2016 ANNUAL REPORT

OF THE

CHILOQUIN VECTOR CONTROL DISTRICT

In compliance with:
Oregon Revised Statutes
452.120(5) (Partially)

Prepared by:

Edward S. Horvath
Contracted IPM Manager
Three Rivers Mosquito and Vector Control
October 21, 2015

THREE RIVERS
MOSQUITO & VECTOR CONTROL

District Name
Chiloquin Vector Control District

Applicator Name
Three Rivers Mosquito and Vector Control

Timeframe this Annual Report covers
January 1, 2016 – December 31, 2016

Contact Information

Three Rivers Mosquito and Vector Control
Edward Horvath
IPM Program Manager

Mailing address
P.O. Box 192
Chiloquin, Oregon 97624-0192

Email
eshorvath@trmvc.com

Phone number
(541) 238-2272

SUMMARY

In 2012, the Chiloquin Vector Control District contracted with Three Rivers Mosquito and Vector Control (TRMVC), a private company, to operate an Integrated Pest Management Program (IPM) for the District, utilizing the Districts equipment and materials. In April 2014, CVCD put an all inclusive contract out for bid, to outsource all control, including equipment and materials. CVCD also sold all pesticide application equipment and vehicles. In July 2014, TRMVC was awarded the bid for a term of three (3) years with an optional two (2) year extension. All equipment upkeep, maintenance and calibration is now the sole responsibility of the contractor, rather than the CVCD Board of Trustees.

All procedures, materials and methods used were done so in accordance with the 2016 Pesticide Use Plan (PUP), submitted and approved in accordance with ORS 452.140 and in observance with an up-to-date Pesticide Discharge Management Plan (PDMP). TRMVC increased the accountability and recordkeeping by incorporated GPS/GIS technology to record adulticide spray missions with the truck mounted ULV sprayer. All application sites and inspection points are recorded digitally and maintained in accordance with Oregon Department of Agriculture Commercial Pesticide Application Recordkeeping standards.

A buffer of 100 meter was maintained from all natural water bodies when necessary as defined in the PUP. In addition, if applications were at to be made within the 100 yard buffer, chemical sensitive strips would be used in order to ensure the buffer was adequate. In 2016, all areas where treatment was needed for adult mosquito control within the 100 meter buffer, Essentria IC^{3}™ was used.

No adverse affects were detected with non-target species during surveillance pre or post application during the 2016 season. No adverse incidents as described in Schedule B, Conditions 2-6 of the General Permit 2300A.

THE VECTOR PROBLEM

A Vector shall mean any insect or arthropod, rodent, or other animal of public health significance capable of causing injury, or capable of harboring or transmitting the causative agents of disease to humans or domestic animals. The Chiloquin Vector Control District defines a vector as a mosquito capable of transmitting disease and/or pestiferous, reducing the quality of life of residents.

Most mosquito vectors are extremely mobile and often cause the greatest hazard or discomfort away from their breeding source. Each has a unique life cycle and most of them occupy different habitats.

The vector problem in Chiloquin is largely a human associated problem resulting from agricultural endeavors, increasing population, urbanization and lack of maintenance of drainage systems. Un-maintained fields, vegetation and overgrown vacant lots in and around the City of Chiloquin play a role in protecting adult mosquitoes from Ultra Low Volume adulticides, making it difficult to control mosquitoes in these area that have developed into adults. Additionally, the Nature's Conservancy's reclamation and creation of wetlands on the southwest portion of the District has created large mosquito sources. The Fort Klamath irrigated fields continue to play a major influence for mosquitoes migrating into the District, largely affecting the residents and visitors of Spring Creek and Collier Park. In 2016, the affects of Fort Klamath's irresponsible irrigation practices was less noticeable within the CVCD boundaries due to limited control activities in Fort Klamath.

Additional problems will occur as urbanization continues into areas of high vector populations and as recreation and conservation areas expand.

New Federal and State regulations regarding the application of pesticides for Public Health Vector Control and the Clean Water Act/National Pollutant Discharge Elimination System (NPDES) have resulted in less pesticide applications and more monitoring and surveillance of vector populations. Spraying for mosquitoes is not based on service requests or complaints, rather based on justifiable mosquito population data.

In 2016, the Modoc Point Irrigation District continued to provide irrigation water to properties throughout the summer. With the warm summer, these waters quickly created miles of stagnant mosquito sources. Several properties within the District changed irrigation practices which provided less desirable mosquito sources, producing fewer mosquitos than in the past. The Chiloquin VCD Board of Trustees approved an early start to the season due to warmer spring weather. TRMVC pre-treated several sources that were historically known to cause significant spring mosquitoes. This reduced service requests from those locations significantly.

GOALS:

The goals of the District are to prevent new vector sources from developing, to abate existing vector populations and their sources in order to protect public health and comfort, to reduce the level of vector populations throughout the District, as well as reduce vector and human interaction. Additionally, the District's environmental goals are to reduce mosquitoes with increased larviciding while being environmentally responsible by reducing adulticiding. Water soluble and non/petroleum based products are the first choice of the District.

DISTRICT STAFF

Chiloquin Vector Control District outsourced the labor for District operations beginning in 2002. In 2012, CVCD entered into a 3 year labor contract with Three Rivers Mosquito and Vector Control (TRMVC). In July 2014, CVCD disposed of all application equipment and outsourced not only labor but materials and equipment as well as an all inclusive, Integrated Pest Management Program (IPM).

Edward S. Horvath
Contracted IPM Manager
P.O. Box 192
Chiloquin, Oregon 97624-0192
(541) 238-2272

PROPOSED ANNUAL WORK PROGRAM FOR 2015-2015

1. Provide mosquito abatement services utilizing outsourced services.

2. Continue the District's policy of mosquito control in compliance with Oregon Revised Statutes, Chapter 452 and DEQ General Permit 2300A. And in agreement with the Oregon Department of Health and the Oregon Department of Fish and Wildlife through a mutually approved Pesticide Use Plan (PUP).

3. Continue regular surveillance of all known mosquito sources throughout the District and investigate potential new ones.

4. Respond to service requests from residents of the District.

5. Request the cooperation of individuals in reducing the areas of mosquito production through proper irrigation and cultural practices.

