Comox Valley REGIONAL DISTRICT

Staff Report

DATE: January 8, 2021

FILE: 4200-01

TO: Chair and Directors
Electoral Areas Services Committee

FROM: Russell Dyson
Chief Administrative Officer

Supported by Russell Dyson
Chief Administrative Officer

R. Dyson

RE: Saratoga Beach Mosquito Management Service Establishment

Purpose
To provide details regarding a Mosquito Management Service for mosquito control in the Saratoga Beach area to be included within the 2021 Singular Alternative Approval Process (AAP).

Recommendation from the Chief Administrative Officer:
THAT the board support the advancement of the Saratoga Mosquito Management Service Establishment Project as generally outlined in the staff report dated January 8, 2021;

AND FURTHER THAT staff be directed to bring forward the necessary service establishment bylaw and related legislative requirements for consideration of readings and inclusion with the singular Alternative Approval Process to seek participating area approval.

Executive Summary
In response to several seasons of resident reports of recurrent adult mosquito nuisance, the local community association, Saratoga and Miracle Beach Residents Association (SAMBRA), approached the Comox Valley Regional District (CVRD) to have the subject investigated further. They are supportive of the CVRD taking action to manage this problem.

The findings from the investigation indicated there is the potential for a mosquito control program within the community. The next step is to develop an Integrated Pest Management Plan (PMP) for provincial approval focused on using Bti larvicide.

- Bti occurs naturally in soil and has safely been used as a mosquito control for 30 years.

If the PMP is approved the next step would be to create a service as outlined below.

- The proposed mosquito control program would be part of the singular AAP process occurring this spring. Upon electoral approval the service would officially begin in 2022.
- The projected annual cost proposed for this program has an upper limit of $32,000 to be supported by an annual property tax requisition.
- The control program will be completed by a contractor in alignment with the provincial approved PMP and provincial pesticide use permits.

It should be noted this process is specific to mosquitoes only in the Saratoga Beach area and if the AAP fails the community will have to seek assistance from other agencies such as the province.

The proposed service is specific to mosquitos, applies only to the defined service area and doesn't currently include consideration of any other resources other than the proposed contracted services.

The establishment of the service may create public expectations for a greater role of the CVRD ie: other pests, broader area and more proactive response to similar issues. No additional resources are currently contemplated to manage these possibilities.

Prepared by:	Concurrence:
D. DeMarzo	***J. Warren***
Doug DeMarzo General Manager of Community Services	James Warren Deputy Chief Administrative Officer

Background/Current Situation

The CVRD understands the concerns raised regarding the mosquito problem within the Saratoga/Miracle Beach area of Electoral Area C. Without a service being established, the CVRD has no legal authority to apply mosquito control to the area or throughout the region. A Mosquito Management Service with the authority to tax residents ensures adequate expertise is provided, community support is provided and provides authority to apply mosquito control to affected areas with owner's permission.

In response to several seasons of resident reports of recurrent adult mosquito nuisance, the local community association, SAMBRA, approached the CVRD to have the subject investigated further. The CVRD hired a consultant to study problematic areas of mosquito breeding. Several studies were completed to help guide next steps. The studies looked at potential breeding areas within the Miracle Beach and Saratoga Beach regions all of which would be helpful for those that manage the subject properties. The findings located various breeding sites with standing water present. As well it has been advised that climate related factors may also adjust the mosquito population including precipitation, temperatures and tide heights.

The findings indicated there is the potential for a mosquito control program within the community. The next step will be hiring a consultant to develop an integrated PMP for provincial approval. The consultant would be instructed to:

- Prepare an integrated PMP for submission to the BC Ministry of Environment. This process includes public advertisement, First Nation and interest group engagement, community opportunity for comment and input.

If the PMP is approved the next step would be to create a service and control program to help control mosquito larvae using a Biological larvicide known as Bti. Bti occurs naturally in soil and has safely been used as a mosquito control for 30 years. There has been no reports of residual activity, it does not bio-accumulate and studies outline it has no impact on beneficial organisms found in mosquito development habitats. Negative or toxic effects on mammals, birds or other wildlife have not been observed with Bti use. The PMP and Provincial approval will reflect any concerns and long term impacts regarding water bodies, water courses and wells. One potential long term impact is reducing mosquitoes as a food source for local wildlife.

The proposed Saratoga Mosquito Management Service Establishment Project is part of the singular AAP process occurring this spring. Upon electoral approval the service would officially begin in 2022. Conversations with SAMBRA indicate they may be able to oversee a pilot program this summer if required through a community grant but are not able to oversee the service long-term. If approved, the long term oversight of the program at the CVRD would likely fall to the CVRD Electoral Areas Community Parks Service.

Policy Analysis
On November 4, 2015 the board approved the following recommendation:

> THAT the Comox Valley Regional District commit $6,000 from the Electoral Area C feasibility studies function 2016 budget to conduct an investigation into the scope of the Saratoga Beach mosquito problem and if required, develop options and cost estimates for mosquito population abatement in this area.

As a result a report was completed that promoted website updates and individual homeowners to take action on their properties.

A report titled Update on Mosquito Abatement dated May 9, 2017 was approved by the board and the following recommendation regarding mosquito management within the community was brought forward.

> THAT staff continue to monitor nuisance mosquito complaints originating in Comox Valley Regional District electoral areas and assess the need for future nuisance mosquito investigations on a case-by-case basis.

Additional funding through the feasibility budget was completed and a study was undertaken by DUKA environmental as well as some community consultation. The study is attached as Appendix B as well as being referred to throughout this report.

The AAP process was further supported in November 2020 with the following recommendation:

> THAT the Board approve the concept of the singular alternative approval process, to occur in May/June 2021;
>
> AND FURTHER THAT the following projects be considered for the singular Alternative Approval Process (AAP) with additional presentation at subsequent Committee, Commission or Board meetings as needed:
>
> - Rural Cumberland Fire Maximum Requisition Increase
> - Electoral Areas Community Halls Service Establishment
> - Saratoga Mosquito Management Service Establishment
>
> AND FINALLY THAT the final set of projects for the singular AAP be determined in February 2021, including any required bylaw readings and / or project logistics.

This report also included the map of the service area and shown again here in Appendix A.

Options
The options the Board has include:

- Adopt the development a new Saratoga Beach Mosquito Management Service.
- Postpone until 2022, with service establishment in 2023.
- Decline the development of a Saratoga Beach Mosquito Management Service.

Staff are recommending option 1.

Financial Factors

A projected five-year operating budget for this proposed service from 2022 through 2026 has been prepared and is included in Table 1 below.

Table 1- Projected 2022 – 2026 Financial Plan – Saratoga Beach Mosquito Management Service

CVRD 5 Year Operating Budget by Service

Functions: TBD

Objects: Multiple

Account Code	Account Description	2022 Draft Budget	2023 Financial Plan	2024 Financial Plan	2025 Financial Plan	2026 Financial Plan
01 - General Revenue Fund						
TBD - Pest Management						
Revenues						
TBD - Pest Management						
01-1-TBD-019	Reqn Elect/Spec Prov Govt	31,000	31,250	31,500	31,750	32,000
296 - Weed Control		31,000	31,250	31,500	31,750	32,000
Revenues		31,000	31,250	31,500	31,750	32,000
Expenses						
TBD - Pest Management						
01-2-TBD-200	Support Services	300	300	300	300	300
01-2-TBD-316	Tipping Fees	500	500	500	500	500
01-2-TBD-335	Advertising	1,000	500	500	500	500
01-2-TBD-350	Maps & Printing Supplies	500	500	500	500	500
01-2-TBD-369	Insurance Liability	300	312	324	337	351
01-2-TBD-381	Legal Fees	750	500	500	500	500
01-2-TBD-400	Contracted Svcs Buildings/Land Mtce	25,000	25,500	26,010	26,530	27,061
01-2-TBD-489	Reserve Contribution	650	1,138	866	582	288
01-2-TBD-495	Transfer To Other Functions	2,000	2,000	2,000	2,000	2,000
TBD - Pest Management		31,000	31,250	31,500	31,750	32,000
Expenses		(31,000)	(31,250)	(31,500)	(31,750)	(32,000)
TBD - Pest Management		0	0	(0)	0	0
01 - General Revenue Fund		0	0	(0)	0	0

The projected annual costs for this program would total $32,000 by 2026 to be funded through an annual property tax requisition. It is expected to cost approximately $50.00 per household based on a parcel tax calculation for the approximately 600 homes in this service area. A report in February, 2021 will be forthcoming that outlines the max requisitions and more detailed projected cost per household as part of the singular AAP process.

Legal Factors

Applying a pesticide or larvicide such as Bti, requires a provincial pesticide use permit supported by a provincially approved PMP. Together these plans and permits provide direction and for the use of integrated mosquito management activities. Some of the integrated mosquito management activities for mosquito control are already underway and include individual landowner actions outlined on our website.

The development and approval of a PMP by the Province ensures all laws are considered and public consultation requirements are satisfied. For example an approved PMP allows the CVRD to hire a certified contractor or undertake the work themselves with proper certification to apply Bti to publically owned lands. It should be noted the CVRD will also further undertake consultation with

other partners such as BC Parks and the Ministry of Transportation and Infrastructure (MOTI) to determine their interest in participating in an integrated pest management for mosquitoes.

The CVRD has the broad authority to operate any service it considers necessary or desirable. To operate most services, the regional district board must pass a service establishing bylaw. The adoption of an establishing bylaws includes a number of legislative requirements, including approval by the Provincial Inspector of Municipalities and participating area approval which in this case may be obtained through an assent vote or alternative approval process. An AAP has been proposed given that the cost and timing efficiencies as well as the level of community engagement undertaken and proposed.

An AAP, formally known as a counter-petition, is a form of approval that allows local governments to directly engage citizens about a proposed bylaw or other matter requiring elector approval. The process entails the board notifying the electors of its intent to proceed with final passage and adoption of a bylaw (or other matter) unless at least 10 per cent of the electors petition against the initiative, in which case the bylaw or other matter may not be adopted without first obtaining the assent of the electors by voting.

The general process and legislative sequence for the Saratoga Beach Mosquito Management Service Establishment Project is outlined in Table 2 below. It is noted that the AAP timeline is proposed to be conducted through the singular AAP process to be conducted in the spring of 2021.

Table 2

Service	Bylaw	Process
Saratoga Beach Mosquito Management Service	New service establishing bylaw to be drafted	1. Board to give three readings to the service establishment bylaw 2. Provincial review and approval (6-8 weeks) 3. Approval of the electors by way of an AAP (6-8 weeks) 4. Adoption of the bylaw by the board

Regional Growth Strategy Implications
There are no none implications with the Regional Growth Strategy at this time.

Intergovernmental Factors
The proposed Mosquito Control Service will involve working closely with MOTI, and BC Parks. BC Parks and MOTI have been informed of the process and will need to identify if they are supportive of treatment of their lands each year based on information the consultant provides them through the proposed consultation service for the annual collection of field information.

