



2018 Annual Report Town of Johnstown Mosquito Control Program



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**Town of Johnstown
Mosquito Management Operations**

Annual Report For 2018

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Program Objectives

Vector Disease Control International, LLC (VDCI) completed its 15th year of cost-effective Integrated Mosquito Management (IMM) for the Town of Johnstown in 2018. The primary objective of Johnstown's IMM Program is to monitor and reduce mosquito populations through the use of specific, environmentally sound, control techniques in order to protect its residents from the threat of mosquito-borne diseases. VDCI prioritizes the detection and elimination of larval mosquitoes in aquatic habitats, in conjunction with the monitoring of adult mosquito populations through routine surveillance, in order to assess West Nile virus vector species abundance in the area.

Open communication is maintained by VDCI between the HOA Residents, Property Management Companies, the Weld and Larimer County Departments of Health & Environment and surrounding municipalities to ensure that the highest level of mosquito control and epizootic response is achieved. This diligent and cooperative communication is important to the Town of Johnstown's mosquito management program and provides significant benefit to public health throughout the entire area.

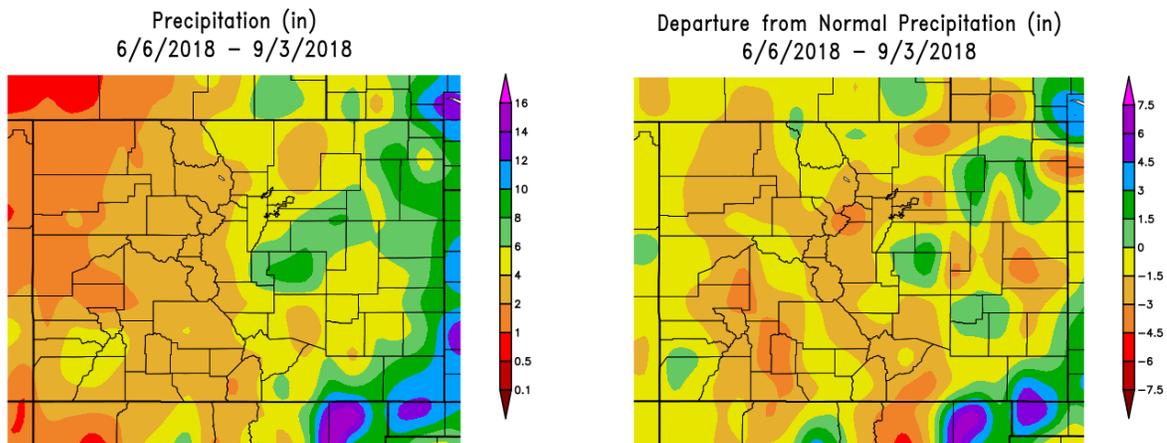
VDCI's Commitment

Vector Disease Control International is a company built on the foundations of public health, ethics, professionalism, and technical expertise. VDCI is committed to providing our customers with scientifically based, environmentally sensitive and technologically advanced Integrated Mosquito Management (IMM) programs of the highest quality. All of our employees are committed to excellence in vector control and public health and strive to improve the quality of human life in communities through public education and the control of mosquitoes and the diseases they can transmit. VDCI currently has programs across the state of Colorado, providing services for towns, cities, counties, homeowners associations, and encephalitis surveillance monitoring programs for county health departments.

Vector Disease Control International, as the contractor for the Town of Johnstown, will continue to use proven scientific Integrated Mosquito Management techniques to survey and control local mosquito populations using biorational larval controls and limited low-toxicity insecticide applications. All of the methods and materials used have been reviewed and registered by the US Environmental Protection Agency, the Centers for Disease Control, the Colorado Department of Agriculture and the American Mosquito Control Association.

2018 Season Perspective

At VDCI we have come to expect each Colorado summer to present a unique set of temperature, precipitation, irrigation, and human interactions that combine to create new and different challenges in both mosquito control and mosquito-borne disease proliferation. The late-spring and early summer of 2018 started off with an earlier than normal peak runoff from snow melt. As the season started, precipitation was significantly lower than average throughout most of the state causing drought conditions with larval production concentrated along the river and permanent water sources. Rainfall throughout Larimer and Weld County was 1.5 inches below historical averages but came in significant bursts throughout the season creating significant flooding and altered landscape in some areas. Mosquito abundance remained above historical averages for most of the season. However, West Nile virus activity in both mosquito and human populations remained below average throughout the summer.

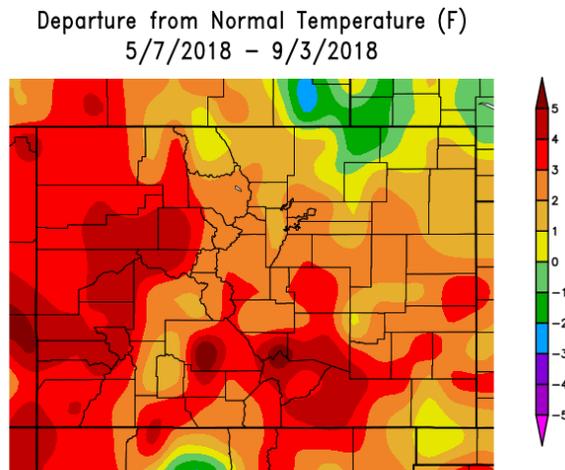


Generated 9/4/2018 at HPRCC using provisional data.

NOAA Regional Climate Centers Generated 9/4/2018 at HPRCC using provisional data.

NOAA Regional Climate Centers

Temperatures throughout Northern Colorado seem to increase every summer and 2018 was no different. The High Plains Regional Climate Center reports temperatures 2-3 degrees higher than average throughout the 2018 summer months. As temperatures increase so does the rate of growth in larval mosquito populations.



Generated 9/4/2018 at HPRCC using provisional data.

NOAA Regional Climate Centers

West Nile Virus Season

Since the introduction of West Nile virus to the United States in 1999, the virus has made a complete westward expansion to the West Coast. Starting in the Northeastern parts of the United States, the virus steadily spread through the South, the Midwest, the Rocky Mountain region and to the Western States. This extensive distribution is due to the ability of WNV to establish and persist in the wide variety of ecosystems present across the country. WNV has been detected in 65 different mosquito species in the U.S., though it appears that only a few *Culex* species drive epizootic and epidemic transmission (WNV Guidelines, CDC 2013). Although West Nile virus has been endemic to the United States since 1999, researchers continue to seek an understanding for some of the factors which contribute to region specific spikes in vector abundance and human risk. We still do not understand why some humans develop West Nile fever while other infections develop into more serious West Nile encephalitis or West Nile meningitis cases. Additionally, physicians and researchers continue to seek answers to the variable recovery times and occurrence of deaths that result with some infections. WNV has expanded to the point that it can now be found in all 48 contiguous states and since its introduction has produced two additional, large nationwide epidemics in 2003 and 2012 (WNV Guidelines, CDC 2013).

As of September 4, 2018, a total of 45 states and the District of Columbia have reported West Nile virus infections in people, birds, or mosquitoes in 2018. Overall, 559 cases of West Nile virus disease in people have been reported to CDC. Of these, 312 (56%) were classified as neuroinvasive disease (such as meningitis or encephalitis) and 247 (44%) were classified as non-neuroinvasive disease.

West Nile Virus Activity by State – United States, 2018 (as of September 4, 2018)



*WNV human disease cases or presumptive viremic blood donors. Presumptive viremic blood donors have a positive screening test which has not necessarily been confirmed.

As of September 4th, the Centers for Disease Control has reported 16 cases of human West Nile virus (WNV) infections from the state of Colorado. 8 of these cases were neuroinvasive including symptoms of meningitis or encephalitis (including meningoencephalitis), and 8 were non-neuroinvasive which includes cases where individuals are non-symptomatic or present with fever and other minor symptoms. To date, there have been no deaths associated with West Nile virus infections from Colorado in 2018.

West Nile Virus Disease Cases by State 2018



West Nile Virus Disease Cases* and Presumptive Viremic Blood Donors by State – United States, 2018 (as of September 4, 2018)