6. Examine any new development in mosquito control for possible incorporation into our control program.

7. Maintain communication between CVCD and agencies involved in water management.

8. Maintain good public relations through news releases and informative programs.

9. Maintain spray records in accordance with Oregon Department of Agriculture standards; monitoring mosquito production and spray costs.

10. Use District resources, when available, to assist property owners, municipalities and the Irrigation District in source reduction.

11. Create a long term plan to reduce mosquito sources each year using contracted services.

12. Assist the contractor to develop and implement plans to reduce mosquito sources by manipulation of existing sources utilizing District funds.

13. Assist, if possible, with funding of a dedicated *Gambusia affinis* (Mosquitofish) location within the District.

14. Consider the implementation of Arbo-Virus Surveillance.

15. Increase the biological and cultural control measures, while reducing chemical control.

16. Become the first, biologically and environmentally responsible District on the West Coast, eventually eliminating the routine use of non-natural pesticides.

SURVEILLANCE

TRMVC conducts surveillance through adult and larval surveys. Several techniques used by TRMVC and recommended by the American Mosquito Control Association include landing rates, CDC Light Traps, and larval dipper counts. In 2016, TRMVC conducted ten (10) night time light trap sessions for twelve (12) weeks and more than 878 inspections of sites within the District using landing rates and larval surveys. In 2015, 777 inspection sites were monitored.

ADULT MOSQUITO SURVEILLANCE

Photo 1 CDC Light Trap

TRMVC collects and monitors adult mosquito populations with CDC light traps. Three (3) CDC Light traps were set weekly and monitored. In addition, CVCD Board members placed and monitored several randomly placed CDC light traps to monitor results (efficacy) of the control program. These traps were used to provide justification per DEQ Pesticide General Permit 2300A; in accordance with our Pesticide Discharge Management Plan (PDMP) and our Pesticide Use Plan (PUP). TRMVC only applied adulticides when the application was justified in accordance with the annual PUP and PDMP. Light traps were used for justification for all adult mosquito control pesticide application utilizing ULV sprayers when landing rates at service requests did not justify spraying. In addition to CDC light traps, landing rates were monitored and recorded at more than 257 locations, weekly from March through September 15th. Non-target species were monitored for effects from pesticide applications. It was determined that there were minimal, if any, effects on non-target species during the adult mosquito surveillance. In fact, it was noticed that there were more species of midges in Quality Control Inspection traps monitored by the CVCD Board of Trustees. ***In 2016, no adverse affects were discovered on non-target species within the CVCD*.** Several residents throughout the District reported an increase in Dragonflies, Mayflies and Caddis flies.

LARVAL MOSQUITO SURVEILLANCE

TRMVC conducted routine larval surveillance and uses this data to justify larval control utilizing State and Federally approved Integrated Mosquito Management principles. Either chemical, biological or mechanical (by modifying the source so that it does not retain mosquito larvae) are used to control mosquito larvae once discovered during the larval survey. Post treatment inspection were conducted within a week or two after application to determine efficacy toward target pest and monitor any adverse affects on non-target species. ***In 2016, no adverse affects were discovered on non-target aquatic species within the CVCD.***

Photo 2 Standard Larval Dipping Cup

RESISTANCE MONITORING

Photo 3 Bottle Bio-Assay

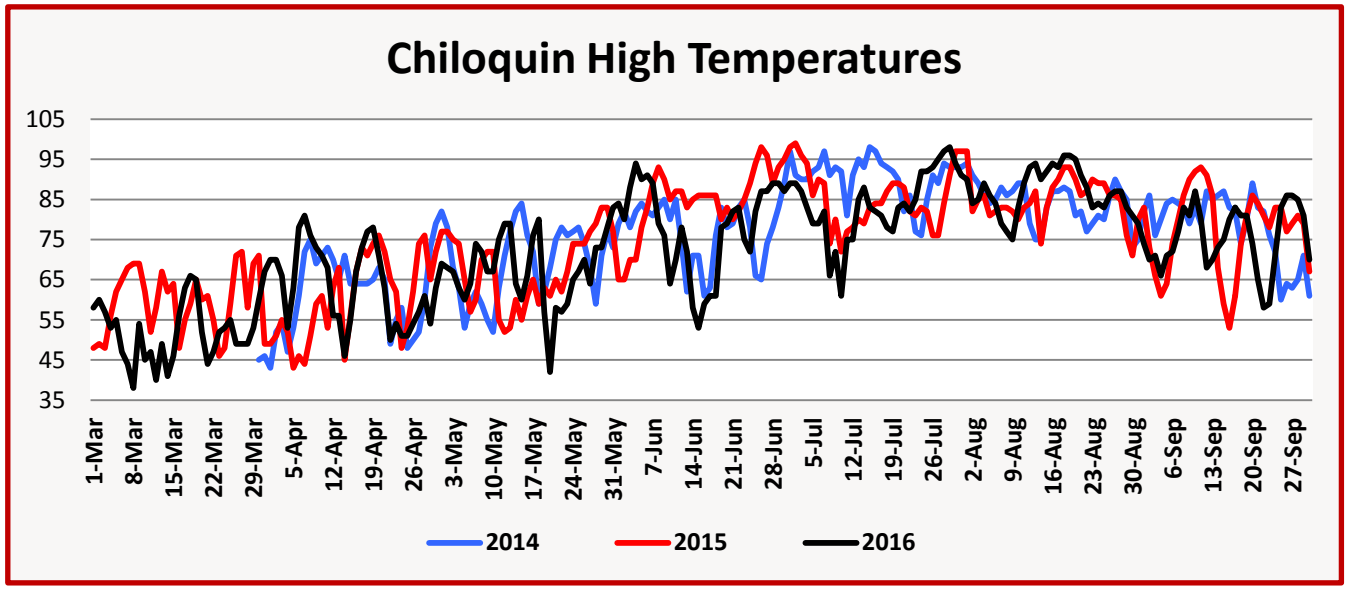
Three Rivers Mosquito and Vector Control conducts resistance analysis using industry standard bio-assays on a monthly routine. No resistance was discovered in the target species to pesticides used in the current year. In addition, TRMVC conducted efficacy testing for each pesticide used within the Chiloquin Vector Control District. Results indicate that current pesticides used are effective in accordance with industry standards with no resistance present. TRMVC recommends that the District continue to monitor resistance and efficacy results.