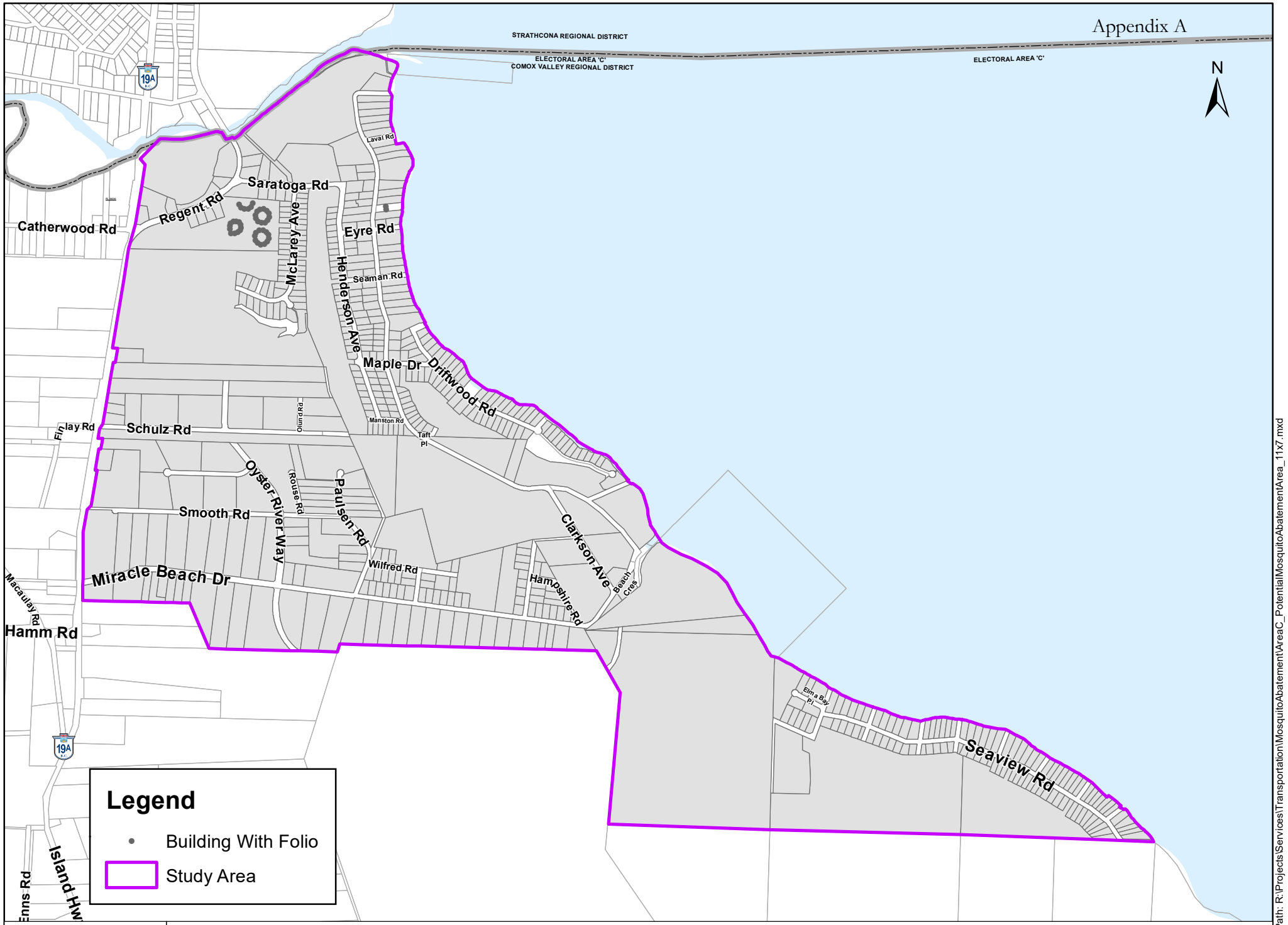
Interdepartmental Involvement
The Community Services branch will be working closely with parks, water and sewer programs to ensure proposed mosquito program follows all environmental standards. It is anticipated the parks department will oversee the operations of this service if approved.

Citizen/Public Relations
The communication plan has been developed that outlines how residents will be informed about the project through letters, website updates, newsletter updates, and an online community information session.

The process for the PMP, managed by a consultant, will begin early January 2021. The process includes legal advertising and an opportunity for public input before submitting to the Province for approval. A forthcoming report will outline the details of the AAP process from legislative services.

It should be noted no other resources are available to the CVRD to control mosquitoes and if the AAP process fails the community will have to advocate other means for controlling nuisance mosquitoes with the province.

Attachments: Appendix A – "Map of Saratoga area"
Appendix B – "Report from DUKA environmental"


Appendix A
STRATHCONA REGIONAL DISTRICT
ELECTORAL AREA 'C'
COMOX VALLEY REGIONAL DISTRICT
ELECTORAL AREA 'C'
N
Laval Rd
Saratoga Rd
Regent Rd
Catherwood Rd
McLarey Ave
Eyre Rd
Henderson Ave
Seaman Rd
Maple Dr
Driftwood Rd
Manston Rd
Taft Pl
Olund Rd
Finlay Rd
Schulz Rd
Oyster River Way
Rouse Rd
Paulsen Rd
Smooth Rd
Wilfred Rd
Clarkson Ave
Hampshire Rd
Beach Cres
Miracle Beach Dr
Macaulay Rd
Hamm Rd
Elma Bay Pl
Seaview Rd
Island Hwy
Enns Rd
19A
Legend
Building With Folio
Study Area
Comox Valley
REGIONAL DISTRICT
Potential Mosquito Abatement Area
Date Saved: 2020-10-13 10:43:20 AM
Document Path: R:\Projects\Services\Transportation\MosquitoAbatement\AreaC_PotentialMosquitoAbatementArea_11x7.mxd

Comox Valley Regional District

Saratoga and Miracle Beach (CVRD Electoral Area C)
Mosquito Development Site Survey
Summary Report

Mosquito larvae and one pupae breathing at the surface

A Report Prepared For
Comox Valley Regional District
Community Services Branch
Courtney, BC

Prepared by
Duka Environmental Services Ltd.

File No. 2220
14 September 2020

EXECUTIVE SUMMARY

In response to several seasons of resident reports of recurrent adult mosquito nuisance, the local community association, the Saratoga and Miracle Beach Residents Association (SAMBRA), approached the Comox Valley Regional District (CVRD) to have the subject investigated further. The CVRD, Community Services Branch requested that *Duka Environmental Services Ltd* (*Duka Ltd.*), an environmental services firm with extensive expertise in integrated pest management (IPM) programs, and specifically with mosquito and biting flies, to locate, map and identify potential larval mosquito development habitats occurring within, and near the community known as Saratoga and Miracle Beach, located within CVRD Electoral Area "C".

This report presents the results of the *Duka Ltd.* April to August 2020 preliminary survey for nuisance mosquito development habitats occurring within this community.

To meet the study objectives *Duka Ltd.* field biologists and technicians identified, surveyed and coarsely mapped potential mosquito development habitats. The community is a mix of residential/rural properties, both small and large (+2 acres in size) and commercial properties including RV/Campgrounds, a marina, golf course, the Saratoga Speedway, Bed and Breakfasts, restaurant, stores, pub etc. The area contains a tidally influenced slough connected through culverts with the ocean at Black Creek and snowmelt and precipitation-influenced swamps, bogs, marshes and other slow-draining areas. Smaller, permanent and temporary ponds, ditches and depressions are located along roadsides, near houses and throughout the forested and undeveloped areas.

Methodologies employed in this study involved ground-based surveying to locate and sample potential larval mosquito development habitats. Aerial/satellite photos, and maps (Google-earth™) were used to guide ground-based surveillance and sampling, for both larval and adult mosquitos. As part of several surveys of potential habitat, the site areas were coarsely mapped for larval occurrence and adult mosquito dispersal was established. Larval and adult mosquito samples collected from accessible areas were enumerated and identified.

Larval and adult mosquito samples were collected by program biologists and community volunteers during the period 20 April to 29 July 2020 as part of 4 field visits. Larval samples and adult mosquito populations were collected during each field visit, 20-22 April, 25-27 May, 08-09 June and 28-29 July. Additional adult mosquito samples were provided throughout this period, and into late August, by local residents who had deployed mosquito magnets or hand caught them while walking in their neighbourhood.

Larval and adult specimens collected were predominantly (88%) *Aedes dorsalis,* the salt marsh mosquito. Additional specimens included *Aedes provocans*, *Aedes sticticus* and *Culex tarsalis.* On the coast *Aedes dorsalis* mosquitos more or less develop all season long, hatching with each successive high tide and resultant water accumulation. Adults can disperse from their source for several kilometres and are vicious biters, both day and night.

The predominant larval development site, is a saltwater (tidal) influenced slough, the “Driftwood Marsh”, extending from Black Creek northwards in an old channel/back dune area approximately 10-30m wide, and with a length of some 900 - 1000m, for a total area of ~20,000m^2 (2.0 ha). A similar, smaller (< 2,000m^2) salt water influenced habitat exists adjacent to the Pacific Playgrounds Resort and Marina at the end of Clarkson Avenue. Sampling of several areas including golf course ponds and freshwater water accumulations from seepage and precipitation water run-off, totalling less than 1,000m^2, found only a few larval specimens when sampled during the 2020 study site visits.

Additional surveys of potential mosquito development habitats and sample collection during operational seasons will determine more accurately the species composition, and distribution of local mosquito populations. Larval controls, focused in the tidal-influenced slough, should begin in late April or early May and continue through August, and possibly early September.

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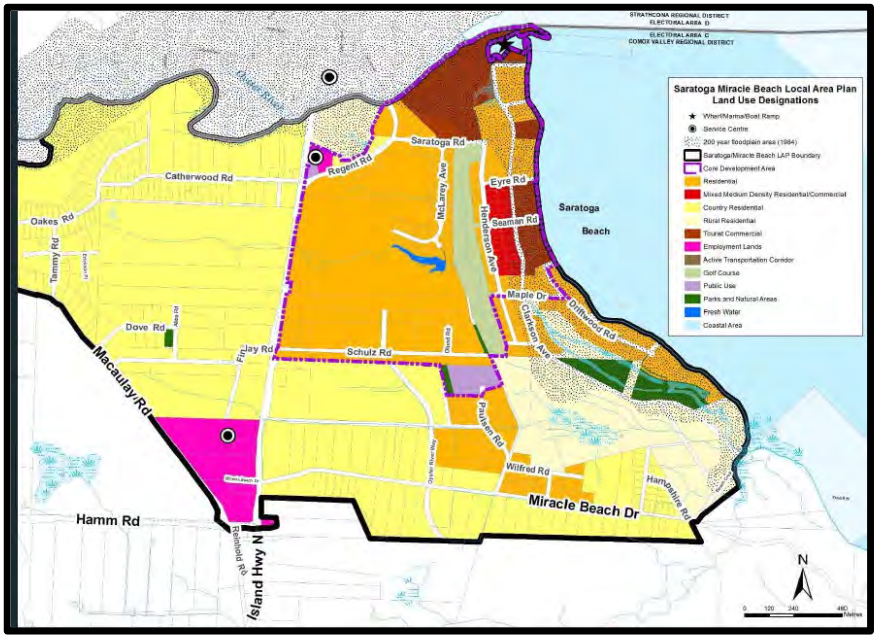
1.0 INTRODUCTION

Duka Environmental Services Ltd. (Duka Ltd.), an environmental services firm with extensive experience in mosquito and biting fly surveillance and population management were selected by the Comox Valley Regional District (CVRD) and the Saratoga and Miracle Beach Residents Association (SAMBRA) to complete a larval mosquito development site survey.

The Saratoga Miracle Beach settlement is a rural residential community located midway between the City of Courtney and City of Campbell River, approximately 30 minutes from each community by car. Located with the CVRD Electoral Area "C", this seaside community borders the Strait of Georgia to the east and the Oyster River along the northern boundary. Highway 19A (old Island Highway) passes through the middle.



The Saratoga Miracle Beach area has significant recreational and environmental value, providing residents and visitors with many outdoor summer activities including hiking, walking, camping, fishing, boating, cycling, golfing, gardening etc. The goal of this survey was to identify and quantify, where possible, the locations and extent of nuisance mosquito larval development habitats affecting residents and visitors to this community.