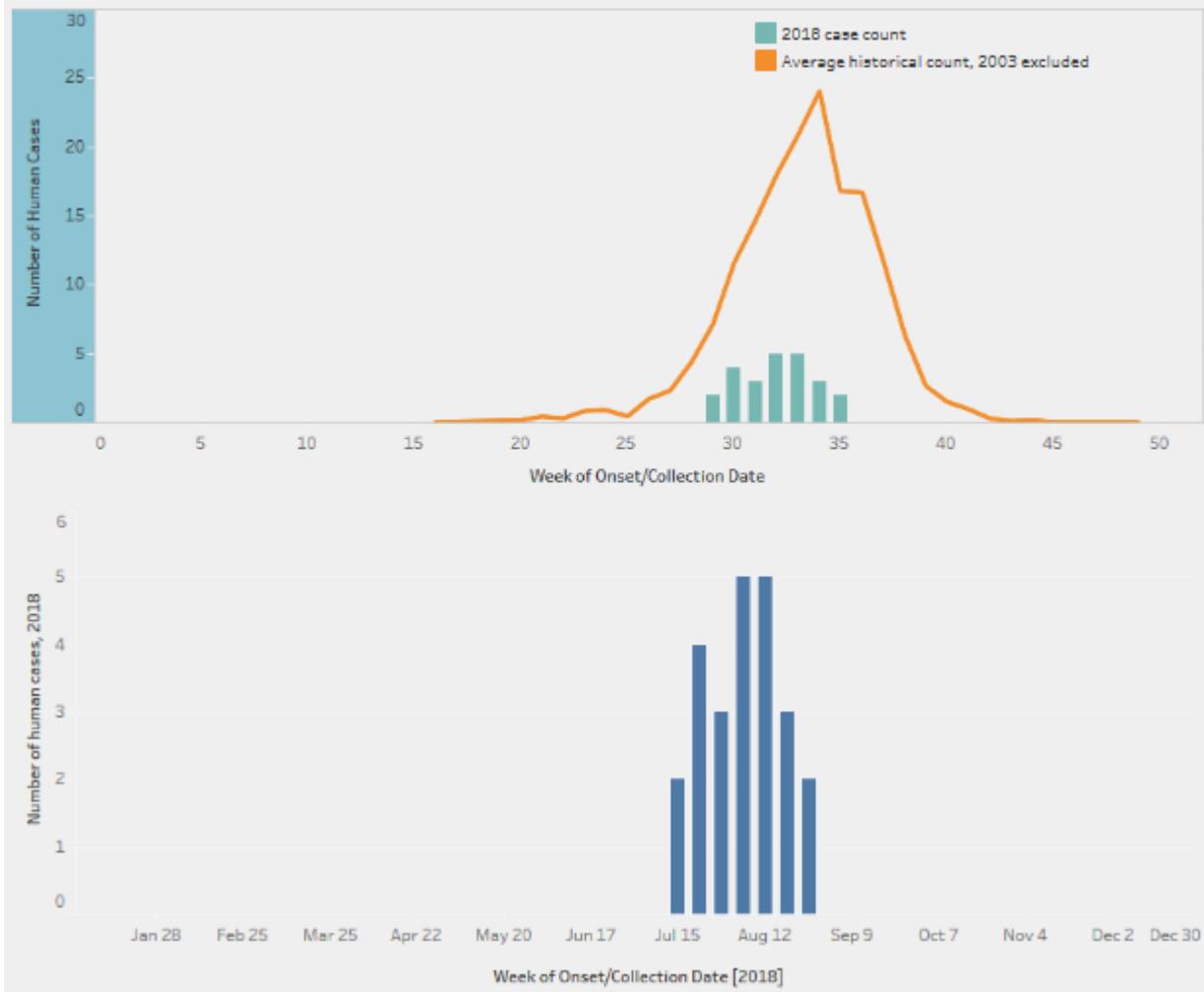
State	Neuroinvasive Disease Cases†	Non-neuroinvasive Disease Cases	Total cases	Deaths	Presumptive viremic blood donors‡
Colorado	8	8	16	0	1

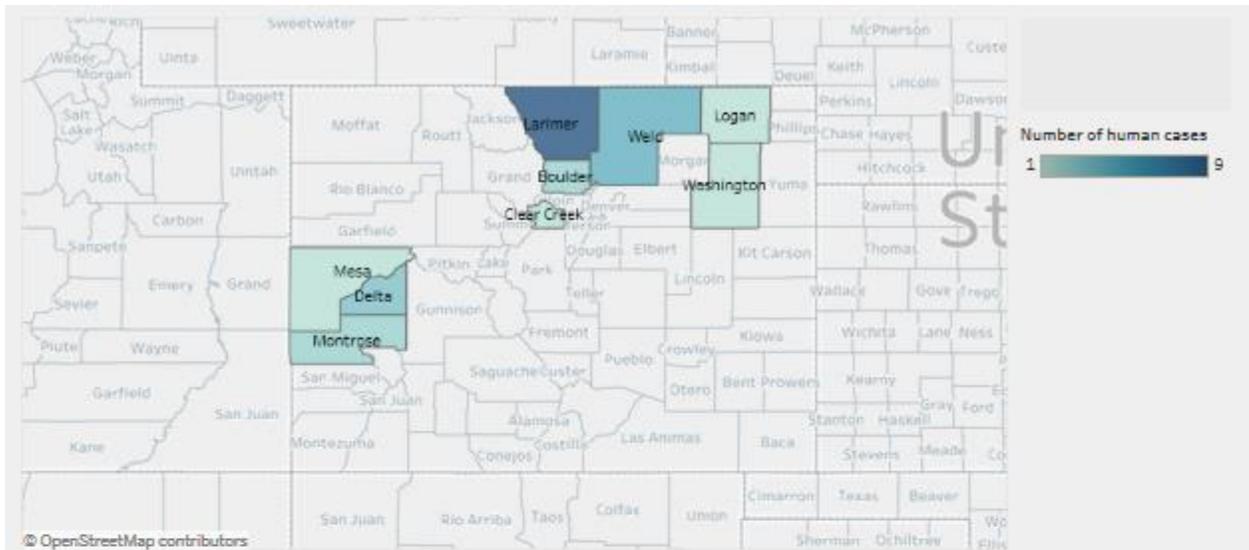
(<https://www.cdc.gov/westnile/statsmaps/preliminarymapsdata2018/disease-cases-state.html>)

The Colorado Department of Health and Environment reports a total of 24 human cases of West Nile virus infection from the state of Colorado. Many of these human cases are concentrated in Northern Colorado with 9 human cases reported from Larimer County, 4 from Weld County and 2 from Boulder County. While we have passed the historical peak of WNV risk these numbers are expected to rise as there is often a delay in onset of symptoms, diagnosis and reporting. Please note that the additional cases reported by CDPHE will also be reported to the Centers for Disease Control.

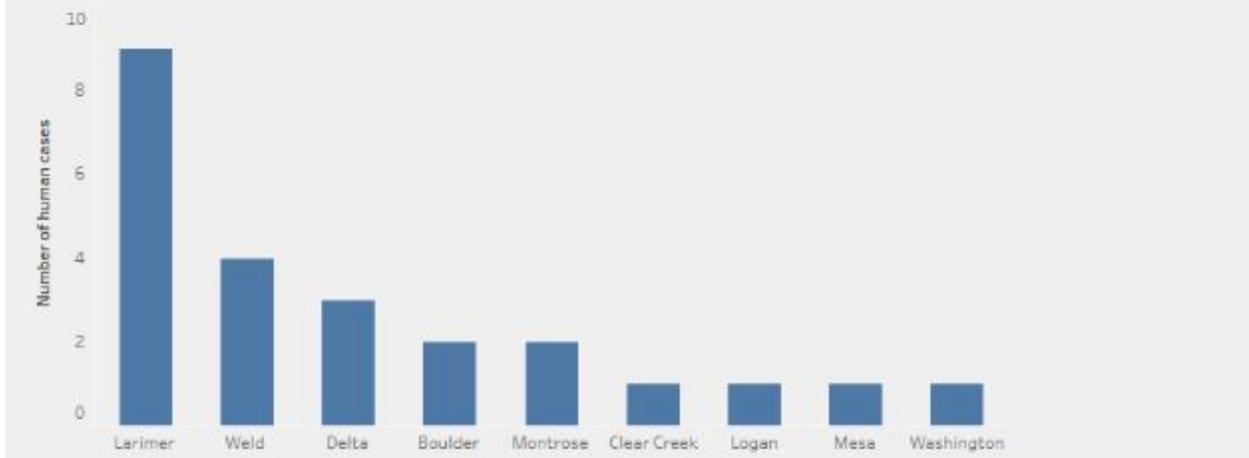
Nine Counties across the state of Colorado have reported human West Nile virus infection. These include Larimer, Boulder, Weld, Clear Creek, Delta, Logan, Mesa, Montrose and Washington.

Current human case count: 24





Year: 2018



Larval Mosquito Control

Larval mosquito control is the foundation of the Town of Johnstown's Mosquito Control program and can be an extremely effective way to manage mosquitoes, thereby reducing the number of potential disease vectors and annoyances associated with biting adults. Years of research and practical experience have shown that the most effective way to control mosquito populations is through an aggressive Integrated Mosquito Management (IMM) approach. This approach aims at using a variety of concepts, tools, and products to reduce a pest population to a tolerable level.

Pre-season larval control work involved ground truthing GIS maps and remapping areas where new development or flooding had altered the landscape. VDCI began larval site inspections in many areas mid-April. Hiring of seasonal field technicians began in March and continued into May. VDCI's Annual Field Technician Classroom Training Day took place on May 21st with over 50 new and returning field technicians in attendance. Field training by VDCI management and veteran employees lasted through May and full-time field activities were in force by mid-June.

In 2018 Vector Disease Control International performed 379 larval site inspections, of which 335 sites (88.4%) were wet upon inspection and 181 (54%) were producing mosquito larvae in the Town of Johnstown. VDCI applied 799.1 lbs. of VectoBac (Bti) and 14.8 gallons of BVA mineral oil to 184.5 acres of lands in the Town of Johnstown.

By comparison, Vector Disease Control International performed 397 larval site inspections, of which 363 sites (91.4%) were wet upon inspection and 202 (55.4%) were producing mosquito larvae in the Town of Johnstown during the summer of 2017. VDCI applied 1,191.8 lbs. of VectoBac (Bti), and 4.8 gallons of BVA mineral oil to 130.1 acres of lands in the Town of Johnstown.