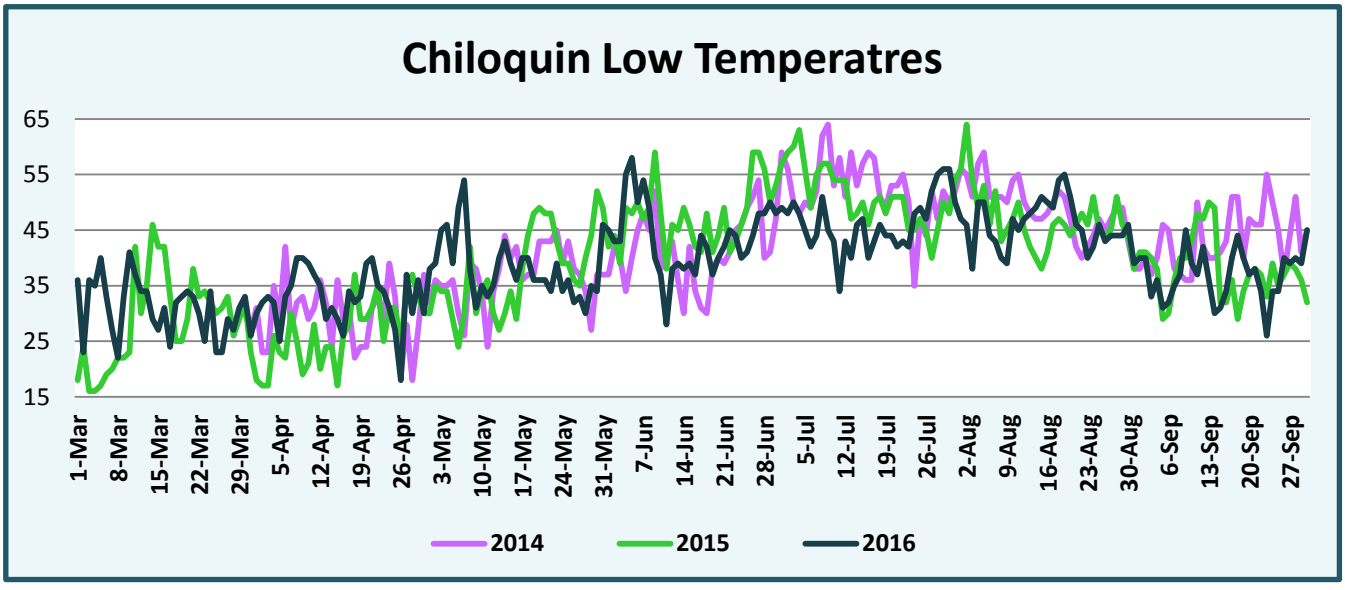
WEATHER

Weather plays a major role in mosquito activity. While the below weather graph does not represent the month of March for 2014, you will notice that the first notation of temperature (March 30th) reflected a significantly higher thermperature in 2015 than the previous year. In 2016, the high temperatures remained lower (for the most part) than in 2016, until the later part of March. A noticable increase in larval activity started closer to the mid/late March 2016. While the CVCD Board of Trustees approved an early start to the 2016 season, treatments did not begin until closer to the normal time of the season. This provided the District with the tools to be prepared if the season warmwed up early, while saving the District funds by not treating until larvae was present.

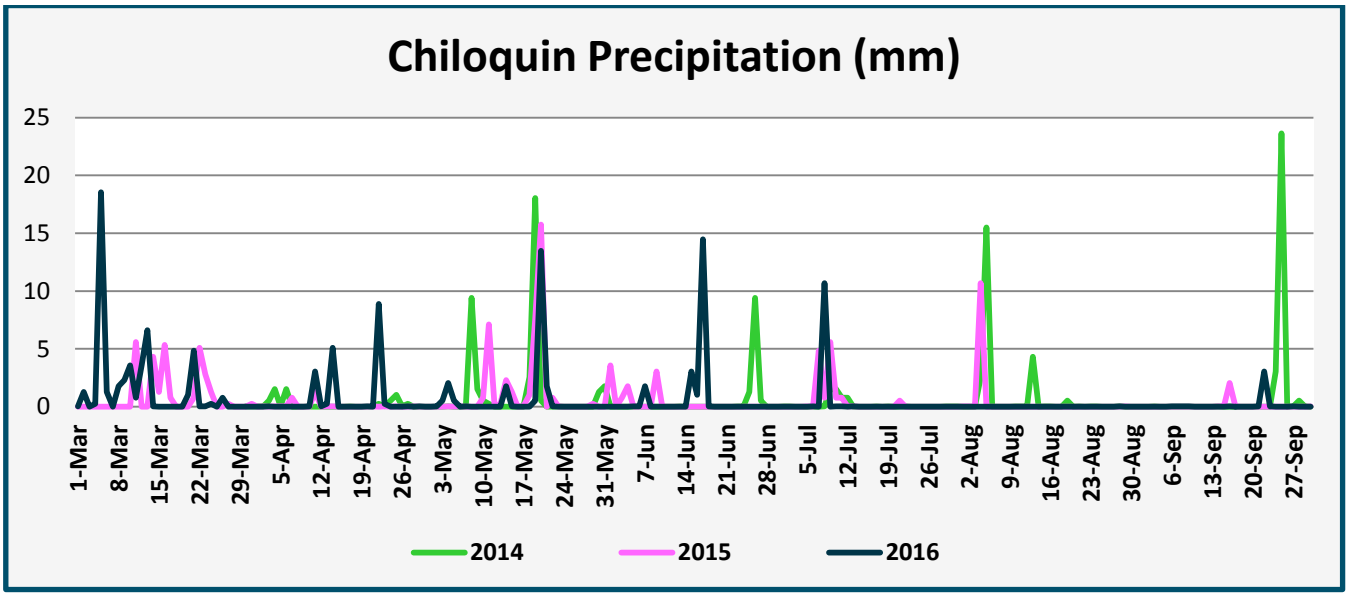
There was no pre-treatment of troublesome sources prior to surveillance justifying the application of a larvicide. District Board of Trustees should consider pre-treating sources that have regularly produced mosquito larvae in March and April rather than wait for larvae eggs to hatch in order to produce even better results in 2017. These early treatments have been successful at reducing mosquitoes that are typically a nuicance in April-May.