Key objectives of the mosquito development site and population survey were to develop a nuisance mosquito control strategy and achieve the following objectives:

- Identify and quantify larval mosquito development habitats,
- Determine preliminary, 'baseline' mosquito species data, larval and adult, for the area, and,
- Provide treatment area estimates for an operational, larval mosquito surveillance and control program.

1.1 The Need for Mosquito Control

Provided there is community support and available funding, there are three components required to develop, and initiate an operational mosquito surveillance and control program. The first is a larval

development and adult mosquito population survey and feasibillity study, which this report contributes to. The second is the development of an Integrated Pest Management (IPM) Plan, and the final component is the annual funding, staffing and delivery of mosquito population control operations.

Several recent seasons of above average, and often extreme adult mosquito nuisance had been reported by area residents, business owners/mangers and facility operators. In addition to negative impacts on the lifestyle and general health of residents, a large population of mosquitos can have a negative economic impact on local businesses. Worker safety, comfort and efficiency can be compromised by adult mosquito annoyance and distraction. Reduced use and enjoyment of hotel and restaurant outdoor patios, sports fields, golf courses, campgrounds and cycling or hiking trails by residents and area visitors directly affects business operations and revenues.

The goal of an annual mosquito control program for the Saratoga and Miracle Beach area is to provide residents and visitors with relief of adult mosquito nuisance through proactive larval mosquito control using an Integrated Pest Management (IPM) approach. This approach consists of five components:

1) Public Education which explains mosquito biology, program operations, goals , limitations and how the public can contribute to successful operations;
2) Surveillance and identification of mosquito species and their distribution;
3) Timely implementation of mosquito controls and preventative measures;
4) Review of results achieved and adaptive management during a season; and,
5) Program evaluation and assessment to ensure sustainable, effective controls are achieved.

The purpose of an annual mosquito control program is provide residents, workers and visitors to the Saratoga and Miracle Beach area (CVRD Electoral Area C) with relief from adult mosquito annoyance. Any control program to be developed for the area is not intended to, nor would it be possible, to eradicate local mosquito populations. Despite the best of efforts though, some adult mosquito annoyance may still occur during the months of June through August and residents are encouraged to avoid areas of mosquito harbourage (typically treed, forested or landscaped areas) during certain times of day, and to use repellants and approved adult mosquito control devices and products as per label directions.

Although not a common occurrence in most areas of British Columbia, mosquitos are also capable of transmitting (vectoring) diseases. An effective, pro-active mosquito control program which focuses on the identification, prevention and timely control of larval mosquito populations, also contributes to the protection of public health.

2.0 MOSQUITO BIOLOGY

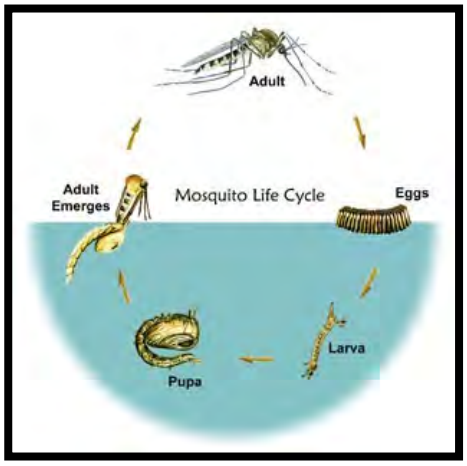
Mosquitos are found world-wide in standing water of all possible descriptions. Mosquitos belong to the order Diptera, along with other pests such as the common house fly and the black fly. There are over sixty species common to Canada and over thirty are found in British Columbia.

Mosquitos are best known as vectors of 'tropical' diseases such as malaria and yellow fever. Although these exotic afflictions are extremely rare in British Columbia, mosquitos can still pose a serious health concern. Extreme allergic reactions or secondary infections from mosquito bites can occasionally require hospitalization. Diseases such as canine heartworm, Western Equine Encephalitis (WEE) and West Nile virus (WNv) are transmitted from some mosquito species to family pets, humans, and livestock. More exotic diseases include Zika and chikungunya.

The BC Centre for Disease Control (Vancouver) and local health authorities are responsible to coordinate the surveillance, identification and reporting of these diseases and their mosquito vectors. As part of this planning, the BCCDC has developed the *Arbovirus Surveillance and Response Guidelines for British Columbia,* and the BCCDC has a provincial database containing all mosquito, bird and human health surveillance data relating to WNv and vector mosquito species. Due to the low and stable incidence of WNv in BC it was decided by the BCCDC in the fall of 2014 that it was no longer necessary to conduct active surveillance of mosquitos or other indicators. The provincial decision to eliminate this surveillance was reached at the BC Communicable Disease Policy Advisory Committee meeting in February 2015. Human clinical testing continues though as part of routine blood donor collection programs. Specific details on the response guidelines, surveillance, permitting, and other related information is available online through www.BCCDC.org

Mosquitos undergo four distinct development stages; egg, larvae, pupae and adult.

Larvae and pupae are aquatic and adults are terrestrial. The eggs of some species of mosquitos, such as *Aedes*, are laid on the soil and can survive for upwards of 20 years. They hatch after a period of winter freezing and upon being wetted, typically by river flooding, tidal influences or snowmelt. Other mosquitos such as *Culex* and *Culiseta* lay their eggs on the water surface where they soon hatch.



Mosquito larvae undergo four larval instars (or moults), each time emerging larger, but virtually unchanged from the previous instar. This is the feeding stage of the aquatic mosquito. The mosquito pupa, as with a cocoon for moths, or a chrysalis for butterflies, is where the once aquatic, larval mosquito undergoes metamorphosis to emerge as the winged, terrestrial adult mosquito. After pupation, adult mosquitos rest and feed for few days before dispersing. Adult mosquitos feed on plant juices and it is only the female which requires a blood meal to complete the development of her eggs.

Female mosquitos have been found 30 kilometres from their source and at heights of over 10,000 ft. These are the extreme, and most adult female mosquitos will typically fly less than 1-2km in search of a blood meal although distances of 5km are not uncommon, especially when aided with wind.

Mosquito development occurs in a wide range of larval habitats ranging from snowmelt and precipitation-influenced flood and seepage water pools and channels along rivers and lakes to permanent freshwater, ponds, marshes (salt and freshwater), ditches and similar water-holding depressions. Bird baths, plugged rain gutters, livestock watering troughs, stored equipment, irrigation and surface water run-off collection in salt marsh and freshwater ponds, ditches, catch basins and any man-made container capable of holding water for a period of 7 to 21 days can provide suitable larval mosquito habitat.

2.1 Mosquitos of British Columbia

The great majority (+90%) of mosquito species inhabiting British Columbia are *Aedes* sp. which do not effectively transmit diseases. These mosquitos are often, however, aggressive biting pests which prefer flooded, temporary or recurring habitats such as over-irrigated fields, river floodplains, snowmelt pools in woodlands, meadows and fields, and tidally-influenced salt marshes.

Aedes mosquitos lay their eggs in moist soil along the edges of recently flooded areas where the eggs can lay dormant for upwards of twenty years. Following a period of wetting, and drying or freezing, eggs become "primed" to hatch. Egg hatching is dependent on flooding, and is typically synchronous, with larval eclosion (hatching) and development, occurring within hours of inundation. Larval populations of 50-100 larvae/dip are routine, and +300 larvae/dip are not uncommon. Each inundation can cause a new hatch.

Aedes mosquitos are typically the most numerous during the first half of the season, from late April through July. The most common *Aedes* mosquitos in southern British Columbia and Vancouver Island include the "salt marsh" mosquito, *Aedes dorsalis*, the "floodwater mosquito", *Aedes vexans,* which prefers river floodplains, and *Aedes sticticus*, which prefers valley bottoms and flooded cottonwood forests. Receding water levels, increasing ambient temperatures, evaporation and decreased tidal heights and precipitation causes these habitat types to dry, drain and disappear over the course of a typical summer. Since flooding, snowmelt, rainfall or recurring tidal fluctuations may immerse eggs several times in one season, each initiating a further hatch, regular surveillance and control of *Aedes* mosquitos is required. In addition to being aggressive pests of man and animals, some species of *Aedes* may vector diseases such as West Nile virus (WNv).

Culex and *Culiseta* mosquitos typically develop later in the season, from June through August, and require a different set of cues to initiate the onset of larval development, including increasing day length and temperatures. They prefer permanent and slow-draining, or frequently refilled sites including natural and man-made ponds, ditches and containers such as stored tires, boats and buckets or livestock watering troughs. Species such as *Culex tarsalis* are able to withstand brackish (salt) waters and a high degree of pollution. They can inhabit areas with high organic content, including septic field seepage, sewage lagoons and livestock hoof prints around barns, feed lots and along creeks. *Culex pipiens*, the "house mosquito", can use a large variety of freshwater habitats including manmade containers and they are the predominant (+99%) mosquito developing in roadside catch basins. *Anopheles* mosquitos are not very common and prefer permanent sites or slow draining and flowing ditches or stream margins.

Culex, Culiseta and *Anopheles* are the most numerous during late summer when drier conditions and warmer conditions typically exist. Although their populations and individual development sites are not usually as large as the synchronous hatching *Aedes* mosquitos, *Culex* and *Culiseta* mosquitos are capable of producing several generations in a season. They can be a source of annoyance since their preferred habitats are common to residential, commercial, recreational and agricultural properties. Several species of *Culex* and *Culiseta* mosquitos also have the capacity to vector disease including West Nile virus (WNv) and Western Equine Encephalitis (WEE), also known as sleeping sickness in horses.

3.0 PROJECT DESIGN AND METHODOLOGY

Methodologies employed in this study involved the surveying and identification of potential mosquito development habitats located within the area of the CVRD Electoral Area 'C', defined as Saratoga and Miracle Beach, (Figures 1 and 2). *Duka Ltd.* field biologists and technicians used ground-based surveys, photographs, larval sampling and ortho-photo (Google earth™) maps, feedback and input provided by local residents to assist with the identification and recording of potential habitats. *Duka Ltd.* personnel also reviewed the *Saratoga Beach and Miracle Beach Nuisance Mosquito Study* (2017) as part of this background research.

Community volunteers assisted *Duka Ltd.* personnel by collecting larvae and adult mosquito samples, providing "tours" of their community and/or properties, and their personal, anecdotal observations on historical, and current mosquito populations and nuisance.

3.1 Mosquito Development Habitat and Sampling Larval Mosquitos

A wide variety of standing or stagnant water habitat types can be an ideal place for larval mosquito development to occur. These are classified as:

- artificial containers such as discarded tires, boats, buckets,
- landfill and excavation sites including borrow pits and tire ruts,
- grassy slough backwater areas, river/creek seepage areas,
- established ponds, swamps, bogs and marshes (fresh and salt water),
- rain and snowmelt-filled pools and depressions, and
- non flowing ditches.

The persistence of these sites over the summer season is variable and dependent on a number of meteorological and hydrological factors including river levels, tidal heights and fluctuations, precipitation, humidity and temperatures. Some of these site types may become dry part way through the mosquito development season, but all can potentially allow mosquito larval development to occur, and for some sites and species, on more than one occasion.

Weather conditions during the period April through August can either amplify, or reduce, the extent of flood and seepage water accumulations in salt marsh habitats, sloughs, river flood plains, freshwater ditches and ponds. Temperatures and precipitation can impact development site size, persistence and larval activity. Humidity and winds can affect adult mosquito survival, dispersal and longevity.