Larval mosquito control can be achieved in several ways including biological, biochemical, chemical, and mechanical means. No single larvicide product will work effectively in every habitat where mosquito larvae are found, so a variety of products and methods should be employed. Additionally, although there are a variety of methods for reducing larval populations, some may have negative consequences that outweigh their benefits. Mechanical or physical habitat modification is a technique which VDCI uses on relatively small-scale projects, as the area to be modified must be carefully reviewed.

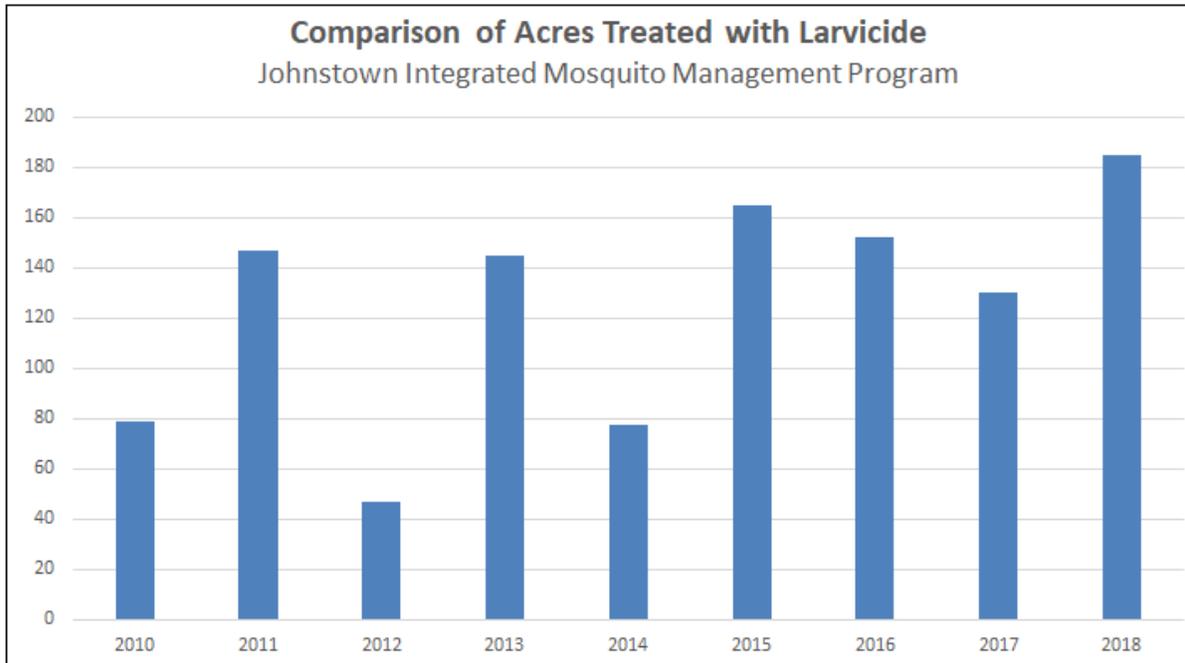


VDCI's favored method of larval mosquito control is through the use of bacterial bio-rational products. The main product used by VDCI is a variety of bacteria (*Bacillus thuringiensis var. israeliensis*). *Bti*, as it is known, has become the cornerstone of mosquito control programs throughout the world. The benefits include its efficacy and lack of environmental impacts. When used in accordance with its label, successful control of mosquito larvae can be achieved without impact to non-target species such as other aquatic invertebrates, birds, mammals, fish, amphibians, reptiles, or humans. A broad label allows for the use of the product in the

majority of the habitats throughout the service area. Another bacterial product closely related to *Bti* is *Bacillus sphaericus* (*Bs*). *Bs* provides similar benefits to *Bti* while also providing residual control of certain species of mosquitoes. It is used specifically in difficult to treat areas where *Culex* are the predominant species due to its limitations and high cost.

Other larval control products include the insect growth regulator methoprene (Altosid), and light mineral oils (BVA 2 larvicide oil). Methoprene is a synthetic version of a juvenile growth hormone in larval mosquitoes. The hormone prevents the normal development of larval mosquitoes into pupae and adults, eventually causing death. VDCI limits the use of chemical larvicides to areas with little biodiversity, such as road side ditches, or areas that chronically produce high mosquito populations. They are only used after a thorough assessment has been made of any habitat where their use is being considered. Mineral oil is the only product effective in controlling mosquito pupae and therefore is an essential tool when pupae are present.





VDCI Surveillance Laboratory

Information about mosquito abundance and species diversity is essential to integrated program. Vector Disease Control International utilizes two kinds of traps to monitor mosquito populations. The most commonly used is the CDC light trap which uses carbon-dioxide from dry ice as bait to attract female mosquitoes seeking a blood meal from a breathing animal. Once attracted by the CO₂, the mosquitoes are lured by a small light to a fan that pulls them into a net for collection. The second type of trap VDCI uses is called a gravid trap. Gravid traps use a tub of highly-organic water as bait to attract female mosquitoes that are looking for a place to lay their eggs. A fan placed close to the water surface forces mosquitoes that come to the water into a collection net. Once back in the laboratory, the contents of the trap nets are counted and speciated by trained technicians.

In 2018, Vector Disease Control International monitored a statewide network of hundreds of weekly trap sites, collecting 687,368 adult mosquitoes that were counted and identified to species by the VDCI Surveillance Laboratories. While individual traps provide only limited information, trap data is interpreted in the context of historical records for the same trap site, going back in time more than a decade. Individual traps are also compared to other traps from around the region that were set on the same night and therefore exposed to similar weather conditions. Technicians working in the Surveillance Laboratories at Vector Disease Control International are trained to provide accurate species-level identification of both larval and adult mosquitoes.



Additionally, the VDCI Surveillance Laboratory conducts an intensive larval identification program with larval mosquito samples collected by I&L technicians prior to larviciding being identified to species. This information is now invaluable in targeting mosquito control efforts as we gain a greater understanding of the habitat types preferred by Colorado mosquito species and the seasonality of these habitats as sites for mosquito development.

Specimens and data collected from these traps and larval identification are used in:

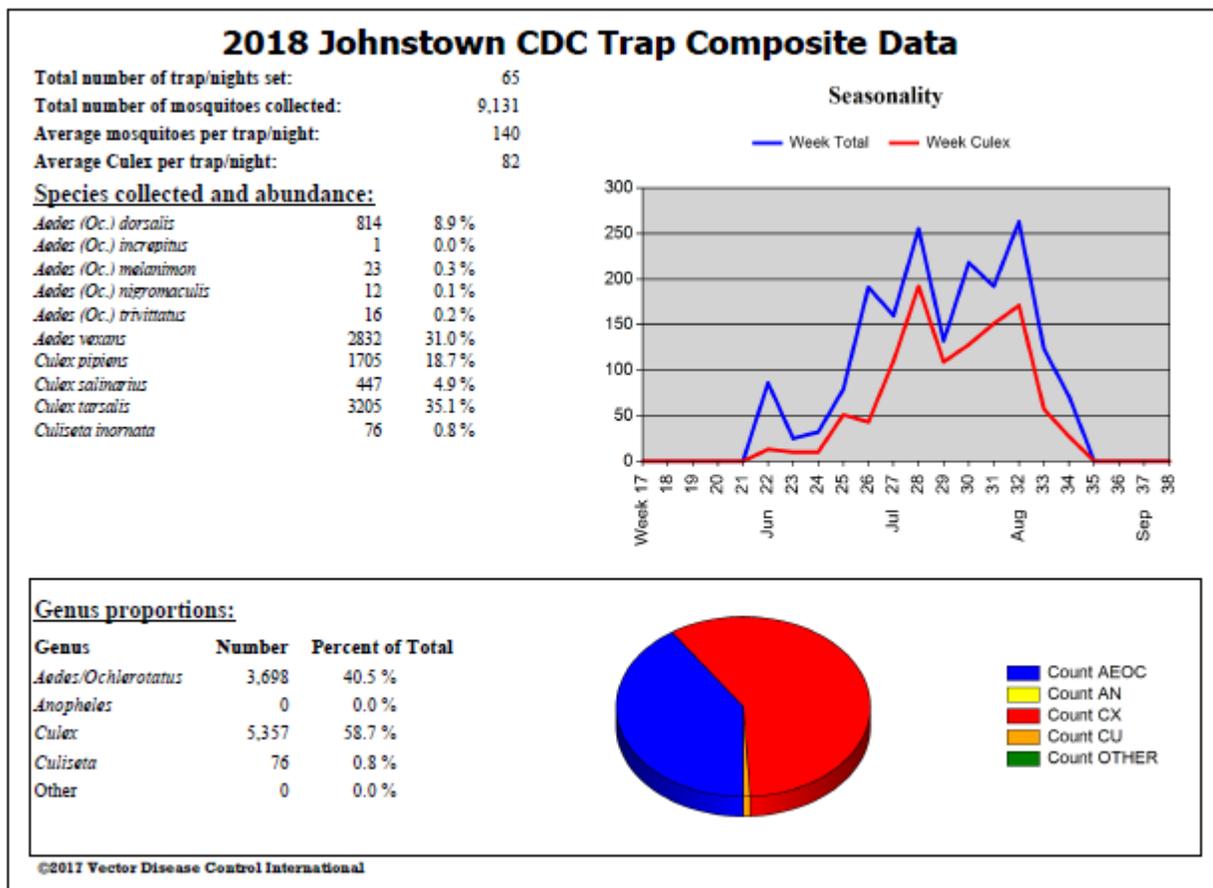
- ✿ Determining the effect of larval control efforts. Each mosquito species prefers specific kinds of habitats for larval development. If a trap includes large numbers, it could indicate the presence of an unknown larval habitat and, based on the species identification and known habitat preference for that species, direct field technicians as to possible sources of the mosquitoes collected.
- ✿ Determining larval and adult mosquito species. This helps to illustrate the threat of mosquito-borne disease amplification and transmission because different mosquito species can vector different diseases to people and animals.
- ✿ Determining where adult control efforts were necessary. While mosquito eradication is impossible, significant population reduction is achievable. In places where larval control is insufficient, such as neighborhoods where adult mosquitoes have migrated in from outside of the control area, it may be necessary to use adulticide methods, such as ULV truck fogging or barrier sprays of harborage areas. Trap counts that exceed an acceptable threshold for an area may trigger adult control measures.
- ✿ Surveillance for Mosquito-borne Disease. Historically, VDCI efforts were targeted primarily at controlling mosquito nuisance problems with limited disease surveillance. However, since the arrival of the West Nile virus in Colorado in August of 2002, the paradigm has shifted toward disease prevention and control. Accurate species identification of the mosquitoes in the traps is important when monitoring species population trends. It also is necessary for evaluating whether a population spike represents an actual increase in disease transmission potential or only an increased nuisance level.