TRMVC staff recommends that we monitor future temperatures adjust the starting of operations accordingly.

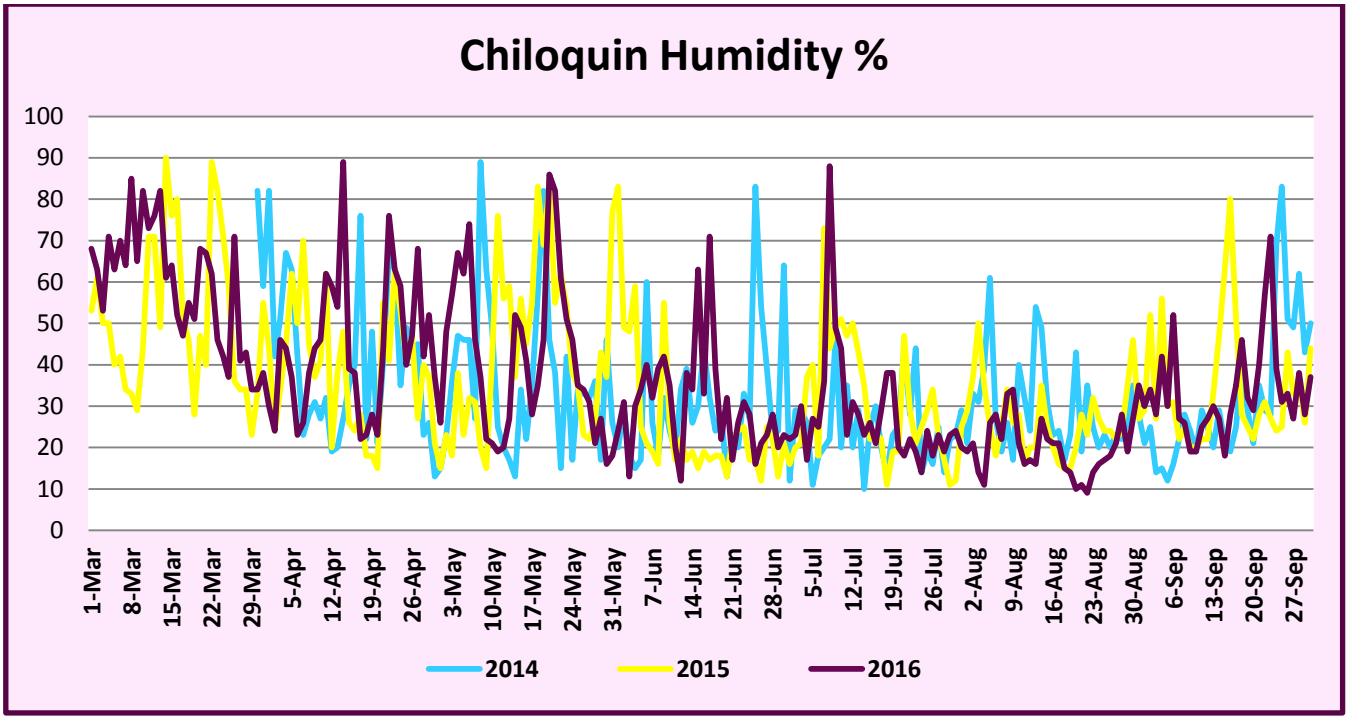




Rainfall and humidity not only have an impact of the mosquito populations by providing the needed water, it also affects the aggressiveness of the female mosquito for acquiring a blood meal. From the data collected for temperature, rainfall and humidity, there is a direct corrolation with the service requests for adult mosquito control. (see below graphs).



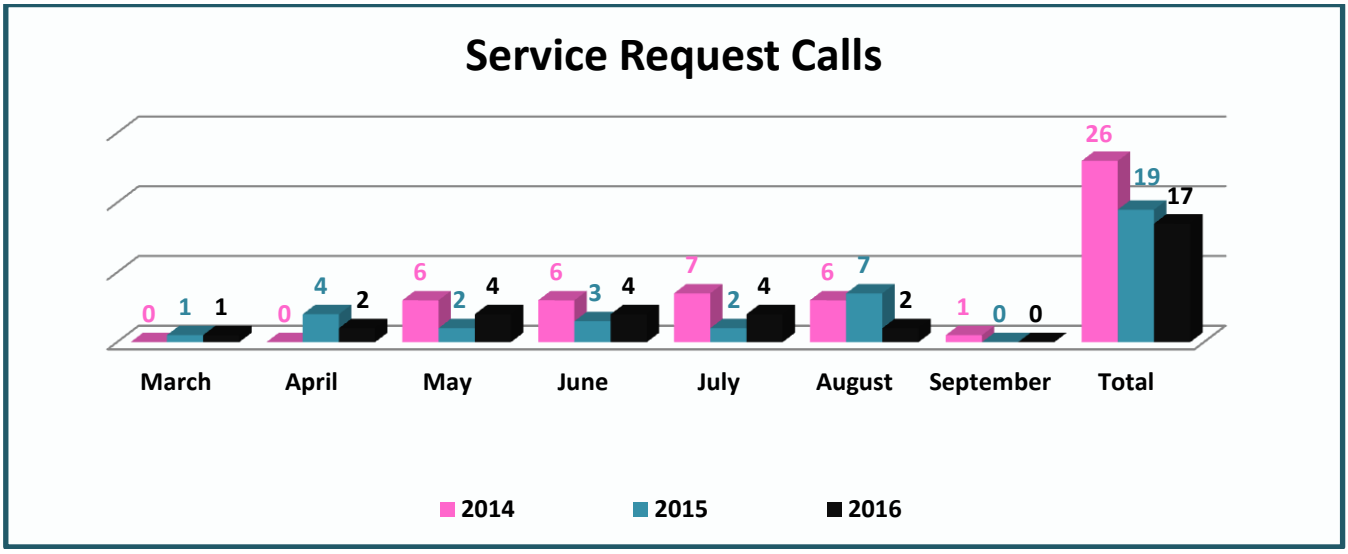
Graph 1



Graph 2

SERVICE REQUESTS

While service requests numbers reduced since 2014 and 2015, it is important to note that several of the calls in 2016 were request to be added to the "Do Not Spray" list and not true "Service Requests."