Surveying and monitoring for larval development determines the presence of larvae and the need for control. Larval mosquitos were sampled using a standard 350ml plastic dipper. Populations in excess of 5 larvae/350ml dip sample are indicative of a population size with the potential, upon emergence, to cause widespread, reportable, adult mosquito annoyance. Mosquito populations of as little as 1-2 larvae/dip sample, in an area as small as a neglected backyard pond or pool (10m x 5m), can produce 10,000 adult mosquitos if left unattended.

Larval sampling efforts at Saratoga and Miracle Beach were focused on salt marsh habitats as these were quickly identified as the primary source of larval development and reported nuisance. Freshwater ponds, marshes and ditches were noted within the area, and the great majority were found to be generally small in size, have some amount of flow early in the season (April – May) and to have greatly decreased in size and occurrence as the season progressed. Sampling of several naturally occurring ponds and seepage water sites located in forested and undeveloped areas during the course of the study did not find any significant larval development.

Manmade sites such as landscape, display or irrigation ponds, bird baths, stagnant pools, containers (buckets, boats, etc.) were not surveyed for as part of this study. They are most often small (<100m^2) and usually "hidden" on properties behind landscaping, fences or in back yards. These types of sites are typically found when field personnel respond to resident reports of annoyance. Most often these can be addressed and eliminated as a source of mosquito development by residents or business operators through removal, drainage or regular maintenance.

All specimens retrieved from development sites were preserved in 50% ethyl alcohol and forwarded to our laboratory for enumeration and taxonomic identification. Larval mosquitos collected were identified according to the taxonomic keys of Darsie and Ward (1981), Wood, *et. al*. (1979) and Peter Belton (1983). Larval sampling and species data are presented in Table 1.

3.2 Sampling Adult Mosquito Populations

Female mosquitos are attracted to mammals, including man, by body heat, scent and exhaled moisture and gases. Perfumes, sweat, blood type and diet all contribute to one's attractiveness to adult female mosquitos.

To objectively measure localized adult mosquito populations, two internationally sampling methods are employed. The first, a standard biting or landing count, measures the number of mosquitos which land

on the exposed forearm (from wrist to elbow), to bite in a one minute period. Adult mosquito biting/landing counts of three or more per minute, measured between the wrist and exposed forearm, are intolerable for most people, and is the minimum level of adult mosquito annoyance recognized as warranting treatment with an approved control agent. Beyond three bites per minute, outdoor worker performance and safety are affected, and negative economic impacts on tourism and enjoyment of outdoor recreational activities can be expected. Adult mosquitos were captured, by both *Duka Ltd.* personnel, and area residents, using aspirators or inverted pill bottles and lids, when they landed to bite.

The second method of adult mosquito population assessment employed the use of standard CDC Atlanta light traps. These typically use a small light bulb as a thermal attractant (body heat) and a fan at the top of the trap to push adult mosquitos down into a collection bottle attached below. Light traps were also baited with carbon dioxide (CO_2), as dry ice, to mimic exhaled breathe. Light traps were set up in the late afternoon and retrieved the next morning. Benefits associated with these traps include the collection of undamaged specimens for identification and to provide an objective, reproducible sampling method.

In addition, several residents provided *Duka Ltd.* with adult mosquitos collected using “mosquito magnets". These use CO_2 gas generated by a small propane flame to attract mosquitos and a small fan which pushes them into a collection bin. These devices can be left running for several days to weeks, depending on the propane supply.

Both these devices complement bite count sampling for annoyance by allowing field personnel to more effectively collect and identify the mosquito species present in a particular area.

Adult mosquitos were identified according to the taxonomic keys of Darsie and Ward (1981) and Wood, Dang and Ellis (1979) and Peter Belton (1983). Adult mosquito sampling data and species identifications are detailed in Table 2.

4.0 OBSERVATIONS AND DATA

Mosquito larvae require water in which to develop. Any natural or man-made container or feature that impounds or holds water for a period of from 7-21 days can provide suitable mosquito development habitat. Generally, larval development habitats are non-flowing waters during the period of mosquito larval development.

4.1 Larval Mosquito Development and Habitats

Field surveys and sampling were first completed on 20-22 April 2020, and thereafter, approximately every 3-4 weeks to locate, identify and sample potential larval mosquito development habitat and adult mosquito populations. A total of four surveys were scheduled to coincide with high tides, which were typically forecasted to exceed 4.6m, as measured at Mitlenatch Island. Surveys were typically completed within 2-5 days of the peak tidal height and the extensive larval populations observed confirmed this "threshold" to be sufficient to initiate larval mosquito development.

Larval sampling locations were recorded (tracked) using global positioning equipment (GPS). Larval development habitat was coarsely mapped, Figures 1 and 2. Larval samples collected by *Duka Ltd* personnel, and others provided by local residents, were identified to species, Table 1.

Saratoga foot bridge -looking south (Driftwood marsh)

The predominant larval development site is a saltwater (tidal) influenced slough (Driftwood Marsh) extending from Black Creek northwards in an old channel/back dune area approximately 10-30m wide. With a length of some 900 - 1000m, the total area of this site is ~20,000m^2 (2.0 ha). A similar, smaller (< 2,000m^2) salt water influenced habitat/marsh exists adjacent to the Pacific Playgrounds Resort and Marina at the end of Clarkson Avenue.

Sampling of several other areas including golf course ponds, a number of roadside ditches and other freshwater water accumulations from seepage and precipitation water run-off in forested areas behind the Miracle Beach School were completed as time allowed. Only a few larval specimens were found when sampled during 2020 site visits.

As expected, when sampling salt water influenced mosquito development habitat, *Aedes dorsalis* was the most numerous larval mosquito collected, accounting for 99.4% (975/981 specimens) of all larvae collected during the study (Table 1 and Chart 1, below).

Chart 1: Saratoga and Miracle Beach; Larval Mosquito Temporal Distribution and Occurrence, by Species - 2020

Species	WNv compentence	Species Occurrence # of Samples	Total # of Individuals	% occurrence	April				May					June				July				August		
				Week # →	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Ae. dorsalis	+++	26	975	99.4%	0	0	0	0	0	0	323	306	95	0	68	0	0	0	0	0	0	183	0	0
Ae. mercurator	0	1	1	0.1%	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cx. tarsalis	++++	2	5	0.5%	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	3	0	0
	Larval Total	29	981	100%	0	0	0	1	0	0	323	306	97	0	68	0	0	0	0	0	0	186	0	0

Notes: ·Species Occurrence: Lowest Value … Highest Value

·West Nile Virus (WNv) competency was ranked by the BC Centres for Disease Control (2005) and Belton (2015). Mosquito species were ranked from (0), or no potential to transmit the disease, to (++++), or the ability to readily, and effectively transmit the disease.

4.2 Adult Mosquito Populations

Given the inaccessible nature of potential freshwater habitat in forested areas of the community, adult mosquito sample collection was extensive. The goal was to collect and identify adult mosquitos occurring in areas of past, reported annoyance. This data helped to determine the extent of nuisance arising from the salt marsh and the contribution (%) of any freshwater species to that annoyance.

Adult mosquito populations were sampled by *Duka Ltd.* personnel using light traps at numerous locations, extending out from the salt marsh 1.0 - 2.0 km, the commonly observed dispersal distance for *Aedes dorsalis*. These collections were augmented with mosquito magnet (MM) collections and samples of individual mosquitos collected while they were landing (Hand Capture, HC) to bite, Figures 1 and 2.

Adult mosquito species collection data is presented in Table 2 and the chart below**.** Following the collection of a few adult specimens other than *Aedes dorsalis* in mid-April and early May sampling, *Aedes dorsalis* were the predominant species collected from 19 May to 23 August, accounting for 77.1% (806/1045 specimens) of all adults collected. A further 16.1% of all adults collected during 2020 were from the genus *Aedes.* Their species could not be determined because of sample damage resulting from mold occurring in the large, often +2000 specimens/sample, in resident mosquito magnet collection. *Culex tarsalis* accounted for 3.3% of all adult specimens collected during 2020. *Culex territans* is a mosquito which prefers to bite amphibians and is not a human pest.

Chart 2: Saratoga and Miracle Beach; Adult Mosquito Temporal Distribution and Occurrence, by Species - 2020

Species	WNv compentence	Species Occurrence # of Samples	Total # of Individuals	% occurrence	April				May					June				July				August				
				Week # →	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Ae. cinereus	+?	1	1	0.1%	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ae. dorsalis	+++	37	806	77.1%	0	0	0	0	0	1	0	253	53	7	100	0	16	0	16	0	16	31	0	155	0	158
Ae. provocans	0 ?	1	30	2.9%	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ae. spp	N/A	6	168	16.1%	0	0	0	0	0	0	0	0	0	0	0	0	47	0	48	0	48	25	0	0	0	0
Ae. sticticus	+?	1	1	0.1%	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
An. punctipennis	+?	1	1	0.1%	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cs. spp	N/A	1	1	0.1%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Cx. tarsalis	++++	6	34	3.3%	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	4	24	0	0	0	0
Cx. territans	0 ?	1	3	0.3%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
	Adult Total	55	1045	100%	0	0	0	2	0	1	1	283	53	7	100	0	66	0	67	0	68	84	0	155	0	158

Notes: ·**Species Occurrence:** Lowest Value — Highest Value

·West Nile Virus (WNv) competency was ranked by the BC Centres for Disease Control (2005) and Belton (2015). Mosquito species were ranked from (0), or no potential to transmit the disease, to (++++), or the ability to readily, and effectively transmit the disease.

Aedes dorsalis development was recurrent throughout the season and influenced by the rising and falling tides and related flooding in the Driftwood marsh that accompanied them. Late July and early August 2020 adult sampling collections showed a slight increase in the occurrence of *Culex tarsalis.* This was not unexpected as *Culex* and *Culiseta* mosquito populations tend to increase later in the season. Correlation of this data over several years with larval monitoring and adult mosquito biting count and light trap data will allow for continued, increased forecasting of mosquito populations and the identification of possible additional sources of mosquito development.

5.0 RESULTS AND DISCUSSION

The predominant mosquito habitat type affecting Saratoga and Miracle Beach area residents are tidally-influenced salt marsh habitats. Synchronous, extensive larval development occurs within days of inundation from increased tidal heights, tentatively identified as 4.6m, as measured at Mitlenatch island. This "*larval development threshold*", to be confirmed and "fine-tuned" over several operational seasons will allow for increased certainty of larval development onset and distribution patterns. This predictive threshold will ensure effective, timely larval control and prevention of off-site adult mosquito annoyance.

Additional larval mosquito development in freshwater habitats may be occurring, but based on preliminary 2020 sampling, their contribution to the local mosquito species complex and as sources of annoyance at Saratoga and Miracle Beach is small, to negligible.

Additional surveys of potential mosquito development habitats and sample collection during operational seasons will determine more accurately the species composition, and distribution of local mosquito populations, including freshwater sites. Larval controls, focused in the tidal-influenced slough, should begin in late April or early May and continue through August, and possibly early September.

Man-made sites and containers, including rain gutters, buckets, boats and stored equipment, livestock watering troughs, etc., located on private properties have the potential to contribute to local mosquito populations, particularly in seasons of above average precipitation and temperature. Their ephemeral nature, small size and locations often make them difficult to locate. The control of larval development in these habitats is best accomplished through public education and use of physical control methods by the property owner or resident.

5.1 Mosquito Species Occurrence and Distribution

- ***Larval sampling***

Larval sampling completed between 20 April and 28 July 2020 resulted in the collection, for taxonomic identification, of a total of 981 specimens, (Table 1, Chart 1)**.** Collected exclusively from the previously identified salt marsh habitats, and as the most numerous species collected as an adult, *Aedes dorsalis* is the predominant nuisance mosquito of the Saratoga and Miracle Beach area. Developing in response to each successive high tide they are a season long source of recurring adult mosquito annoyance.