SURVEILLANCE LIGHT TRAP DATA

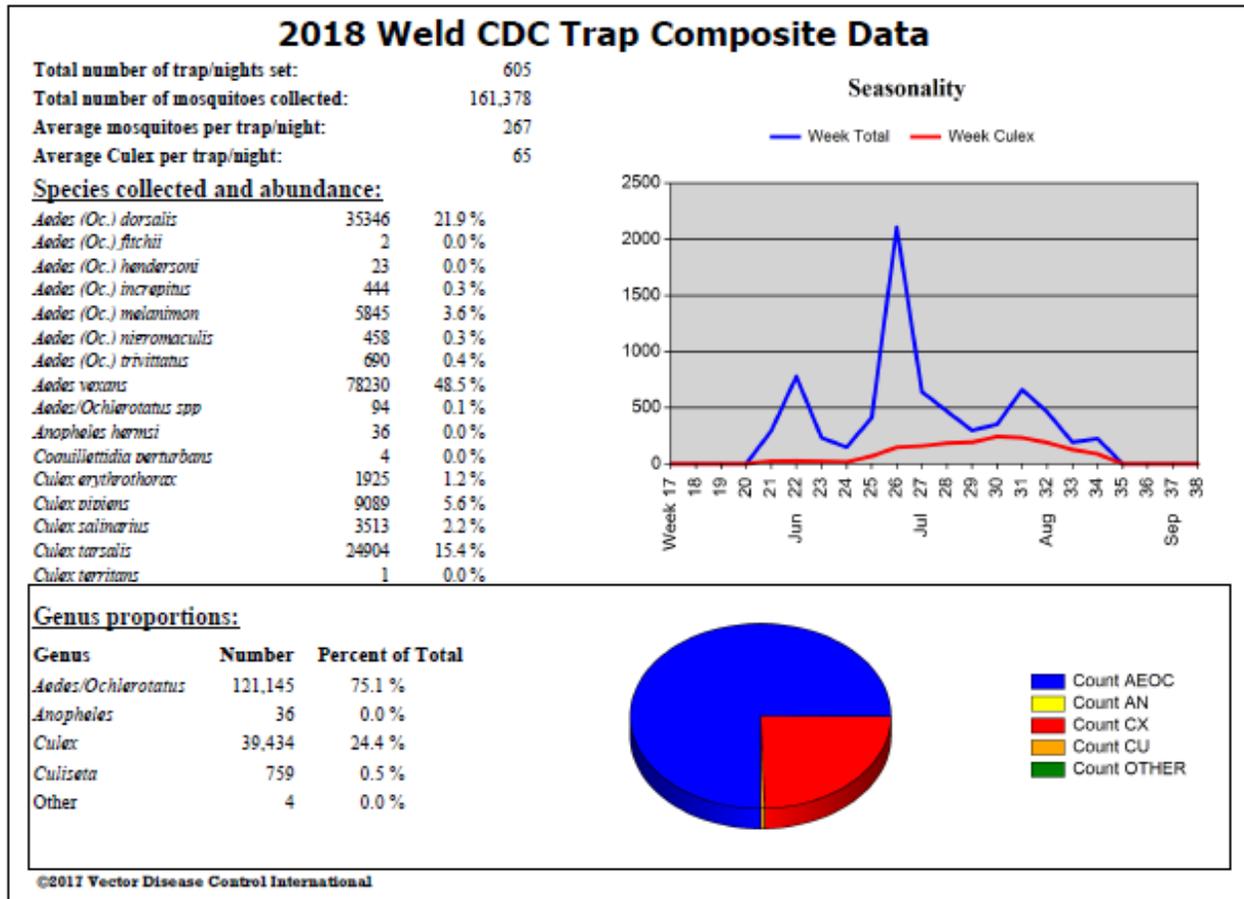
In 2018, an average of 5 surveillance light traps monitored adult mosquito populations within the Town of Johnstown on a weekly basis. Surveillance trapping began the week of June 1st and full-scale trapping was concluded on August 31st. There were 65 CDC light surveillance traps set within the Town of Johnstown, which collected a total of 9,131 mosquitoes. This year there was an average of 140 mosquitoes caught per trap per night and an average 82 *Culex* mosquitoes per trap per night. The composition of mosquitoes collected was 58.7% (5,357) *Culex spp.*, 40.5% (3,698) *Aedes/Ochlerotatus spp.*, and less than 1% (76) *Culiseta spp.* Please refer to the Light Trap Genus Summary for a weekly breakdown of mosquitoes collected by trap location.

In 2017, an average of 5 surveillance light traps monitored adult mosquito populations within the Town of Johnstown on a weekly basis. Surveillance trapping began the week of June 1st and full-scale trapping was concluded on August 31st. There were 65 CDC light surveillance traps set within the Town of Johnstown, which collected a total of 15,847 mosquitoes. This year there was an average of 244 mosquitoes caught per trap per night and an average 60 *Culex* mosquitoes per trap per night. The composition of mosquitoes collected was 24.6% (3,905) *Culex spp.*, 75.2% (11,922) *Aedes/Ochlerotatus spp.*, and less than 1% (16) *Culiseta spp.* Please refer to the Light Trap Genus Summary for a weekly breakdown of mosquitoes collected by trap location.

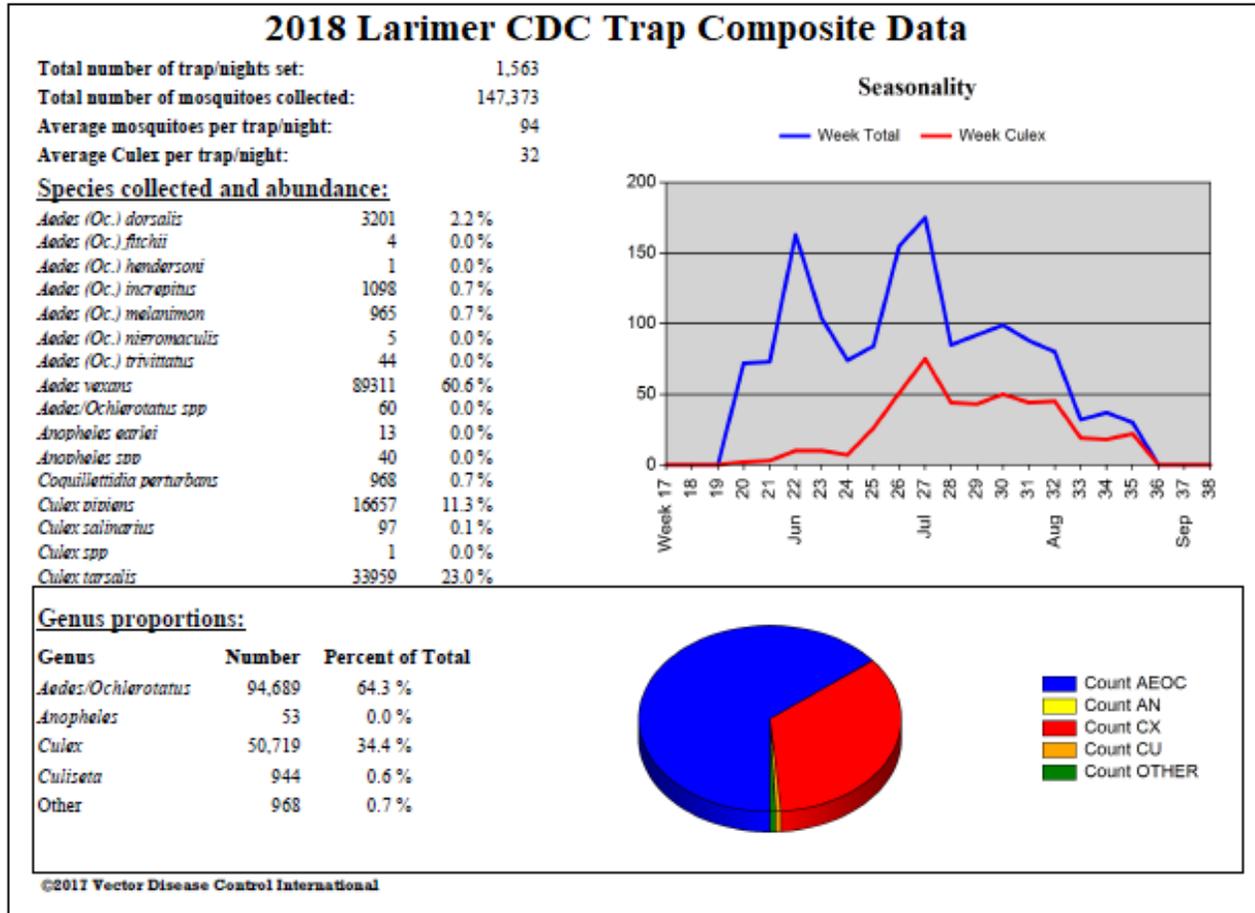
In 2016, an average of 5 surveillance light traps monitored adult mosquito populations within the Town of Johnstown. Surveillance trapping began the week of June 1st and full-scale trapping was concluded on August 28th. There were 59 CDC light surveillance traps set within the Town of Johnstown, which collected a total of 6,588 mosquitoes. There was an average of 112 mosquitoes caught per trap per night and an average 55 *Culex* mosquitoes per trap per night. The composition of mosquitoes collected was 49.7% (3,273) *Culex spp.*, 50.1% (3,298) *Aedes/Ochlerotatus spp.*, and less than 1% (16) *Culiseta spp.*