Graph 3

ARBOVIRUS

The Chiloquin Vector Control District has not had arbovirus activity since the discovery of an infected Shrubjay in 2006. In September 2015, a horse was discovered infected with the West Nile Virus approximately 12 miles east of the CVCD boundary. CVCD Board Chairman and TRMVC staff worked together with the County and State Health Departments in order to ensure that proper and timely notification was received in the future. This will better serve the residents of Chiloquin, Klamath County and the State in general. In 2016, all arbo-virus surveillance returned negative test results.

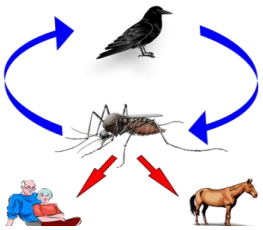


Figure 1 West Nile Virus Transmission Cycle

CONTROL PROGRAM 2016

BIOLOGICAL CONTROL (LARVAE)

Photo 4 Gambusia affinis (Mosquitofish)

During the 2016 season, *Gambusia affinis* (Mosquito Fish) were still of limited supply due to over fishing by adjacent Districts during drought conditions. Other Districts depleted the populations to a point that very few were available for CVCD. These fish are natural predators of mosquito larvae and have been known to consume their own weight in larvae in a single day. One of TRMVC's long term goals is to create a breeding reserve of Gambusia *affinis* for continuous and long term availability for Districts and residents. In 2016, TRMVC staff stocked two (2) ponds with *Gambusia affinis.*

The District also treated approximately 464.98 acres for the control of mosquito larvae with the biological insecticides *Bacillus thuringensis, var, israelensis (Bti)* and *Bacillus sphaericus (BS)*. These microbial insecticide are highly toxic to mosquito larvae and has no harmful effects on humans, domestic animals, wildlife, beneficial insects, fish and other aquatic life. Excellent results were obtained with *Bacillus sphaericus* controlling larvae on approximately 25.89 acres.

In 2016, the District gave the endorsement to TRMVC to investigate the feasibility of creating another biological program to control mosquito larvae. The goals of the District are to reduce the applications of pesticides and create a control program that is predominately natural and biological in concept. TRMVC staff began a survey of water sources to evaluate the current levels of Copepods and other naturally occurring mosquito predators. Over the next couple years, TRMVC will be producing different copepod species to evaluate the efficacy and feasibility of using introduced copepods within the District's boundaries.

CHEMICAL CONTROL (LARVAE)

The chemicals used by the District are non-persistent public health insecticides. They are used at median application rates and have been cleared for mosquito control by the Environmental Protection Agency, the Oregon State Health Division, the Oregon State Department of Fish and Wildlife and the Oregon State Department of Agriculture. TRMVC produces a "duplex" mixture using methoprene and Bti (utilizing Altosid™ supplemental label, however did not use any Duplex products in Chiloquin for 2016.

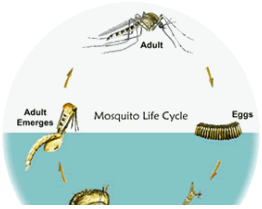


Figure 2 Mosquito Life Cycle

CHEMICAL CONTROL (PUPAE)

TRMVC used Aqnique® MMF, a mono-molecular film applied to standing water where late in-star mosquito larvae and pupae were identified. Agnique® MMF is a larvicide and pupicide with a unique physical mode of action rather than chemical toxicity. It is ideally suited for the District as it can be used in a wide range of habitats. Approximately 7.94 acres were treated using this product.

CHEMICAL CONTROL (ADULT)

CVCD began phasing out Malathion which has been applied by a truck mounted ULV sprayer. Malathion (or other pesticide with similar mode of action) will only be used to control the potential of resistance within the mosquitoes of the District and will not be used as a sole adulticide. In 2014, TRMVC introduced the use of Aqualuer® 20-20, a permethrin based adulticide which is diluted with water and is formulated with a botanical, cold-pressed orange oils rather than petroleum products. The ULV sprayer was calibrated to ensure proper pesticide amounts were applied along with droplet sizes, bi-weekly.

During the 2016 mosquito season, TRMVC treated approximately 6,757.52 acres for the control of mosquito larvae and adults. Of this, 0.00 acres (*reduced Malathion use by 100%)* were treated with Malathion. 3,697.52 acres were treated with Aqualuer® 20-20, using both ATV and truck mounted ULV foggers.

TRMVC used an eco-exempt adulticide over 2,587.44 acres treated with an EPA exempt Eccentria™ IC^3 fogging/barrier treatment using an ATV mounted ULV sprayer. Essentria™ IC is a pesticide that targets the octopamine receptors of the adult mosquito. By targeting octopamine receptors, the essential oils that make up Essentria $IC^{3™}$ provide insect control with a much wider margin of safety than other products. Because vertebrates like birds, fish, dogs and people don't have octopamine receptors; they are not affected by this unique mode of action. This product was used as both a barrier and fogging treatment when mosquito populations were unacceptable near natural bodies of water. All fogging operations are conducted during the evening hours for the control of adult mosquitoes with justification in accordance with NPDES General Permit 2300A.

PUBLIC HEALTH INSECTICIDES APPLIED DURING 2016

	ADULTICIDES					
Material	**EPA Reg #**	**Acres Treated**	**Rate of Application**		**Amount Used**	**Method Used**
Aqualuer® 20-20	769-985	3,697.19	0.0035 lb ai/A		3,069.16 oz	Truck/ ATV ULV
Essentria™ IC[3]	Exempt	2,587.44	0.83 oz/A		2,147.57 oz	ATV ULV Fogger
Fyfanon® ULV	67760-34	0.00	0.03 lbs ai/A		0.00 oz	Truck ULV Fogger
Total Acres Treated (Adulticide)		**6,284.63**				
	LARVICIDES					
Material	**EPA Reg #**	**Acres Treated**	**Rate of Application**		**Amount Used**	**Method Used**
Aqnique® MMF	2302-14	7.94	25.6–128.0 oz/A		132.25 oz	Hand can/Pres Spray
Bti Ffast™	432-1515	352.12	4.0-16.0 oz/A		1,645.67 oz	ATV ULV Fogger
Methroprene 2.1%	2724-375	20 ft^2	1 ea/ (up to 100 ft^2)		2 ea	Hand Toss
Methroprene 5.0% (*Duplex*)	2724-392 [1]	0.00	3.0-4.0 oz/A		0.00 oz	Pressure Sprayer
VectoBac® 12AS (*Duplex*)	73049-38 [1]	0.00	4.0-32.0 oz/acre		0.00 oz	Pressure Sprayer
Vecto-Bac® G	73049-10	68.71	2.5 -10.0 lb/A		189.58 lbs	Backpack Blower
Vecto-Lex® FG	73049-20	18.23	5.0-10.0 lb/A		94.92 lbs	Backpack Spreader
Vecto-Lex® WDG	73049-57	25.88	8.0-24.0 oz/acre		186.62oz	Pressure Sprayer
Vecto-Lex® WSP	73049-20	0.013	5.0-10.0 lb/A		60 ea	Backpack Spreader
Total Treated Acres [2] (Larvicide)		**472.89**				
Total Acres Treated		**6,757.52**				