The second most common mosquito identified to species, *Culex tarsalis*, is capable of developing in a wide variety of habitats including brackish (salt) waters, septic field overflow and any type of freshwater site, including containers. It is a likely contributor to reports of nuisance later in the season.

Lesser numbers of other *Aedes*, *Culex* and *Culiseta* larvae could, in some seasons, and under certain conditions, not only available to contribute to the annoyance largely caused by *Aedes dorsalis*, but could possibly extend the "mosquito season" into late summer or early fall.

- ***Adult sampling***

Adult mosquito collections completed between 15 April and 23 August 2020 provided a total of 1045 identifiable specimens. The majority of these (806, 77.1%) were *Aedes dorsalis,* which were collected consistently throughout the season. The next largest group of adult mosquito specimens (16.1%) could only be identified to the genus *Aedes* because of damage/mould from the large mosquito magnet collections completed between late June and late August by local residents. It is likely that a large proportion of these were *Aedes dorsalis,* with lesser numbers of *Ae. sticticus*, *Ae. mercurator Ae. cinereus*, *Ae. provocans*, and possibly others. All of these other *Aedes* species are "wood land" mosquitos developing in shaded and precipitation-activated, temporary habitats.

Of the non-*Aedes* species of adults collected in 2020, *Culex tarsalis,* accounted for 3.3% of all specimens identified, (Table 2, Chart 2 above).

All of the species collected at Saratoga and Miracle Beach (CVRD Electoral Area C) during 2020 sampling are able to develop as multiple hatches during a typical season. They are all capable of causing reportable and often extreme annoyance, particularly *Aedes,* and *Ae. dorsalis, Ae. sticticus* and *Ae. cinereus* are potential West Nile virus (WNv) vectors. *Culex* and *Culiseta* mosquitos are not only a source of annoyance, but they too are also recognized as vectors of several diseases, including WNv. *Culex tarsalis* is identified by the BC Centres for Disease Control (BCCDC) and the Centers for Disease Control (Atlanta, USA) as the most competent vector of WNv in North America. *Anopheles punctipennis* is also listed a s potential WNv vector. Control of locally occurring *Aedes*, *Culex, Culiseta* and *Anopheles* mosquitos not only prevents widespread nuisance for the benefit of residents, workers and visitors, but also contributes the protection of public health.

Additional surveys of potential mosquito development habitats and sample collection during operational seasons will determine more accurately the species composition, and distribution of local mosquito populations. Larval controls, focused in the tidal-influenced slough, should begin in late April or early May and continue through August, and possibly early September.

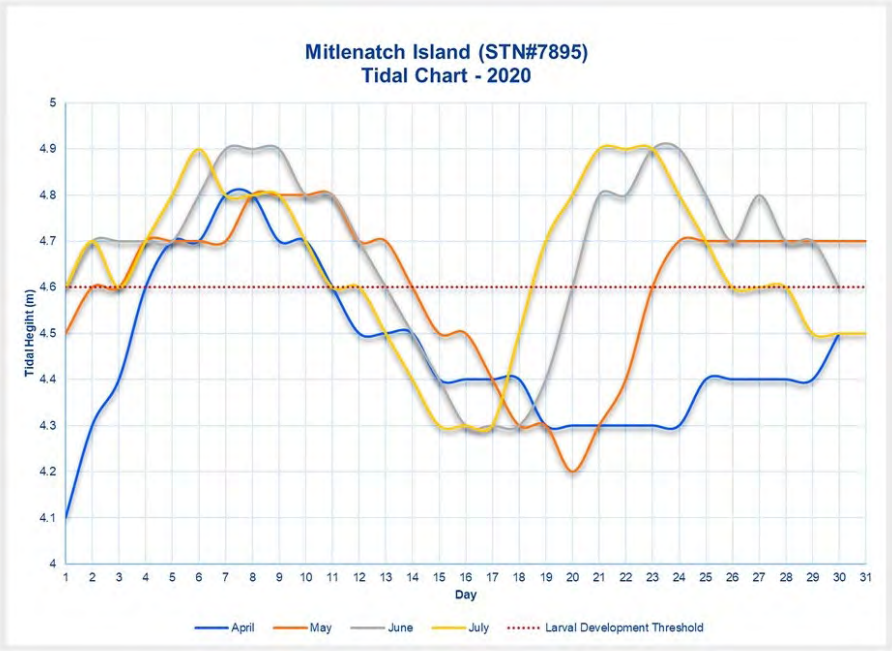
5.2 An Operational Mosquito Control Program

The objective of nuisance mosquito control programs is to reduce the extent of adult mosquito annoyance which would affect area residents and visitors. This is best accomplished through implementation of an integrated approach to reducing overall mosquito populations with a focus on larval control initiatives. A program of this scope is not intended to eradicate the mosquito population.

There will always be some adult mosquitos, and in certain seasons possibly some annoyance. The total eradication of a widespread, fecund insect pest is not feasible. With the appropriate treatment scope and level of effort, the potential for adult mosquito annoyance can be greatly reduced.

The success of control activities, combined with a need to coexist with a delicate aquatic habitat, necessitates that an integrated approach to mosquito control be undertaken. This approach requires an assessment of the problem, an in-depth understanding of factors influencing the situation, followed by the use of appropriate control. Measures employed in an IPM approach to mosquito control typically include a combination of elements directed at the elimination or modification of mosquito-producing habitat and control of larvae through natural predators and biological larvicides to suppress their populations.

Prevention or control of larval development is the most effective approach to reducing overall mosquito populations, and in preventing adult mosquito nuisance. Since larvae are concentrated in places which can be identified, and where they must remain there for 7-10 days to complete their development, timely sampling and control is possible with biorational products such as VectoBac 200G. See product safety and efficacy information in Appendix 1. A major emphasis for effective program operations locally should be a focus on controlling larval mosquitos, predominantly *Aedes dorsalis,* occurring in salt water, tidally-influenced development habitats, Figures 1 and 2. A total of some 2.0 - 3.0 hectares of salt marsh habitat have been identified at the Saratoga and Miracle Beach area.



Regular surveillance and correlation with tidal heights, as measured at Mitlenatch Island will allow for an effective, predictive "*larval development threshold*" to be established. Tentatively identified (2020)

as 4.6m, larval development locally was observed to occur with days of tidal heights exceeding this height. High tides typically occur every two weeks, and with larval surveillance 1-2 days before peak tides, and again 3-5 days after, developing larvae will be identified for timely treatment and control.

Freshwater habitat in the area is predominantly slow draining temporary and permanent larval mosquito habitats located in difficult to access mixed forest and undeveloped areas. The most mosquito species occurring in these types of habitat are likely *Culex*, *Culiseta* and *Anopheles* all of which are not too numerous and are not a typically as aggressive a pest as *Aedes*. Visible, and accessible potential habitats of this type would, at this stage in a new, and evolving program, be a secondary concern with active surveying, monitoring and treatment to be completed on a "as time allows" basis. These sites, where they occur, would be including in routine operations and prioritized depending on their contribution to adult mosquito annoyance being reported by affected businesses and residents.

The larvicide of choice for use in an IPM mosquito control program is VectoBac 200G. Classified as a 'bio-rational' larvicide, VectoBac contains the bacterium *Bacillus thuringiensis* var. *israelensis (B.t.i).* VectoBac is very specific and controls developing larval mosquitos. It has no impact on natural mosquito predators and has no residual activity. See Appendix 1 for product information.

Decreasing or eliminating larval mosquito development habitats, where practical is desirable and once done, often needs no further attention. Removal or alteration of mosquito producing habitat does not necessarily mean drainage resulting in habitat destruction for other organisms and natural predators. Installing a fountain in a pond makes it inhospitable for larval mosquito development while conserving natural aquatic predators including other insects, fish, amphibians and reptiles.

Wherever practical, residents and businesses are advised of options for physical control of mosquito development habitats located on their property. Property owners are encouraged to manage stagnant and non-flowing waters on their properties to minimize their use as sources for mosquito development. Grading of depression and tire ruts, maintaining flow in ditches, adding a fountain to a pond either eliminates a potential habitat or alters it such that it is unusable for larval development. Drainage or physical removal of water holding containers such as stored boats, tires, watering troughs and rain barrels is easily done and permanently eliminates their potential to produce mosquitos.

Public relations and ongoing program education could be accomplished through regular contacts with residents, businesses and community visitors. Information on mosquitos, their control, and prevention, should be available to the general public in a variety of forms including notice boards, informational brochures, websites, newspaper articles, websites open-houses and farmer's markets etc. Resident requests for service should be followed up with telephone contact and site inspection. Physical reduction,

elimination or alteration of larval mosquito development habitats is an important aspect of the control program. Wherever possible, and practical, property owners should be advised of measures they could undertake to reduce mosquito development.

5.3 Pest Management Plan Development

Approval for an operational program requires the preparation and acceptance of a Integrated Pest Management Plan by the BC Ministry of Environment (BCMOE). If an operational program is to take place during 2021, all regulatory requirements must be completed by early April 2021 and with a BCMOE recommended minimum of 75-96 days to meet the identified milestones, PMP updates and completion, advertising and consultation (First Nations, Public), it is recommended that the process begin as soon as possible, and no later than November 2020. The consultants managing and delivering the program would require a Pest Control Service License and field personnel must possess valid Pesticide Applicators Certificates in the category of Mosquito and Biting Fly Abatement or equivalent.

The Mosquito Surveillance and Control Program Pest Management Plan (PMP) has a prescribed format which must adhere to the requirements of *Integrated Pest Management Act and Regulation,* including amendments, and the *Mosquito Management Sector Review Paper*. Copies of these documents may be accessed through the BC Ministry of Environment home page at www.env.gov.bc.ca/epd/epdpa/ipmp/pestact/index.html. Common themes of larval mosquito development prevention, identification and control necessary to achieve the program's goals, while ensuring environmental protection are to be detailed in the final, and BCMOE accepted PMP.

The Pest Management Plan would be 'owned' by the Comox Valley Regional District. Once approved it would remain in place for the purposes of mosquito population management and control for five years.

The following provides a brief summary of the PMP application/registration process:

- **Phase I: PMP Updates, Advertisement and Solicitation of Input to the Plan**

The *Integrated Pest Management Act and Regulation* requires at least two legal advertisements, in local newspapers, to advise of intended public land or aquatic pesticide use. The public, first nations and other stakeholders including community groups or associations, Provincial Parks and operators are invited by these advertisements to provide comments to the PMP holder or his designate, on PMP contents and the proposed mosquito population management and control program. Some of these may need to be contacted directly for their input and comments. In addition, First Nation input must be actively solicited by the PMP proponent. This is typically achieved through letters, facsimile, email and telephone or personal contact with administrators, chiefs and council, as appropriate. Potential, affected First Nations, Indian Bands and Tribal Councils would need to be identified as part of PMP development and registration.

This aspect of the process can take a minimum of 45 days, and typically requires much more.

- **<u>Phase II:</u> PMP Amendments/additions, *Confirmation Report*, *Pesticide Use Notice* and *Notice of Intent to Treat*, preparation and submissions to BCMOE**

Once any information or requirements, which may have been proposed by the general public, First Nations, stakeholder or other interested groups or individuals and appropriate government agencies have been received, reviewed and incorporated into the document, the final version of the PMP is completed. At this point, the CVRD or it's consultant would prepare the "*Pesticide Use Notice*" (PUN), the *Consultation Report* reviewing all First Nation and stakeholder, public contacts and comments with covering memo for submission to the Pesticides Management Branch of the BCMOE along with a cheque for the $500 processing/registration fee. The BCMOE (Victoria) reviews the submitted PMP, the PUN and then issues a Pesticide Use Confirmation letter. Following receipt of this confirmation, the annual "*Notice of Intention to Treat*" (NIT) must be prepared and submitted (BCMOE, Nanaimo), and then the control program may begin. In the first season this form can be submitted with Confirmation Letter and the PUN.