In 2018, there were a total of 605 surveillance light traps set within the entire Weld County area, which collected 161,378 total mosquitoes. The average number of mosquitoes collected per trap per night was 267 and the average number of *Culex spp.* mosquitoes collected per trap per night was 65. See image below for percent composition of mosquitoes collected in Weld County.



In 2018, there were a total of 1,563 surveillance light traps set within the Larimer County area, which collected 147,373 total mosquitoes. The average number of mosquitoes collected per trap per night was 94 and the average number of *Culex spp.* mosquitoes collected per trap per night was 32.



CSU WEST NILE VIRUS MOSQUITO SAMPLE TESTING RESULTS - LARIMER COUNTY

Many local health departments have moved towards mosquito-based surveillance indicators to assess the weekly risk of West Nile transmission and guide response decisions for adult mosquito control applications. The vector index and infection rate is derived by testing the mosquitoes VDCI collects for the presence of West Nile virus. This value is closely monitored by the CDPHE and local health departments to evaluate the risk posed by the vector mosquito population.

As defined in the CDC guidelines for West Nile virus surveillance, prevention and control, the vector index (VI) is an estimate of the number of West Nile virus infected mosquitoes in an area. This number can serve as a human health risk value. An operational value of 0.5, which was derived from the comparison of historical data for human infections, as well as relative abundance and infection in mosquitoes, serves as an indicator of high risk for West Nile virus transmission to humans in the corresponding area. As the value of the vector index increases there is a corresponding risk of human disease and this value can be used to offset epidemics.

Due to budget cutbacks associated with West Nile virus surveillance in recent years, the CDPHE does not have the ability to test mosquitoes from across the state. As a result, there is very limited testing done within unincorporated Weld County and limited traps tested from the Town of Johnstown in 2018. As stated on the CDPHE website, the seasonal variation of West Nile virus risk can change throughout a summer and it is best to assume you have some risk for WNV if you have mosquitoes.

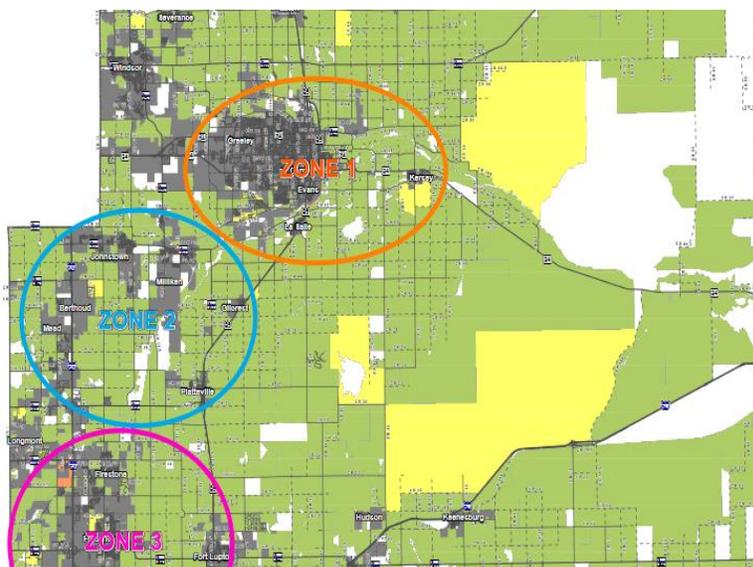
As of Sept 1st, 2018 Colorado State University's Department of Microbiology, Immunology and Pathology, has tested a total of 1,283 mosquito pools from Larimer County. A total of 85 mosquito pool samples have tested positive for WNV with 4 of those being collected from Berthoud, 5 from Loveland and 76 from the City of Fort Collins. Testing of these mosquitoes for West Nile virus is paid for by the City of Fort Collins, Loveland, and Berthoud. It is important to note that the large number of WNV positive sample pools reported from Fort Collins is highly correlated with the fact they test all mosquitoes with the potential for transmitting disease versus just a subset of the population.

CDPHE WEST NILE VIRUS MOSQUITO SAMPLE TESTING RESULTS – WELD COUNTY

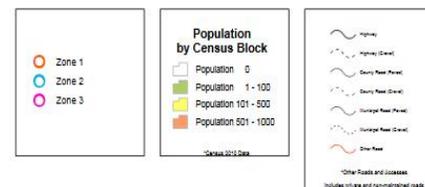
In 2018 there were a total of 164 mosquito pools samples submitted for West Nile virus testing from mosquitoes collected in Weld County from all three sentinel zones. There were 17 confirmed positive samples.

32 samples containing mosquitoes from the Town of Johnstown were submitted for WNV testing in the 2018 season and only two of those came back positive. These samples were collected in Disease Week 33 (August 14th).

Vector Index Log			
Week	Zone 1	Zone 2	Zone 3
June 10-16	0	0	0
June 17-23	0	0	0
June 24-30	0	0	0
July 1-7	0	0	0
July 8-14	0	0	0.07
July 15-21	0	0	0
July 22-28	0.20	0.20	0.20
July 29-August 4	0.00	0.67	0.40
August 5-11	0.46	0.37	0.19
August 12-18	0.20	0.61	0
August 19-25	0	0.20	0.17



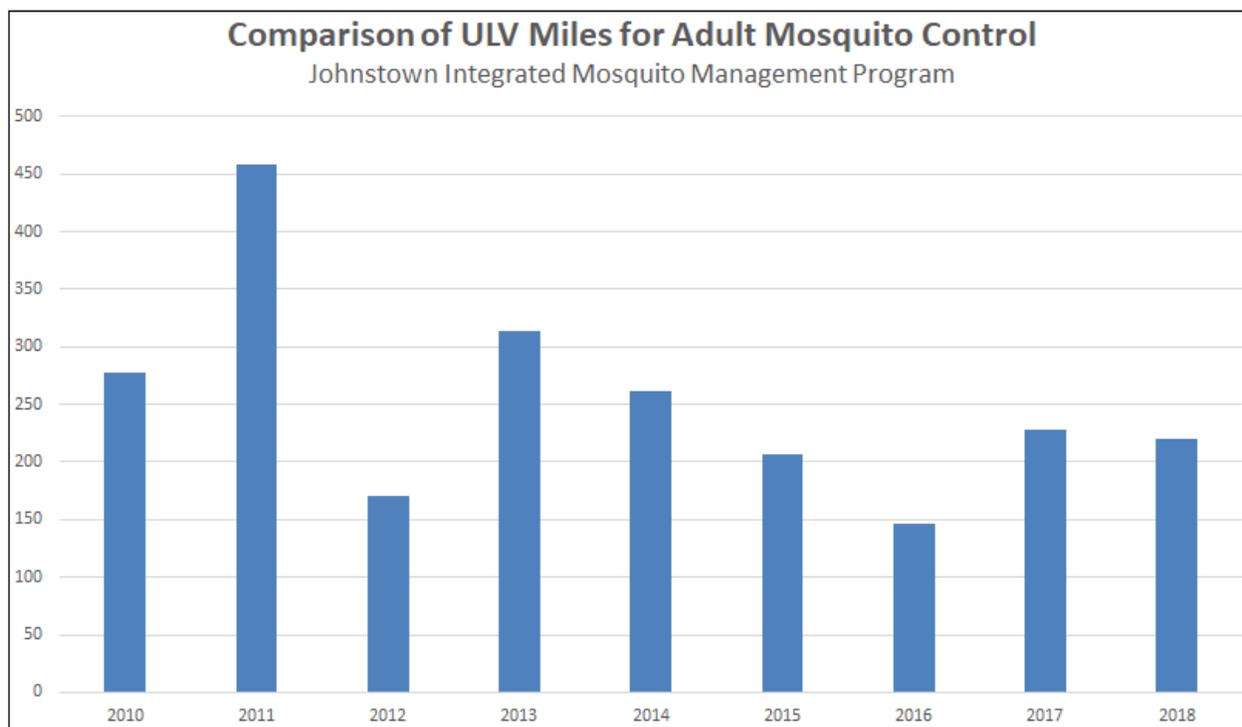
**Trap Site Zones
for West Nile Virus**
Weld County
Weld County GIS
August 2013



ADULT MOSQUITO CONTROL

The goal of Vector Disease Control International is to provide our customers with the best options for safe, effective, modern mosquito management. The primary emphasis of the Town of Johnstown Mosquito Management Program is to control mosquitoes in the larval stage, using safe biological control products. When mosquito counts surpass nuisance or disease thresholds of 100 mosquitoes or 50 *Culex* mosquitoes respectively, VDCI uses EPA and CDC approved adulticides to reduce mosquito populations. During the 2018 season a total of 220 miles of roads and access paths within the Town of Johnstown were fogged using AquaKontrol 3030.