Table 1 Pesticide used by CVCD

[1] Methoprene 5.0% and VectoBac® 12AS were mixed together and applied as "Duplex" in accordance with Altosid Liquid
[2] Mixed pesticides are only counted once for total acres treated.

GROUND APPLICATIONS

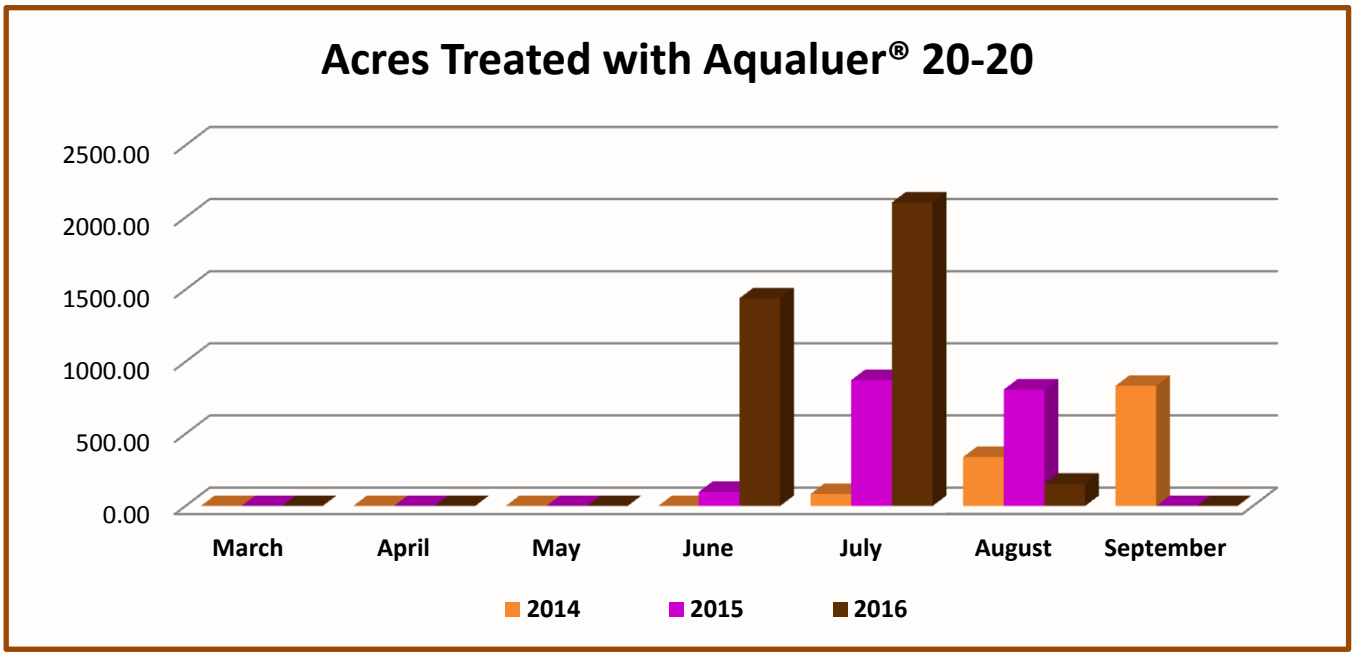
RECORD KEEPING

All known mosquito sources were recorded in Geographic Information System (GIS) maps that serve as permanent records in TRMVC databases. Shape-files are contained in GPS enabled handheld computers and are used to dispatch ground surveillance and control. Labor cost for inspections, ground treatments and pesticide record keeping was $35,864.38 and conducted by TRMVC staff as a contracted service. In addition, the District requested arbovirus testing and miscellaneous public education projects for an additional $1,725.00. With the establishment of an all inclusive IPM contract, the applications of adulticides with the truck mounted fogger are recorded with GPS and GIS technology. All applications are recorded and maintained in order to provide better accountability of where adulticide pesticides were applied, as well as not applied.

TREATMENT METHODS

Fogging operations are conducted during the evening hours for the control of adult mosquitoes with justification in accordance with NPDES General Permit 2300A. The ULV sprayers were calibrated to ensure proper pesticide amounts were applied along with droplet sizes, bi-weekly or when ever service to the machine is conducted.

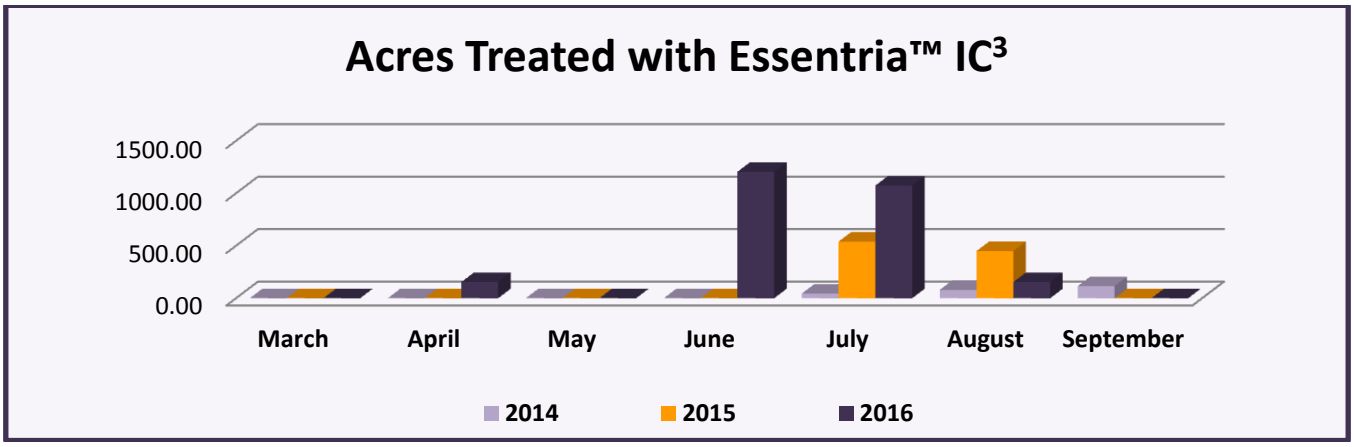
CVCD and TRMVC have partnered with the goals of using more environmentally responsible products, while increasing the control and satisfaction of residents of the District. One of the goals met was to reduce the amount of pesticides used while still increasing the control efficacy by targeted larviciding, water control and source reduction.