Phase II of this process requires a minimum of 30-51 days for processing/handling by the BCMOE. Once accepted, the PMP is valid for 5 years.

Following the successful completion of PMP process and acceptance by the BCMOE Integrated Pest Management Branch, an operational mosquito control program can begin. For subsequent seasons, the NIT must be submitted at least 21 days prior to proposed pesticide use and program start-up. Annual reports must be submitted to the BCMOE every January.

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TABLES

Table 1: Larval Mosquito Sampling and Identifications; Saratoga and Miracle Beach - 2020 Mosquito Development Site Survey

Date	Site #	Sampling Location	# Larvae	Instar Stage	Sample Size	# Identified	Species
20-Apr-20	SB3	Clarkson Ave, Pacific Playground marsh	>1	2	1	1	*Ae. mercurator*
13-May-20	SB1	8768 Driftwood Rd		1-4	24	24	*Ae. dorsalis*
	SB1	8768 Driftwood Rd		1,3	8	8	*Ae. dorsalis*
	SB1	8768 Driftwood Rd		1-4	41	41	*Ae. dorsalis*
13-May-20	SB1	8760 Driftwood Rd		1-4P	43	43	*Ae. dorsalis*
	SB1	8760 Driftwood Rd		2-4	152	152	*Ae. dorsalis*
	SB1	8760 Driftwood Rd		2-4	55	55	*Ae. dorsalis*
19-May-20	SB1	8768 Driftwood Rd		1-4P	36	36	*Ae. dorsalis*
	SB1	8768 Driftwood Rd			87	87	*Ae. dorsalis*
19-May-20	SB1	8760 Driftwood Rd		1-4P	93	93	*Ae. dorsalis*
	SB1	8760 Driftwood Rd		2-4P	90	90	*Ae. dorsalis*
26-May-20	SB3	Pacific Playground marsh	>1	2	6	4	*Ae. dorsalis*
						2	*Cx. tarsalis*
26-May-20	SB2	8816 Driftwood Rd, Driftwood marsh upper	5-20	2-4P	20	20	*Ae. dorsalis*
	SB2	8838 Driftwood Rd, Driftwood marsh upper	5-20	2-4P	17	17	*Ae. dorsalis*
	SB2	8820 Driftwood Rd, Driftwood marsh upper	5-20	4P	6	6	*Ae. dorsalis*
	SB1	8816-8822 Driftwood Rd, Driftwood marsh lower, below Saratoga foot bridge	0-20	2-4P	2	2	*Ae. dorsalis*
	SB1	8816-8822 Driftwood Rd, Driftwood marsh lower, below Saratoga foot bridge	0-20	2-4	26	26	*Ae. dorsalis*
	SB1	8816-8822 Driftwood Rd, Driftwood marsh lower, below Saratoga foot bridge	0-20	2-4	14	14	*Ae. dorsalis*
	SB1	8816-8822 Driftwood Rd, Driftwood marsh lower, below Saratoga foot bridge	0-20	2-4	6	6	*Ae. dorsalis*
08-Jun-20	SB1	Driftwood marsh, lower	5-10	2-4	9	9	*Ae. dorsalis*
	SB1	Driftwood marsh, lower	5-10	1-4	11	11	*Ae. dorsalis*
	SB1	Driftwood marsh, lower	1-5	1-4P	34	34	*Ae. dorsalis*
	SB2	Driftwood marsh, upper	3-5	1-3	14	14	*Ae. dorsalis*

Table 1: **Larval Mosquito Sampling and Identifications; Saratoga and Miracle Beach - 2020 Mosquito Development Site Survey**

Date	Site #	Sampling Location	# Larvae	Instar Stage	Sample Size	# Identified	Species
28-Jul-20	SB1	Driftwood marsh lower, Saratoga foot bridge	3-5	2-4	19	19	*Ae. dorsalis*
	SB2	Driftwood marsh upper	20-100	1-4	97	97	*Ae. dorsalis*
	SB2	Driftwood marsh upper	20-100	1-3	62	62	*Ae. dorsalis*
	SB3	Pacific Playground marsh	1-8	1-3	8	5	*Ae. dorsalis*
				1-2		3	*Cx. tarsalis*
			Total Larvae collected			**981**	

Table 2: **Adult Mosquito Sampling and Identifications; Saratoga and Miracle Beach - 2020 Mosquito Development Site Survey**

Date	Sampling Location	Resident sample	Catch Method	Sample Size	# Identified	Species
15-Apr-20	8826 Driftwood Rd	X	HC	1		midge
20-Apr-20	8826 Driftwood Rd	X	HC	1	1	*An. punctipennis*
23-Apr-20	1993 Maple Dr	X	HC	1	1	*Ae. cinereus*
08-May-20	Driftwood Rd	X	HC	1	1	*Ae. dorsalis*
11-May-20	Driftwood Rd	X	HC	1		midge
11-May-20	Driftwood Rd	X	HC	1	1	*Ae. sticticus*
17-May-20	1993 Maple Dr	X	HC	1		midge
18-May-20	8814 Driftwood Rd.	X	HC	3		midge
19-May-20	8720 Beach Cres	X	MM	83	53	*Ae. dorsalis*
					30	*Ae. provocans*
19-May-20	8776 Driftwood Rd	X	MM	~350	200	*Ae. dorsalis*
20-May-20	8816 Driftwood Rd	X	HC			midge
24-May-20	8813 Driftwood Rd	X	HC	2	2	*Ae. dorsalis*
25-May-20	8809 Driftwood Rd	X	HC	5	5	*Ae. dorsalis*
26-May-20	8670 Paulson Rd		LT	0		
26-May-20	8950 McLarey Rd		LT	1	1	*Ae. dorsalis*
26-May-20	Saratoga foot Bridge, Driftwood lower marsh		HC	1	1	*Ae. dorsalis*
26-May-20	SB1 Driftwood lower marsh		HC	1	1	*Ae. dorsalis*
26-May-20	9023 Clarkson Ave		LT	2	2	*Ae. dorsalis*
26-May-20	8841 Driftwood Rd		LT	7	7	*Ae. dorsalis*
26-May-20	8670 Paulsen Rd		LT	1	1	*Ae. dorsalis*
26-May-20	8950 McLarey Rd		LT	1	1	*Ae. dorsalis*
26-May-20	8813 Driftwood Rd	X	HC	1	1	*Ae. dorsalis*
27-May-20	8809 Driftwood Rd	X	HC	7	7	*Ae. dorsalis*
27-May-20	8809 Driftwood Rd	X	HC	14	14	*Ae. dorsalis*
27-May-20	Miracle Beach school, Paulsen Rd	X	HC	1	1	*Ae. dorsalis*
27-May-20	8868 Driftwood Rd	X	HC	3	2	*Ae. dorsalis*
						midge
28-May-20	8816 Driftwood Rd	X	HC	2	2	*Ae. dorsalis*
28-May-20	8813 Driftwood Rd	X	HC	2		*damaged*
28-May-20	8685 Beach Cres	X	HC	2	*2*	*Ae. dorsalis*

Table 2: **Adult Mosquito Sampling and Identifications; Saratoga and Miracle Beach - 2020 Mosquito Development Site Survey**

Date	Sampling Location	Resident sample	Catch Method	Sample Size	# Identified	Species
28-May-20	Pacific playground marsh	X	HC	2	2	*Ae. dorsalis*
29-May-20	8868 Driftwood Rd	X	HC	1	1	*Ae. dorsalis*
01-Jun-20	Clarkson Ave	X	HC	1	1	*Ae. dorsalis*
01-Jun-20	8860 Driftwood Rd	X	HC	1	1	*Ae. dorsalis*
03-Jun-20	8814 Driftwood Rd	X	HC	1	3	*Ae. dorsalis*
05-Jun-20	8841 Driftwood Rd	X	HC	1	1	*Ae. dorsalis*
05-Jun-20	8841 Driftwood Rd	X	HC	1	1	*Ae. dorsalis*
08-Jun-20	8776 Driftwood Rd	X	MM	~400	100	*Ae. dorsalis*
	8776 Driftwood Rd	X	MM	~400		damaged with fungi
	8776 Driftwood Rd	X	MM	~400		damaged with fungi
26-Jun-20	8832 Driftwood Rd	X	MM	1200	16	*Ae. dorsalis*
					47	*Ae. spp not dorsalis*
					3	*Cx. tarsalis*
10-Jul-20	8832 Driftwood Rd		MM		16	*Ae. dorsalis*
					48	*Ae. spp* not *dorsalis*
					3	*Cx. tarsalis*
24-Jul-20	8832 Driftwood Rd		MM		16	*Ae. dorsalis*
					48	*Ae. spp* not *dorsalis*
					4	*Cx. tarsalis*
27-Jul-20	9023 Clarkson Ave	X	MM			badly damaged, crushed and fungi hundreds of Ae. & Cx./Cs. mosquitoes
28-Jul-20	9023 Clarkson Ave, near Pacific Playground		LT	3	2	*Ae. spp*
					1	*Cs. spp*
28-Jul-20	8670 Paulsen Rd		LT	5	4	*Cx. tarsalis*
					1	Ae. spp
28-Jul-20	Saratoga foot bridge - site SB1		HC	1	1	*Ae. dorsalis*
28-Jul-20	Saratoga foot bridge - site SB1		HC	1	1	*Ae. dorsalis*
28-Jul-20	Miracle Beach school, Paulsen Rd		LT	23	19	*Cx. tarsalis*
					3	*Cx. territans*

Table 2: Adult Mosquito Sampling and Identifications; Saratoga and Miracle Beach - 2020 Mosquito Development Site Survey

Date	Sampling Location	Resident sample	Catch Method	Sample Size	# Identified	Species
28-Jul-20	8776 Driftwood Rd	X	MM	51	1	*Ae. dorsalis*
					28	*Ae. dorsalis*
					22	*Ae. spp*
					1	*Cx. tarsalis*
28-Jul-20	8830 Clarkson Ave	X	MM			no mosquito's just moths and midges
12-Aug-20	9023 Clarkson Ave	X	MM		155	*Ae. dorsalis*
23-Aug-20	8776 Driftwood Rd	X	MM	~170	108	*Ae. dorsalis*
23-Aug-20	8720 Beach Crt	X	MM	~2000	50	*Ae. dorsalis*
			Total Adults collected		**1045**	

LT - New Jersey light traps using $CO^{2.}$ (dry ice ~1kg)

MM - Mosquito Magnet (CO^2 attractant)

HC - Hand capture while landing to bite.