VDCI uses state of the art technology, calibrated application timing, and least-toxic products to minimize non-target impacts. All adult mosquito control is accomplished using Ultra Low Volume (ULV) fogging equipment and performed after dusk when the majority of mosquito species are most active. This type of equipment produces droplets averaging 12 microns in diameter and allows for a minimal amount of product to be put into the environment. These treatments take place in the evening when mosquitoes are flying in greater numbers and non-target insect activity (for example, day-flying pollinators like bees) is greatly reduced. Using this application technique, the overall goal of minimal environmental impact and effective adult control is achieved in the targeted area.



Public Relations and Education

VDCI is dedicated to providing strong Public Outreach and Education Programs to residents in all of our communities. Citizen complaints, inquiry, information and satisfaction surveys can aid in evaluating the effectiveness of a program. VDCI constantly looks for ways to better serve the communities we work with and encourages both the citizen and local media involvement in order to increase the effectiveness of our programs. We have clearly demonstrated that commitment and belief by proactively serving the Town of Johnstown (and all of our contracted communities) with numerous innovative programs, activities and services.

Customer service is always a high priority for VDCI. We take pride in training each and every technician so that they have the knowledge to provide residents with the correct answers to their questions. Each field technician spends part of their day responding to resident concerns in their work area. This in-field customer service personalizes the mosquito control program, provides VDCI with local information on mosquito activity and presents a valuable opportunity to educate our residents about mosquito biology and control.

MosquitoLine™

VDCI maintains a toll-free telephone line (877-276-4306) and local line to the Northern Colorado Office (970-962-2582) at no cost to the customer. This service can be utilized to accept calls from the public concerning:

- ☞ Information about mosquito biology and source reduction of mosquito habitats
- ☞ Information on program components, operations, and monitoring
- ☞ Seasonal West Nile virus activity
- ☞ Personal protection options for mosquito annoyances and West Nile virus risk
- ☞ Reports about mosquitoes and possible larval mosquito habitats
- ☞ Requests to perform larvicide applications and/or opt-out of any adulticide spraying via a shut-off list
- ☞ Request notification when adulticide spraying is planned in their neighborhood
- ☞ Request health and safety information about mosquito control operations and pesticide products used

VDCI has provided Mosquito Hotlines to the residents in communities which we are contracted to also reduce workload by municipal personnel. This enables direct communication and response by mosquito control employees to resident's concerns about West Nile virus and larval site activity and treatment. VDCI maintains a log of calls received and will summarize call activity in monthly and annual reports.

VDCI received 9 mosquito annoyance phone calls, and 31 spray notification requests from residents of Johnstown during the month of July 2018. Residents were informed of fogging thresholds and directed to www.vdci.net/colorado to access fogging schedules and trap data. Spray notification requests were added to our database and these individuals will be informed when adult mosquito control measures are schedules to take place in their area.

CALL NOTIFICATION & SHUTOFF SYSTEM

As a courtesy to its customers VDCI maintain a comprehensive Call Notification & Shutoff database and will notify residents on the list when conducting ULV adulticide spray applications within the Town of Johnstown.

DAILY POSTING OF ULV SPRAY ZONES are maintained and updated online daily at <http://www.vdci.net/colorado>

Appendix 1: Town of Johnstown Individual Light Trap Summaries

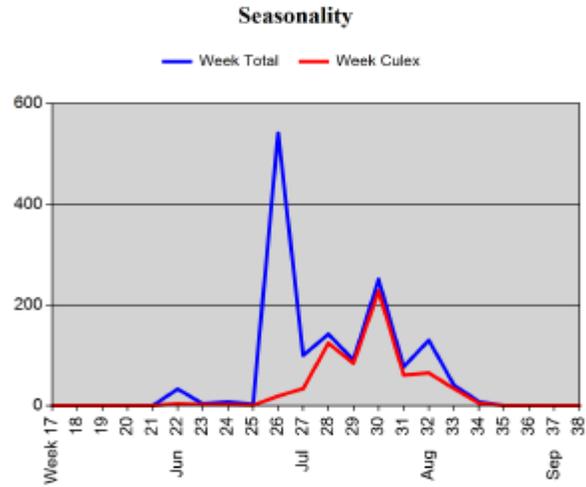
JT-03: Johnstown Central Rolling Hills Ranch

Season: 2018
 Trap Type: Light/CO2 - WCSZ2 Sentinel Zone
 Location: 23161 Telep Ave. (WCR 15)
 GPS: N40° 20.235', W104° 55.485'

Total number of trap/nights set: 13
 Total number of mosquitoes collected: 1,429
 Average mosquitoes per trap/night: 110
 Average Culex per trap/night: 51

Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	510	35.7 %
<i>Aedes (Oc.) melanimon</i>	9	0.6 %
<i>Aedes (Oc.) nigromaculis</i>	10	0.7 %
<i>Aedes (Oc.) trivittatus</i>	1	0.1 %
<i>Aedes vexans</i>	233	16.3 %
<i>Culex pipiens</i>	235	16.4 %
<i>Culex salinarius</i>	81	5.7 %
<i>Culex tarsalis</i>	347	24.3 %
<i>Culiseta inornata</i>	3	0.2 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	763	53.4 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	663	46.4 %
<i>Culiseta</i>	3	0.2 %
Other	0	0.0 %



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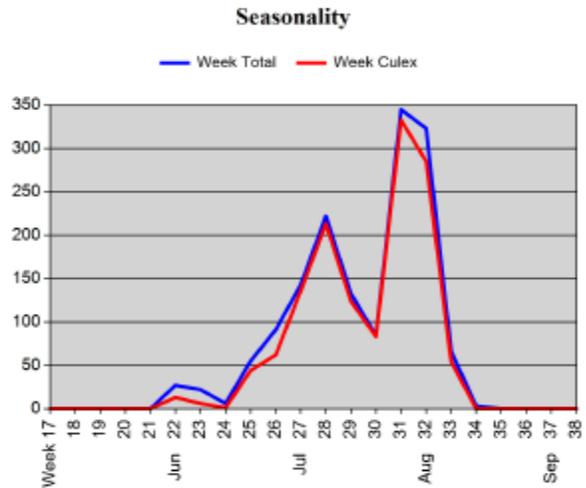
JT-04: Johnstown West Johnstown Reservoir

Season: 2018
 Trap Type: Light/CO2
 Location: southeast corner of Johnstown Reservoir
 GPS: N40° 20.220', W104° 57.580'

Total number of trap/nights set: 13
 Total number of mosquitoes collected: 1,520
 Average mosquitoes per trap/night: 117
 Average Culex per trap/night: 104

Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	32	2.1 %
<i>Aedes vexans</i>	122	8.0 %
<i>Culex pipiens</i>	336	22.1 %
<i>Culex salinarius</i>	202	13.3 %
<i>Culex tarsalis</i>	816	53.7 %
<i>Culiseta inornata</i>	12	0.8 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	154	10.1 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	1,354	89.1 %
<i>Culiseta</i>	12	0.8 %
Other	0	0.0 %



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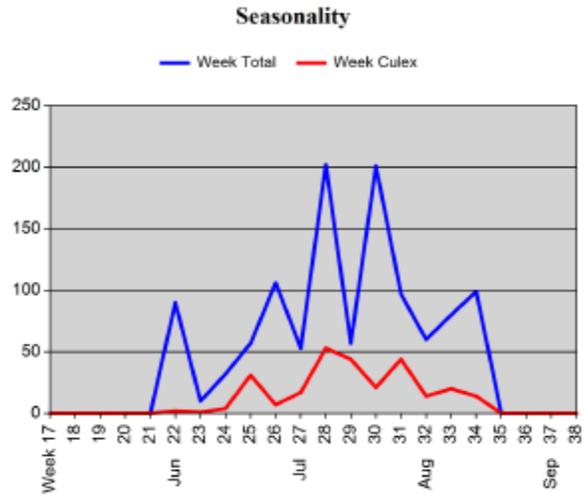
JT-05: Johnstown East - 237 2nd Street

Season: 2018
 Trap Type: Light/CO2
 Location: corner of Kuner Ave. and 2nd St.
 GPS: N40° 20.020', W104° 54.180'

Total number of trap/nights set: 13
 Total number of mosquitoes collected: 1,144
 Average mosquitoes per trap/night: 88
 Average Culex per trap/night: 21

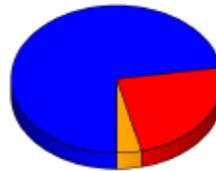
Species collected and abundance:

Species	Count	Percentage
<i>Aedes (Oc.) dorsalis</i>	152	13.3 %
<i>Aedes (Oc.) melanimon</i>	6	0.5 %
<i>Aedes (Oc.) nigromaculis</i>	2	0.2 %
<i>Aedes (Oc.) trivittatus</i>	4	0.3 %
<i>Aedes vexans</i>	665	58.1 %
<i>Culex pipiens</i>	83	7.3 %
<i>Culex salinarius</i>	38	3.3 %
<i>Culex tarsalis</i>	151	13.2 %
<i>Culiseta inornata</i>	43	3.8 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	829	72.5 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	272	23.8 %
<i>Culiseta</i>	43	3.8 %
Other	0	0.0 %



Count AEOC
 Count AN
 Count CX
 Count CU
 Count OTHER

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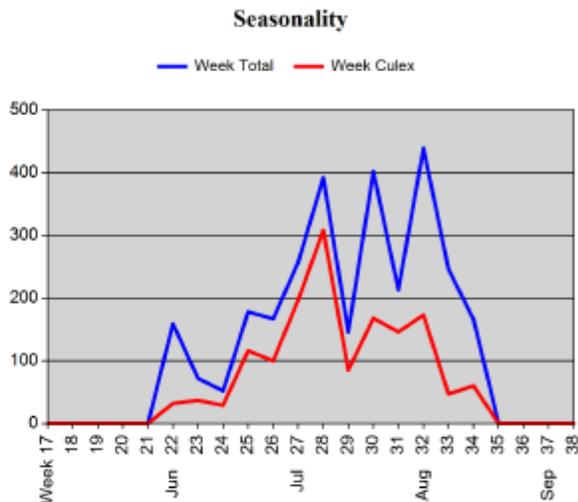
JT-06: Johnstown Thompson River Ranch

Season: 2018
 Trap Type: Light/CO2
 Location: Northwest corner of River Ranch subdivision
 GPS: N40° 23.555', W104° 59.430'

Total number of trap/nights set: 13
 Total number of mosquitoes collected: 2,889
 Average mosquitoes per trap/night: 222
 Average Culex per trap/night: 115

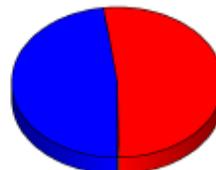
Species collected and abundance:

Species	Count	Percentage
<i>Aedes (Oc.) dorsalis</i>	25	0.9 %
<i>Aedes (Oc.) inaequalis</i>	1	0.0 %
<i>Aedes (Oc.) melanimon</i>	3	0.1 %
<i>Aedes (Oc.) trivittatus</i>	1	0.0 %
<i>Aedes vexans</i>	1354	46.9 %
<i>Culex pipiens</i>	493	17.1 %
<i>Culex salinarius</i>	88	3.0 %
<i>Culex tarsalis</i>	917	31.7 %
<i>Culiseta inornata</i>	7	0.2 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	1,384	47.9 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	1,498	51.9 %
<i>Culiseta</i>	7	0.2 %
Other	0	0.0 %



Count AEOC
 Count AN
 Count CX
 Count CU
 Count OTHER

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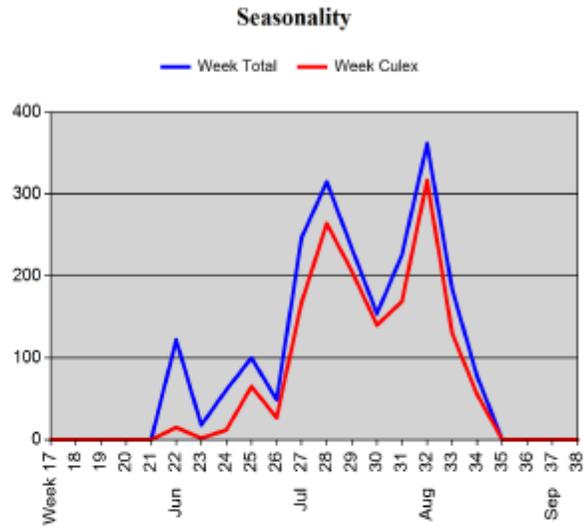
JT-07: Johnstown Stroh Farm

Season: 2018
Trap Type: Light/CO2
Location: Park east of 1662 Mallard Drive, Johnstown
GPS: N40° 18.635', W104° 54.440'

Total number of trap/nights set: 13
Total number of mosquitoes collected: 2,149
Average mosquitoes per trap/night: 165
Average Culex per trap/night: 121

Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	95	4.4 %
<i>Aedes (Oc.) melanimon</i>	5	0.2 %
<i>Aedes (Oc.) trivittatus</i>	10	0.5 %
<i>Aedes vexans</i>	458	21.3 %
<i>Culex pipiens</i>	558	26.0 %
<i>Culex salinarius</i>	38	1.8 %
<i>Culex tarsalis</i>	974	45.3 %
<i>Culiseta inornata</i>	11	0.5 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	568	26.4 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	1,570	73.1 %
<i>Culiseta</i>	11	0.5 %
Other	0	0.0 %



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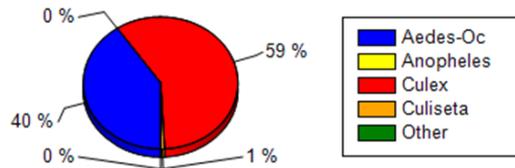
Appendix 2: Adult Mosquito Surveillance Light Trap Genus Summaries

Vector Disease Control International

Adult Trap Data

Trap #	Type	County	Date		Ae/Oc	An	Cx	Cs	Other	TOTAL
JT-03	LIGHT	Weld	06/05/2018	Johnstown Central Rolling Hills Ranch	29	0	4	0	0	33
JT-03	LIGHT	Weld	06/12/2018	Johnstown Central Rolling Hills Ranch	2	0	2	0	0	4
JT-03	LIGHT	Weld	06/19/2018	Johnstown Central Rolling Hills Ranch	6	0	2	0	0	8
JT-03	LIGHT	Weld	06/26/2018	Johnstown Central Rolling Hills Ranch	2	0	1	0	0	3
JT-03	LIGHT	Weld	07/03/2018	Johnstown Central Rolling Hills Ranch	522	0	19	0	0	541
JT-03	LIGHT	Weld	07/10/2018	Johnstown Central Rolling Hills Ranch	65	0	34	1	0	100
JT-03	LIGHT	Weld	07/17/2018	Johnstown Central Rolling Hills Ranch	18	0	124	0	0	142
JT-03	LIGHT	Weld	07/24/2018	Johnstown Central Rolling Hills Ranch	7	0	84	0	0	91
JT-03	LIGHT	Weld	07/31/2018	Johnstown Central Rolling Hills Ranch	22	0	228	1	0	251
JT-03	LIGHT	Weld	08/07/2018	Johnstown Central Rolling Hills Ranch	16	0	61	0	0	77
JT-03	LIGHT	Weld	08/14/2018	Johnstown Central Rolling Hills Ranch	65	0	65	0	0	130
JT-03	LIGHT	Weld	08/21/2018	Johnstown Central Rolling Hills Ranch	7	0	34	0	0	41
JT-03	LIGHT	Weld	08/28/2018	Johnstown Central Rolling Hills Ranch	2	0	5	1	0	8
JT-04	LIGHT	Weld	06/07/2018	Johnstown West Johnstown Reservoir	13	0	13	1	0	27
JT-04	LIGHT	Weld	06/14/2018	Johnstown West Johnstown Reservoir	16	0	6	0	0	22
JT-04	LIGHT	Weld	06/21/2018	Johnstown West Johnstown Reservoir	4	0	1	1	0	6
JT-04	LIGHT	Weld	06/28/2018	Johnstown West Johnstown Reservoir	10	0	44	1	0	55
JT-04	LIGHT	Weld	07/03/2018	Johnstown West Johnstown Reservoir	29	0	62	0	0	91
JT-04	LIGHT	Weld	07/12/2018	Johnstown West Johnstown Reservoir	7	0	136	0	0	143
JT-04	LIGHT	Weld	07/19/2018	Johnstown West Johnstown Reservoir	9	0	213	0	0	222
JT-04	LIGHT	Weld	07/26/2018	Johnstown West Johnstown Reservoir	5	0	124	4	0	133
JT-04	LIGHT	Weld	08/02/2018	Johnstown West Johnstown Reservoir	1	0	83	0	0	84
JT-04	LIGHT	Weld	08/09/2018	Johnstown West Johnstown Reservoir	11	0	333	1	0	345
JT-04	LIGHT	Weld	08/16/2018	Johnstown West Johnstown Reservoir	35	0	285	3	0	323
JT-04	LIGHT	Weld	08/23/2018	Johnstown West Johnstown Reservoir	11	0	54	1	0	66
JT-04	LIGHT	Weld	08/30/2018	Johnstown West Johnstown Reservoir	3	0	0	0	0	3
JT-05	LIGHT	Weld	06/07/2018	Johnstown East - 237 2nd Street	87	0	2	1	0	90
JT-05	LIGHT	Weld	06/14/2018	Johnstown East - 237 2nd Street	9	0	1	0	0	10
JT-05	LIGHT	Weld	06/21/2018	Johnstown East - 237 2nd Street	28	0	4	0	0	32
JT-05	LIGHT	Weld	06/28/2018	Johnstown East - 237 2nd Street	25	0	31	1	0	57
JT-05	LIGHT	Weld	07/03/2018	Johnstown East - 237 2nd Street	99	0	7	0	0	106
JT-05	LIGHT	Weld	07/12/2018	Johnstown East - 237 2nd Street	36	0	17	0	0	53
JT-05	LIGHT	Weld	07/19/2018	Johnstown East - 237 2nd Street	143	0	53	6	0	202
JT-05	LIGHT	Weld	07/26/2018	Johnstown East - 237 2nd Street	12	0	44	1	0	57
JT-05	LIGHT	Weld	08/02/2018	Johnstown East - 237 2nd Street	179	0	21	1	0	201
JT-05	LIGHT	Weld	08/09/2018	Johnstown East - 237 2nd Street	48	0	44	5	0	97
JT-05	LIGHT	Weld	08/16/2018	Johnstown East - 237 2nd Street	44	0	14	2	0	60
JT-05	LIGHT	Weld	08/23/2018	Johnstown East - 237 2nd Street	52	0	20	8	0	80
JT-05	LIGHT	Weld	08/30/2018	Johnstown East - 237 2nd Street	67	0	14	18	0	99
JT-06	LIGHT	Larimer	06/07/2018	Johnstown Thompson River Ranch	127	0	32	0	0	159
JT-06	LIGHT	Larimer	06/14/2018	Johnstown Thompson River Ranch	35	0	37	0	0	72
JT-06	LIGHT	Larimer	06/21/2018	Johnstown Thompson River Ranch	23	0	29	0	0	52
JT-06	LIGHT	Larimer	06/28/2018	Johnstown Thompson River Ranch	61	0	116	1	0	178
JT-06	LIGHT	Larimer	07/03/2018	Johnstown Thompson River Ranch	65	0	100	2	0	167