Graph 4 Aqualuer 20-20 usage

In 2014, the District approved the use of Essentria™ IC^3, an EPA exempt natural product. Essentria IC^3™ is a pesticide that targets the octopamine receptors of the adult mosquito. By targeting octopamine receptors, the essential oils that make up Essentria IC^3™ provide insect control with a much wider margin of safety than other products. Because vertebrates like birds, fish, dogs and humans don't have octopamine receptors; they are not affected by this unique mode of action. This product was used as both a barrier and fogging treatment when mosquito populations were unacceptable near natural bodies of water. Essentria IC^3 was applied with an ATV

mounted ULV machine. These treatments were limited to Spring Creek residential area, Collier Park and areas close to the Williamson and Sprague Rivers, when mosquito populations in the area created a nuisance for the local residents. In 2016, CVCD treated 2,587.44 acres with Essentria™ IC^3 while in 2015 treated 990.07 acres.



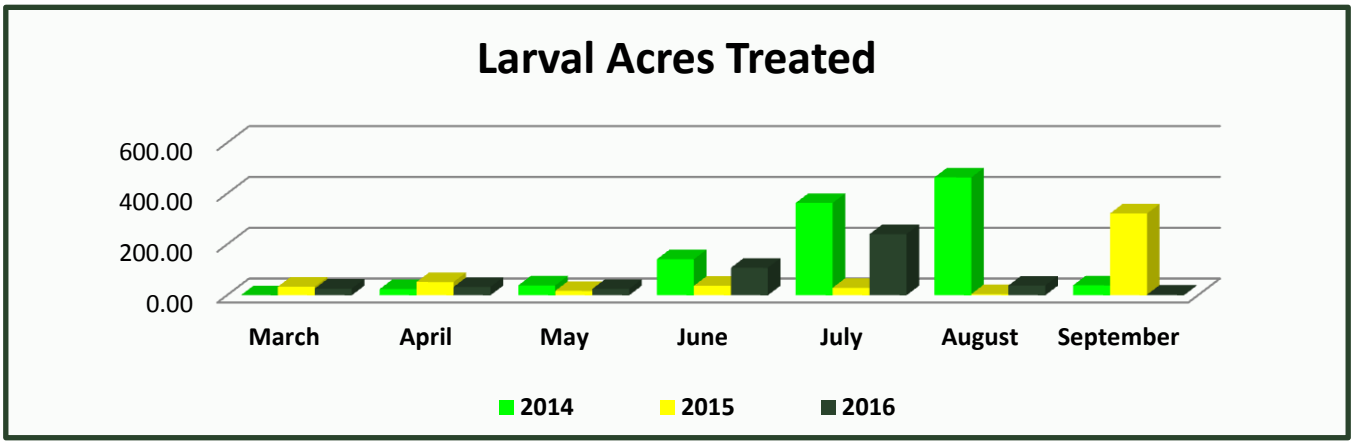
Graph 5 Essentria IC^3 Usage

Biological pesticides were the focus of the District's operation in 2016. TRMVC's 2016 application of *Bti* and *Bs* to irrigated property, isolated ponds and ditches within the District increased from 2013 by more than 300%. Granular *Bti* and *Bs* were applied by gas-powered Maruyama™ backpack blowers, belly grinder style seeders and by horn seeders. *Bti* with Ffast™ technology was applied utilizing an ATV-mounted ULV sprayer, providing efficient and effective control of larval mosquitoes, covering larger pastures.

Agnique MMF™ was applied utilizing both a B&G pressurized hand can and a 12-volt pressurized, ATV-mounted sprayer. Aqnique MMF was used as a spot treatment to rid standing water of pupae. There was a significant reduction in the need for Aqnique MMF in 2016 from 2015 because the irrigation canals remained flowing throughout the season.

Altosid® XR Briquettes (2.1% Methoprene) were applied by hand while Altosid® ALL(5.0% Methoprene) would be applied, after mixing in a duplex mixture with Bti in the formulation of VectoBac® 12AS, through a pressurized sprayer, diluted with water.

This year's larviciding program was kept busy inspecting and treating the sources throughout the district that are known producers of predominately *Aedes* and *Culex* genera of mosquitoes and discovering new sources. Irrigated pastureland ranks as the number one problem for district technicians and is the cause for most of our complaints in the hot summer months.



Graph 6 Larval Acres Treated

INTEGRATED PEST MANAGEMENT (IPM)

Mosquito Control Policy:

Three Rivers Mosquito and Vector Control advocates management of mosquito populations when and where necessary by means of integrated programs designed to benefit or to have minimal adverse effects on people, wildlife, and the environment. This Integrated Pest Management (IPM) policy recognizes that mosquito populations cannot always be eliminated but often must be suppressed to tolerable levels for the well-being of humans, domestic animals, and wildlife and that selection of scientifically sound suppression methods must be based on consideration of what is ecologically and economically in the long-term best interest of mankind.

The following principles are advocated:

- Mosquito control measures should be undertaken only when there is adequate justification based upon surveillance data.

- IPM programs should be tailored to the needs and requirements of the local situation. The combination of methods for mosquito control should be chosen after careful consideration of the efficacy, ecological effects, and costs versus benefits of the various options, including public education, legal action, natural and biological control, elimination of breeding sources, and insecticide applications.

- Mosquito breeding sources, whether natural or created by human activity should be altered in such a manner as to cause the least undesirable impact on the environment.

