc.org](http://www.bccdc.org).
    - The VIHA and BC CDC have determined sampling needs and have developed a program that is consistent with those needs.
    - Remind the public that just because a dead bird has been sited does not mean that the bird is infected with WNV.
  - .2 For information on how to dispose of a dead bird, direct them to the BCCDC website ([www.bccdc.org](http://www.bccdc.org)).
  - .3 If they **do not have web access**, direct them to the **VIHA Info Line (1-866-968-8442)**.
- Q4 If someone calls asking any MEDICAL QUESTIONS.**
- .1 **DO NOT** answer medical questions. Direct them to the **BC Nurse line (1-866-215-4700)**.
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**Appendix 3:**

Emergency Response Plan

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### **Emergency Larvicide Response to West Nile Virus Occurrence in BC:**

The Alert Level response for control of West Nile Virus (WNV) vector mosquitoes would be expected to increase from the current Alert Level 2a to a 3 if there were confirmed WNV bird infection in BC, and if there were a confirmed human case of the disease caused in the province. To date, with the Alert Level 2a, Qualicum Beach has been encouraged to undertake pro-active larviciding, and with an increased Alert Level there would be an ever-greater encouragement. VIHA has encouraged municipalities to apply larvicide to priority WNV mosquito development sites to gain experience with the technique. If an Alert Level 3 was confirmed for the past season in BC it is highly likely that Qualicum Beach would be obliged to undertake larviciding to control the development of higher competency mosquito larval in the following season. This control initiative would substantially limit the risk of human disease occurrence given the higher incidence of the virus in the province.

If there were knowledge of WNV occurring in the province in the past season, larviciding of priority locations in Qualicum Beach could be done starting in June and completed in time to limit local WNV mosquito populations from vectoring the disease. If the WNV is confirmed in the province early in a season there could still be time to carry out larviciding of local priority WNV mosquito sites and limit WNV transmission in the same season.

The following steps would be taken by Qualicum Beach to implement a rapid larviciding program:

- Confirm with health and provincial pesticide regulatory authorities that larvicide treatments can be undertaken immediately
  - Check with Vancouver Island Health Authority officials
- Identify the locations to be treated with larvicide; VectoBac 200G is recommended for application to open water sites and VectoLex CG is recommended for catch basins.
  - Treat High Priority open-water locations as soon as possible:

<b>ID</b>	<b>Ownership</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Location</b>	<b>Habitat Type</b>	<b>Size - m<sup>2</sup></b>
QB10	Public	49.21.377	124.24.281	Eaglecrest Dr. and Country Club Dr.	Drainage ditch	50

- Treat all 700 municipal catch basins as soon as possible
- Consider the treatment of medium and low priority WNV mosquito development sites. Refer to Table 4 for site locations and information.

The catch basins and one open-water priority larvicide treatment in Qualicum Beach can be undertaken by ground base individuals certificated to apply mosquito control pesticides as stipulated by the Pesticide Permit held by VIHA. Treatment of all catch basins, rather than just those that are wet at time of treatment, is most practical and cost effective.

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