JT-06	LIGHT	Larimer	07/12/2018	Johnstown Thompson River Ranch	59	0	197	1	0	257
JT-06	LIGHT	Larimer	07/19/2018	Johnstown Thompson River Ranch	84	0	308	0	0	392
JT-06	LIGHT	Larimer	07/26/2018	Johnstown Thompson River Ranch	61	0	85	0	0	146
JT-06	LIGHT	Larimer	08/02/2018	Johnstown Thompson River Ranch	234	0	168	0	0	402
JT-06	LIGHT	Larimer	08/09/2018	Johnstown Thompson River Ranch	67	0	146	0	0	213
JT-06	LIGHT	Larimer	08/16/2018	Johnstown Thompson River Ranch	266	0	173	0	0	439
JT-06	LIGHT	Larimer	08/23/2018	Johnstown Thompson River Ranch	197	0	47	2	0	246
JT-06	LIGHT	Larimer	08/30/2018	Johnstown Thompson River Ranch	105	0	60	1	0	166
JT-07	LIGHT	Weld	06/07/2018	Johnstown Stroh Farm	107	0	15	0	0	122
JT-07	LIGHT	Weld	06/14/2018	Johnstown Stroh Farm	16	0	2	0	0	18
JT-07	LIGHT	Weld	06/21/2018	Johnstown Stroh Farm	49	0	12	0	0	61
JT-07	LIGHT	Weld	06/28/2018	Johnstown Stroh Farm	35	0	65	0	0	100
JT-07	LIGHT	Weld	07/03/2018	Johnstown Stroh Farm	22	0	27	0	0	49
JT-07	LIGHT	Weld	07/12/2018	Johnstown Stroh Farm	79	0	168	0	0	247
JT-07	LIGHT	Weld	07/19/2018	Johnstown Stroh Farm	50	0	264	1	0	315
JT-07	LIGHT	Weld	07/26/2018	Johnstown Stroh Farm	24	0	206	4	0	234
JT-07	LIGHT	Weld	08/02/2018	Johnstown Stroh Farm	12	0	140	2	0	154
JT-07	LIGHT	Weld	08/09/2018	Johnstown Stroh Farm	56	0	169	1	0	226
JT-07	LIGHT	Weld	08/16/2018	Johnstown Stroh Farm	43	0	317	2	0	362
JT-07	LIGHT	Weld	08/23/2018	Johnstown Stroh Farm	53	0	130	1	0	184
JT-07	LIGHT	Weld	08/30/2018	Johnstown Stroh Farm	22	0	55	0	0	77
					3,698		5,357		0	
							0	76		9,131



TOTAL	%
3,698	40%
0	0%
5,357	59%
76	1%
0	0%

Appendix 3: Town of Johnstown Adulticide Application Data

Vector Disease Control International

Adulticide Data

Customer	Subdiv/Area	Material	Start Time	End Time	Miles	
Johnstown, Town of						
	Truck					
	06/07/2018	THOMPSON RIVER RANCH	Aqua Kontrol 30	23:21:00	23:52:00	7
	06/07/2018	PIONEER RIDGE	Aqua Kontrol 30	12:11:00	12:32:00	5
	06/28/2018	THOMPSON RIVER RANCH	Aqua Kontrol 30	21:17:00	21:52:00	6
	06/28/2018	PIONEER RIDGE	Aqua Kontrol 30	23:03:00	23:25:00	5
	07/03/2018	THOMPSON RIVER RANCH	Aqua Kontrol 30	20:56:00	21:30:00	7
	07/03/2018	ROLLING HILLS	Aqua Kontrol 30	23:15:00	23:38:00	5
	07/03/2018	JOHNSTOWN EAST	Aqua Kontrol 30	21:46:00	22:25:00	8
	07/03/2018	JOHNSTOWN CENTRAL	Aqua Kontrol 30	22:34:00	23:11:00	8
	07/12/2018	THOMPSON RIVER RANCH	Aqua Kontrol 30	20:31:00	21:07:00	6
	07/12/2018	ROLLING HILLS	Aqua Kontrol 30	22:10:00	22:34:00	6
	07/12/2018	PIONEER RIDGE	Aqua Kontrol 30	23:30:00	23:53:00	5
	07/12/2018	JOHNSTOWN CENTRAL	Aqua Kontrol 30	22:42:00	23:20:00	8
	07/12/2018	CLEARVIEW	Aqua Kontrol 30	21:48:00	22:03:00	3
	07/12/2018	CARLSON FARMS	Aqua Kontrol 30	21:22:00	21:42:00	3
	07/19/2018	THOMPSON RIVER RANCH	Aqua Kontrol 30	20:28:00	21:03:00	7
	07/19/2018	ROLLING HILLS	Aqua Kontrol 30	22:07:00	22:32:00	5
	07/19/2018	PIONEER RIDGE	Aqua Kontrol 30	12:11:00	12:36:00	5
	07/19/2018	JOHNSTOWN CENTRAL	Aqua Kontrol 30	22:40:00	23:19:00	7
	07/19/2018	CLEARVIEW	Aqua Kontrol 30	21:44:00	21:59:00	3
	07/19/2018	CARLSON FARMS	Aqua Kontrol 30	21:17:00	21:38:00	4
	07/26/2018	THOMPSON RIVER RANCH	Aqua Kontrol 30	23:31:00	11:50:00	2
	07/26/2018	PIONEER RIDGE	Aqua Kontrol 30	12:58:00	01:24:00	5
	07/26/2018	CLEARVIEW	Aqua Kontrol 30	12:31:00	12:46:00	8
	07/26/2018	CARLSON FARMS	Aqua Kontrol 30	12:10:00	12:34:00	2

08/02/2018	THOMPSON RIVER RANCH	Aqua Kontrol 30	21:46:00	22:17:00	6
08/02/2018	ROLLING HILLS	Aqua Kontrol 30	22:33:00	23:00:00	5
08/02/2018	PIONEER RIDGE	Aqua Kontrol 30	12:33:00	12:56:00	5
08/02/2018	JOHNSTOWN EAST	Aqua Kontrol 30	23:50:00	12:26:00	8
08/02/2018	JOHNSTOWN CENTRAL	Aqua Kontrol 30	23:07:00	23:44:00	8
08/09/2018	THOMPSON RIVER RANCH	Aqua Kontrol 30	23:46:00	12:16:00	7
08/09/2018	PIONEER RIDGE	Aqua Kontrol 30	01:15:00	01:38:00	4
08/09/2018	CLEARVIEW	Aqua Kontrol 30	12:51:00	01:06:00	3
08/09/2018	CARLSON FARMS	Aqua Kontrol 30	12:27:00	12:46:00	4
08/16/2018	THOMPSON RIVER RANCH	Aqua Kontrol 30	22:19:00	22:52:00	7
08/16/2018	PIONEER RIDGE	Aqua Kontrol 30	12:13:00	12:34:00	5
08/16/2018	JOHNSTOWN CENTRAL	Aqua Kontrol 30	23:28:00	12:04:00	7
08/16/2018	CARLSON FARMS	Aqua Kontrol 30	23:06:00	23:21:00	3
08/23/2018	THOMPSON RIVER RANCH	Aqua Kontrol 30	21:44:00	22:14:00	7
08/23/2018	PIONEER RIDGE	Aqua Kontrol 30	21:05:00	21:25:00	4
08/30/2018	THOMPSON RIVER RANCH	Aqua Kontrol 30	22:28:00	23:01:00	7

Truck	Sum	220.0
	Avg	5.5
	Min	2.0
	Max	8.0
	Grand Total	220.0