– Damaged (missing legs wings) mosquitos were not identified

FIGURES

Saratoga / Miracle Beach

Comox Valley Regional District

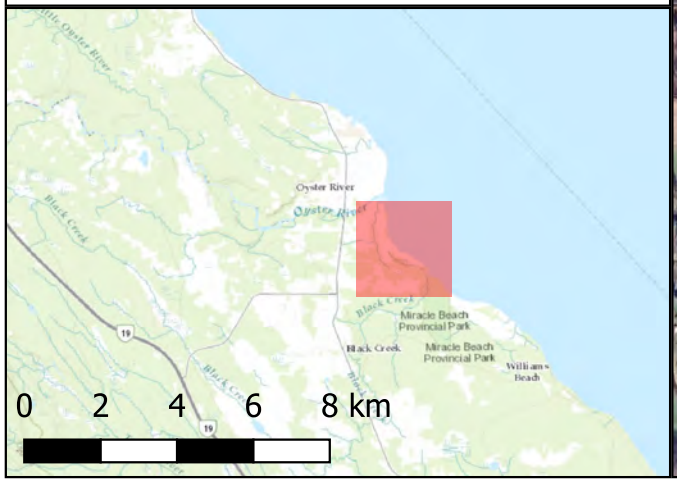
Mosquito Population Site Survey

Duka Environmental Services

Figure 1

Legend

- Development Locations
- Light Trap Captures
- Mosquito Magnet Captures
- Hand Captures



Saratoga / Miracle Beach

Comox Valley Regional District

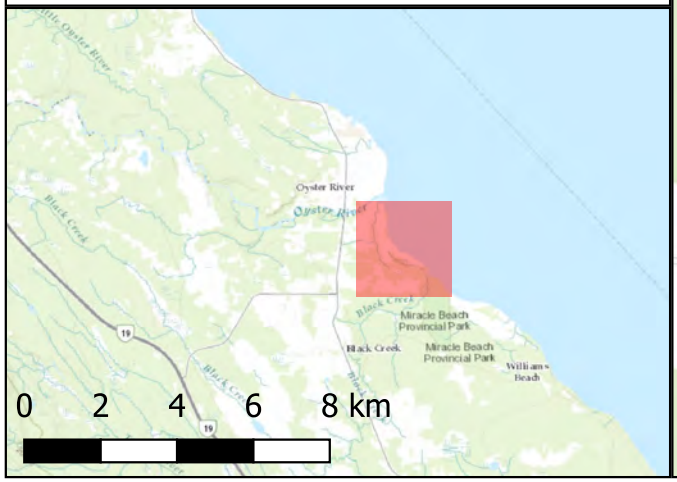
Mosquito Population Site Survey

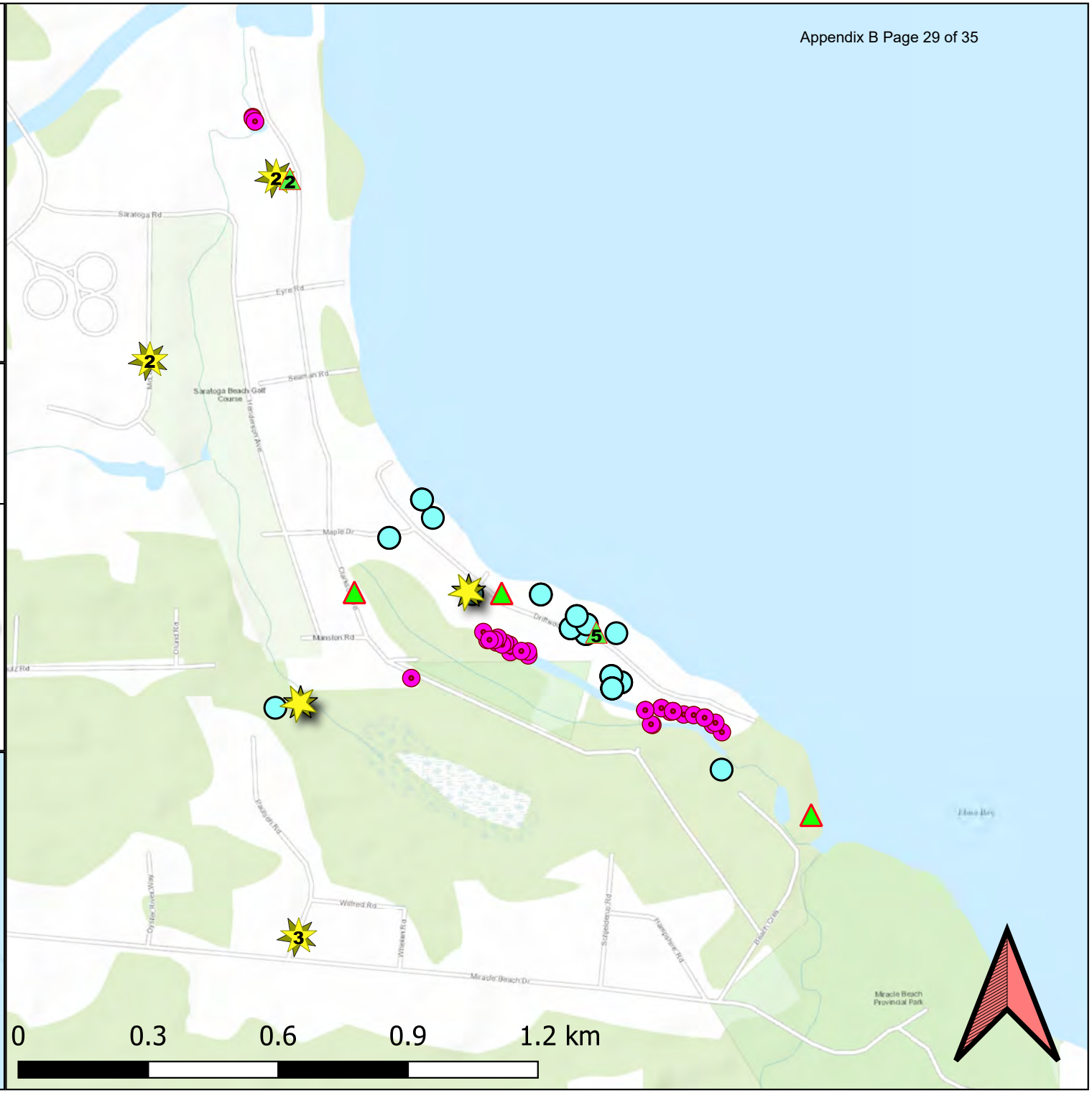
Duka Environmental Services

Figure 2

Legend

- Development Locations
- Light Trap Captures
- Mosquito Magnet Captures
- Hand Captures





APPENDIX 1

VectoBac 200G Product Information

APPENDIX 1 : VectoBac 200G Product Information

The larval control products of choice for use in an Integrated pest management approach nuisance and vector mosquito control programs is VectoBac 200G, containing the soil borne bacterium *Bacillus thuringiensis* var. *israelensis*, Serotype H-14, Strain AM 65-52. Extensive product information can be found at the manufacturer's website www.valentbiosciences.com or through the Health Canada, Pest Management Regulatory Agency (PRMA) website www.pmra-arlc.gc/ca and the Pesticide Label Search www.hc-sc.gc.ca.

VectoBac 200G contains spores and crystals produced by the bacterium (*Bacillus thuringiensis* var. *israelensis, Bti*) and, as such it is classed as a bio-rational, rather than conventional, pesticide. A naturally-occurring soil bacteria, with several effective strains, has no residual activity, is species-specific, does not bio-accumulate and has no impact on other organisms found in aquatic habitats. It is recommended for use in standing water habitats such as temporary and permanent pools in pastures and forested areas, irrigation or roadside ditches, natural marshes or estuarine areas, waters contiguous to fish-bearing waters, catch basins and sewage lagoons. VectoBac's mode of action is on the larval mosquito stomach, and it must be eaten to be effective. It producies rapid lethal effects (within hours) in most species of larval mosquitos. It has no residual activity, does not bio-accumulate and has no impact on beneficial organisms found in mosquito development habitats.

VectoBac will effectively control **ALL** larval mosquito species occurring locally and others to be found throughout British Columbia and Yukon.

VectoBac® 200G

BIOLOGICAL LARVICIDE

GRANULE

GROUP	11	INSECTICIDE

RESTRICTED

GUARANTEE:
Bacillus thuringiensis subsp. *israelensis*,
Serotype H-14, strain AM 65-52, 200 International
Toxic Units (ITU) per milligram (0.2 billion ITU/KG)

REGISTRATION NO. 18158
PEST CONTROL PRODUCTS ACT List No. 60214-13

INDEX:

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

1.0 PRECAUTIONS

KEEP OUT OF REACH OF UNAUTHORIZED PERSONNEL
MAY CAUSE SENSITIZATION
CAUTION EYE IRRITANT

DO NOT apply directly to treated, finished drinking water reservoirs or drinking water receptacles when the water is intended for human consumption.

Avoid contact with skin, eyes, and clothing. Avoid breathing dust/spray mist. Wear a long sleeved shirt, long pants, waterproof gloves, shoes and socks, eye goggles and NIOSH-approved respirator with any N-95, R-95, or P-95 filter for biological products when handling, mixing/loading or applying the product and during all clean-up/repair activities. Applicators may remove gloves, eye goggles and respirators if the design and delivery of the application apparatus reduces exposure to a negligible level (e.g. backpack sprayer with application wands that apply product directly over water surface). Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse.

2.0 FIRST AID

If on skin or clothing	Rinse skin immediately with plenty of water. Remove contaminated clothing and wash separately before reuse. If irritation occurs and persists or is severe, seek medical attention.
If in eyes	Hold eye open and rinse slowly and gently with water. Remove contact lenses, if present, then continue rinsing eye. If irritation occurs and persists or is severe, seek medical attention.
If inhaled	Move person to fresh air, apply respiration if needed and seek medical attention.
If swallowed	Rinse mouth and throat with copious amounts of water. DO NOT induce vomiting. Promptly contact a physician or poison control centre. DO NOT give anything by mouth to an unconscious person.
General	Seek medical attention if irritation or signs of toxicity occur and persist or is severe. Take container, label or product name and Pest Control Product Registration Number with you when seeking medical attention.

3.0 TOXICOLOGICAL INFORMATION

Treat symptomatically.

4.0 STORAGE

In order to ensure microbial purity and potency, VectoBac 200G should be stored in the original container at 0 - 25°C and used within 24 months of the date of manufacture.

5.0 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.

6.0 NOTICE TO USER

This pest control product is to be used only in accordance with the directions on the label. It is an offence under the *Pest Control Products Act* to use this product in a way that is inconsistent with the directions on the label. The user assumes the risk to persons or property that arises from any such use of this product.

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.

7.0 DIRECTIONS FOR USE

MOSQUITOES	Suggested Range Rate
Habitat: Standing water	3 – 10kg/ha* ($0.3 – 1.0$ g/m^2)

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

*Use higher rates in deep and/or polluted water, and when late 3rd and 4th 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 10 km/h.

A 3 to 14 day interval between applications should be employed. Monitoring will indicate the appropriate retreatment interval. VectoBac 200G Biological Larvicide 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.

AERIAL APPLICATION INSTRUCTIONS

Apply only by fixed-wing or rotary aircraft equipment that 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 using appropriate marking devices and/or electronic guidance equipment.

Use Precautions

Apply only when meteorological conditions at the treatment site allow for complete and even coverage.

Apply only when meteorological conditions are in compliance with local and/or provincial authorities.

Operator Precautions

DO NOT allow the pilot to mix product to be loaded onto the aircraft. However, 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. When handlers/loaders use closed systems to load product onto the aircraft, the handler requirement for eye goggles and a NIOSH-approved respirator/mask with any N-95, R-95, or P-95 filter for biological products may be waived. When reduced personal protective equipment is worn, the respirator/mask and eye goggles must be immediately available for use in an emergency such as a spill or equipment breakdown. All personnel on the job site must wash hands and face thoroughly before eating and drinking. Protective clothing must be washed before reuse. Decontaminate aircraft cockpit and vehicle cabs if contamination occurs.

Product 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.