- Insecticides and application methods should be used in the most efficient and least hazardous manner, in accordance with all applicable laws and regulations and available scientific data. The registered label requirements for insecticide should be followed. When choices are available among effective insecticides, those offering the least hazard to non-target organisms should be used. Insecticides should be chosen and used in a manner that will minimize the development of resistance in the mosquito population.

- Personnel involved in mosquito management programs should be properly trained and supervised, and certified in accordance with relevant laws and regulation and should keep current with improvements in management techniques through continuing education and/or training programs.

All methods and materials used by TRMVC for the Chiloquin Vector Control District are based on these principles. An annual Pesticide Use Plan is prepared before every season and sent to the Health Division of the Oregon Department of Human Resources and the Habitat Conservation Division of the Oregon Department of Fish and Wildlife. These two agencies must give approval on a yearly basis to any agencies intending to use chemicals for Vector Control.

MOSQUITOES OF CHILOQUIN VECTOR CONTROL DISTRICT

1. *Aedes aboriginis*
2. *Aedes campestris*
3. *Aedes cataphylla*
4. *Aedes cinereus*
5. *Aedes communis*
6. **Aedes dorsalis*
7. *Aedes exrucians*
8. *Aedes fitchii*
9. **Aedes Increpitus*
10. *Aedes intrudens*
11. *Aedes melanimon*
12. **Aedes nigromaculis*
13. *Aedes niphadopsis*
14. **Aedes vexans*
15. **Anopheles freeborni*
16. *Culex peus*
17. *Culex pipiens*
18. *Culex tarsalis*
19. *Culex territans*
20. *Culiseta impatiens*
21. *Culiseta incidens*
22. **Culiseta inornata*
23. *Culiseta minnesotae*

** Indicates species that pose a control problem*
(These lists were comprised during the CVCD mosquito surveys from 2002-2007 and 2012-2016).

MOSQUITO INFORMATION

I. Anopheles

II.

Anopheles freeborni

An. freeborni (the western malaria mosquito) enters homes and animal shelters readily biting at dusk and dawn. In the fall, generally beginning in early September, the females seek shelter in buildings, culverts, cellars, and other protected places. On warm days in March and April females sometimes leave their shelters to feed and bite viciously. They are also a pest in the summer months with their peak period of biting activity during July and August.
Rain pools, river seepage areas, marshes, swamps, semi-permanent or permanent ponds in irrigated pastures and drainage ditches are sources commonly found to be breeding sites for this mosquito. Clear, sunlit water with emergent vegetation and floating algae is preferred.
Other Anopheles of lesser importance found in Chiloquin are**:**

- *An. punctipennis*
- *An. occidentalis*
- *An. Pseudopunctipennis*

II. Aedes

Aedes vexans

*Ae. ve*xans(the irrigated pasture mosquito) is associated with intermittently irrigated crops, primarily with irrigated pastures and alfalfa. A brood is usually produced in sequence with each irrigation cycle, which can occur every 7 to 14 days.

The irrigation season usually extends from May to October. This is a major pest mosquito in Chiloquin readily attacking humans and animals during the day, and is most active at dusk. Large populations can be an annoyance to domestic animals and to persons engaged in recreation and labor.

Ae. vexans larvae are vigorous swimmers and are usually found in open fields where water remains stagnant following an irrigation. The length of the aquatic stage is influenced by temperature and can vary from five days at 86 degrees F to 16 days at 50 degrees F. During midsummer the larvae grow rapidly and pupate in three days. Peak production is reached in July and August. This combination of rapid growth rate, adult populations of up to 15 million per acre, and a flight range of up to 20 miles makes this mosquito one of the toughest problems to control.
Other flood water mosquitoes that occur in Chiloquin are:

- *Ae. melanimon*
- *Ae. nigromaculis*
- *Ae. melanimon*
- *Ae. dorsalis*
- *Ae. Sierrensis*

Aedes increpitus

In Chiloquin the larvae of *Ae. increpitus* are found in pools along streams left when spring floodwaters subside and in brush or tree covered depressions filled by heavy rains. The adult mosquitoes become active in late spring and early summer, sometimes flying several miles in search of a blood meal. *Ae. increpitus* are persistent biters and continue to be a problem in some areas of the County where housing developments have been built close to existing seasonal creeks and streams.

Aedes communis

Ae. communis (the snow water mosquito) is generally a mountain mosquito, associated with pools of water from melted snow. The females are often serious pests in the forests where they may be encountered in swarms in the spring, biting mostly in the shade or after sundown.
Other mosquitoes found in Chiloquin that are associated with pools of melted snow water are:

- *Ae. Fitchii*

III. Culiseta

Culiseta incidens

Cs. incidens (the cool weather mosquito) are found throughout Klamath County in natural depressions filled with rain or irrigation water and in artificial containers. Examples include troughs, hoof prints, ground pools, rock pools, and log ponds. In our area where the winter climate is moderate, breeding may take place throughout the entire year.

Cs. incidens is a large mosquito and extremely annoying in some areas. Adult mosquitoes have been observed biting on sunny days in mid winter but have a peak activity period between May and August.

Other cool weather mosquitoes found in Chiloquin are:

- *Cs. impatiens*
- *Cs. inornata*
- *Cs. Minnesotae*

IV. Culex

Culex tarsalis

Cx. tarsalis (the western encephalitis mosquito) is the most common of the *Culex* in Chiloquin. The larvae develop in nearly any conceivable containers holding water such as tires, rain gutters, bird baths, rooting buckets, discarded containers, standing pasture water, etc. The females are painful and persistent biters, attacking at dusk and after dark, and readily enter dwellings for blood meals. The adults hide in sheltered places during the day. Mosquitoes of this species can fly considerable distances (up to 16 miles) and when a large untreated source hatches off it can provide a community with several months of biting pests. *Culex* mosquito species are the species of mosquitoes known for the transmission of West Nile Virus.

Culex peus

This species is found in most types of moderately polluted types of water, such as mill ponds but are also found in road culverts, ornamental pools, and other semi-permanent sites.

***Culex pipiens* (Northern House Mosquito)**

The larvae of this mosquito are found in the polluted water of open septic drains and cesspools. They may be associated with *Cx. peus* past mid-summer in semi-polluted environments such as rain barrels or other artificial containers.

Other Culex mosquitoes found in Chiloquin are:

- *Cx. territan*