RESISTANCE MANAGEMENT RECOMMENDATIONS

For resistance management, please note that VectoBac 200G Biological Larvicide contains a Group 11 insecticide. Any insect population may contain individuals naturally resistant to VectoBac 200G Biological Larvicide and other Group 11 insecticides. The resistant individuals may dominate the insect population if this group of insecticides are used repeatedly in the same site. Other resistance mechanisms that are not linked to site of action but are specific for individual chemicals, such as enhanced metabolism, may also exist. The following appropriate resistance management strategies should be followed to delay insecticide resistance:

- Where possible, rotate the use of VectoBac 200G Biological Larvicide or other Group 11 insecticides with different groups that control the same pests in a site.
- Insecticide use should be based on an Integrated Pest Management program that includes scouting, record keeping, and considers cultural, biological and other chemical control practices.
- Monitor treated pest populations for resistance development.
- Contact your local extension specialist or certified crop advisors for any additional pesticide resistance management and/or integrated pest management recommendations for the specific site and pest problems in your area.
- For further information or to report suspected resistance, contact Valent BioSciences Corporation at 1-800-323-9597.

Registrant:

VALENT BIOSCIENCES CORPORATION
870 TECHNOLOGY WAY
LIBERTYVILLE, IL 60048 U.S.A.
1-800-323-9597

Canadian Agent:
Valent Canada, Inc.
6-130 Research Lane
Guelph, Ontario N1G 5G3 CANADA

VectoBac® 200G

LARVICIDE BIOLOGIQUE

GRANULE

GROUPE	11	INSECTICIDE

RESTREINT

GARANTIE:
Bacillus thuringiensis sous-espèce *israelensis*, sérotype H-14, souche AM 65-52, 200 unités toxiques internationales (UTI) par milligramme (0,2 milliard UTI/KG).

NUMÉRO D'HOMOLOGATION 18158
LOI SUR LES PRODUITS ANTIPARASITAIRES
List No. 60214-13

INDEX:

LIRE L'ETIQUETTE AVANT L'UTILISATION
GARDER HORS DE LA PORTÉE DU PERSONNEL NON AUTORISÉ
SENSIBILISANT POTENTIEL
ATTENTION IRRITANT OCULAIRE

1.0 PRÉCAUTIONS

GARDER HORS DE LA PORTÉE DU PERSONNEL NON AUTORISÉ

PEUT CAUSER UNE SENSIBILISATION

ATTENTION IRRITANT OCULAIRE

Éviter le contact du produit avec la peau, les yeux et les vêtements. Éviter de respirer les poussières ou le brouillard de pulvérisation. Porter des vêtements longs (chemise et pantalon), des gants imperméables, des souliers et des bas, des lunettes de sécurité et un appareil respiratoire NIOSH approuvé muni d'un filtre N-95, R-95 ou P-95 pour les produits biologiques lors de la manipulation, du mélange/chargement ou lors de l'épandage du produit et des tâches de nettoyage/réparation. Les applicateurs peuvent enlever les gants, les lunettes de sécurité et l'appareil respiratoire si la conception et le type d'appareil de pulvérisation diminuent l'exposition à un niveau négligeable (c.-à-d. applicateur au dos muni de tiges permettant une application du produit directement au-dessus de la surface de l'eau). Bien se laver à l'eau savonneuse après avoir manipulé le produit. Enlever les vêtements contaminés et bien les laver avant de les porter à nouveau.

2.0 PREMIERS SOINS

En cas de contact avec la peau ou les vêtements	Rincer immédiatement la peau à grande eau. Enlever les vêtements contaminés et les laver séparément avant de les porter à nouveau. En cas d'irritation grave ou persistante, consulter un médecin.
En cas de contact avec les yeux	Garder les paupières écartées et rincer lentement et doucement avec de l'eau. Le cas échéant, retirer les lentilles cornéennes, et continuer de rincer l'oeil. En cas d'irritation grave ou persistante, consulter un médecin.
En cas d'inhalation	Déplacer la personne vers une source d'air frais. Pratiquer le respiration artificielle et consulter un médecin.
En cas d'ingestion	Rincer la bouche et la gorge avec une grand quantité d'eau. NE PAS faire vomir. Appeler un médecin ou un centre antipoison immédiatement. NE RIEN administrer par la bouche à une personne inconsciente.
En général	Obtenir de l'aide médicale immédiatement si une irritation ou des symptômes de toxicité apparaissent et persistent, ou s'ils sont sévères. Emporter le contenant, l'étiquette ou prendre note du nom du produit et de son numéro d'homologation lorsqu'on cherche à obtenir une aide médicale.

3.0 RENSEIGNEMENTS TOXICOLOGIQUES

Traiter selon les symptômes.

4.0 ENTREPOSAGE

Pour assurer sa pureté et sa performance, VectoBac 200G doit être entreposé dans son contenant d'origine à 0° C - 25° C et être utilisé dans les 24 mois de la date de fabrication.

5.0 ÉLIMINATION

Rincer le contenant trois fois ou le rincer sous pression. Ajouter les rinçures au mélange à pulvériser dans le réservoir. Vérifier si un nettoyage supplémentaire du contenant avant son élimination est exigé en vertu de la réglementation provinciale. Rendre le contenant inutilisable. Éliminer le contenant conformément à la réglementation provinciale. Pour tout renseignement concernant l'élimination des produits non utilisés ou dont on veut se départir, s'adresser au fabricant ou à l'organisme de réglementation provincial. S'adresser également à eux en cas de déversement ainsi que pour le nettoyage des déversements.

6.0 AVIS À L'UTILISATEUR

Ce produit antiparasitaire doit être employé strictement selon le mode d'emploi qui figure sur la présente étiquette. L'emploi non conforme à ce mode d'emploi constitue une infraction à la Loi sur les produits antiparasitaires. L'utilisateur assume les risques de blessures aux personnes ou de dommages aux biens que l'utilisation du produit peut entraîner.

NATURE DE LA RESTRICTION: Ce produit doit être employé strictement selon le mode d'emploi autorisé. S'informer auprès des autorités provinciales pour vérifier si un permis d'utilisation est requis.

7.0 MODE D'EMPLOI

MOUSTIQUES	Taux d'application recommandé
Habitat: Les étendues d'eau stagnante	3 – 10 kg/ha* (0,3 – 1,0) g/m^2)

Étendues temporaires et permanentes dans les prés et les boisés, les fossés d'irrigation ou de rues, les marécages ou les estuaires, les étendues d'eau adjacentes à de l'eau contenant des poissons, les bassins collecteurs et les égouts.

*Augmenter ce taux dans les eaux profondes et/ou polluées et lorsque la majorité des larves sont à la fin du 3e et au 4e larvaire.

Appliquer le taux recommandé à l'aide de l'équipement conventionnel utilisé pour l'épandage par voie aérienne ou par voie de terre. Une couverture uniforme est nécessaire pour optimiser les résultats. En application par voie aérienne, appliquer en bandes uniformes qui ne se chevauchent pas et lorsque les conditions ne favorisent pas la dérive ou lorsque la vitesse des vents est inférieure à 10 km/h.

Prévoir 3 à 14 jours entre les applications. On déterminera la fréquence des applications par une surveillance appropriée. Le larvicide biologique VectoBac 200G n'a pas d'effet sur les prédateurs et les parasites invertébrés aquatiques qui ne se nourrissent pas par filtration. Par conséquent, la période de démoustication peut être prolongée grâce à ces ennemis naturels qui contribuent à maintenir la population de moustiques à un niveau acceptable.

APPLICATION PAR VOIE AÉRIENNE

Appliquer seulement à l'aide d'un équipement d'aéronef à voilure fixe ou à air rotatif ayant été calibré pour fonctionner dans les conditions atmosphériques de la région, aux doses et aux conditions de la présente étiquette.

Les doses de l'étiquette, les conditions et les précautions sont spécifiques au produit. Appliquer seulement à la dose recommandée sur cette étiquette, pour une application par voie aérienne Lorsqu'aucune dose, pour un usage spécifique, n'est recommandée pour une application par voie aérienne, ce produit ne peut pas être appliqué à l'aide d'un équipement d'application par voie aérienne.

Assurer une application uniforme en utilisant les marqueurs et/ou le matériel de téléguidage appropriés.

Mises en garde concernant l'utilisation

Appliquer seulement lorsque les conditions météorologiques au site de traitement assurent une couverture complète et uniforme. Appliquer seulement lorsque les conditions météorologiques sont conformes avec les autorités locales et/ou provinciales.

Mises en garde concernant l'opérateur

NE PAS permettre au pilote de mélanger le produit devant être chargé sur l'avion. Par contre, il est permis de charger le produit prémélangé dans un système fermé. Il est désirable que les moyens de communication soient disponibles au pilote à chaque site de traitement au moment de l'application.

Le personnel au sol de même que les personnes qui s'occupent des mélanges et du chargement doivent porter l'équipement de protection décrit dans la section PRÉCAUTIONS de la présente étiquette. Lorsque les manipulateurs/chargeurs utilisent des systèmes fermés pour charger le produit sur l'avion, le manipulateur n'est pas obligé de porter un respirateur approuvé par le NIOSH avec un filtre N-95, R-95 ou P-95 pour les produits biologiques. Si l'équipement de protection rencontre les normes minimales, le respirateur/masque doit être disponible pour une utilisation immédiate en cas d'urgence comme un déversement ou un bris d'équipement.

Tout le personnel sur le site doit se laver les mains et le visage à grande eau avant de manger et de boire. Les vêtements protecteurs doivent être lavés avant d'être utilisés. Le cockpit de l'avion et les cabines des véhicules doivent être décontaminés en cas de contamination.

Mises en garde propres au produit

Lire l'étiquette au complet et bien la comprendre avant d'ouvrir ce contenant. Pour toute question, appeler le fabricant en composant le 1-800-323-9597 ou obtenez des conseils techniques du distributeur ou de votre conseiller agricole provincial ou de votre représentant en foresterie. L'épandage de ce produit spécifique doit répondre aux exigences et/ou être conforme aux sections usages en application aérienne et les doses de la présente étiquette.

RECOMMANDATIONS SUR LA GESTION DE LA RÉSISTANCE

En terme de gestion de la résistance, prendre note que le larvicide biologique VectoBac 200G contient un insecticide du Groupe 11. Toute population d'insectes peut renfermer ou former des insectes naturellement résistants au larvicide biologique VectoBac 200G et à d'autres insecticides du groupe 11. Les individus résistants peuvent finir par prédominer au sein de la population si ces insecticides sont utilisés de façon répétée dans un même champ. Il peut exister d'autres mécanismes de résistance sans lien avec le site ou le mode d'action, mais qui sont spécifiques à des composés chimiques, comme un métabolisme accru. Il est recommandé de suivre des stratégies appropriées de gestion de la résistance pour retarder l'acquisition de la résistance aux herbicides:

- Dans la mesure du possible, alterner le larvicide biologique VectoBac 200G ou tout insecticide du même Groupe 11 avec des insecticides appartenant à d'autres groupes et qui éliminent les mêmes insectes nuisibles au champ.
- Utiliser les insecticides dans le cadre d'un programme de lutte intégrée comprenant des inspections sur le terrain, des relevés d'utilisations antérieures de pesticides et de la rotation des cultures et faisant place à la possibilité d'intégrer des pratiques de labour (ou d'autres méthodes mécaniques) ou des pratiques de lutte culturale, biologique et d'autres formes de lutte chimique.
- Inspecter les populations d'insectes traitées pour y découvrir les signes de l'acquisition d'une résistance.
- Pour des cultures précises ou des biotypes de mauvaises herbes précises, s'adresser au spécialiste local des interventions sur le terrain ou à un conseiller agréé pour toute autre recommandation relative à la gestion de la résistance aux pesticides ou encore à la lutte intégrée contre les mauvaises herbes.
- Pour plus d'information ou pour signaler des cas possibles de résistance, s'adresser à Valent BioSciences Corporation au 1-800-323-9597.

Titulaire d'enrigistrement:

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