

2014 Annual Report City of Louisville Mosquito Control Program



October 2014

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CITY OF LOUISVILLE MOSQUITO CONTROL PROGRAM ANNUAL REPORT 2014

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THE CITY OF LOUISVILLE

MOSQUITO CONTROL PROGRAM

MISSION STATEMENT

The need to protect residents and visitors from the health risks, severe annoyance, and discomfort associated with biting mosquitoes is a chronic annual problem. The primary objective of the City of Louisville Mosquito Control Program is to suppress the development of larval mosquitoes in wetland and other sites, to monitor and reduce numbers of adult mosquitoes thereby reducing overall mosquito populations to an acceptable low-biting "annoyance level", while reducing the threat of mosquito-borne disease transmission, all at the least possible cost, and with the least possible impact on people and the natural environment.

The main focus of the City of Louisville Mosquito Management Program is to employ trained field technicians to suppress populations of larval mosquitoes in aquatic habitats. CMC technicians utilize bacterial larvicides that reduce mosquitoes without harming non-target organisms. Additionally, monitoring of adult mosquito populations is an essential component of an Integrated Mosquito Management (IMM) program. Surveillance trapping performed provides data to assess West Nile Virus (WNV) infection rates, as well as the need for adult mosquito control measures. Data driven response can reduce the threat of disease transmission and annoyance associated with mosquitoes, while reducing the necessity for large amounts of products to be applied.

CMC OBJECTIVES

The City of Louisville Mosquito Management Program, operated by CMC, has developed into one of the foremost environmentally sensitive and technologically advanced IMM programs in the United States. Additionally, CMC has fostered cooperative efforts for mosquito control and epizootic response between surrounding municipalities, counties and homeowners associations, as well as the Center for Disease Control Vector-Borne disease unit in Fort Collins (CDC), the Colorado Department of Public Health (CDPHE), the Tri-County Health Department and Colorado State University (CSU) to respond to mosquito-borne disease and annoyance. Data obtained from CMC is utilized by these entities when evaluating disease risk, a public-private data sharing partnership in the interest of public health which is unrivaled elsewhere in the country.

CONTRACTOR COMMITMENT

Colorado Mosquito Control, Inc. is a large-scale contractor specializing in complete integrated mosquito control services. CMC utilizes an aggressive preemptive Integrated Pest Management (IPM) approach to controlling mosquito populations within contracted areas. CMC, established in 1986, is the largest private company specializing in mosquito control in Colorado, and is the only company in Colorado to only offer complete IPM mosquito control services.



CMC currently has programs throughout the state of Colorado including municipalities, counties, HOA's, Indian Reservations, and others. Geographically, CMC reaches from the Ute Mountain Ute Reservation in the southwest corner of the state to the northeast. CMC has programs in several mountain areas including the Gunnison Valley, the I-70 corridor, and parts of the upper Colorado River valley.

With well over a decade of experience monitoring WNV in Colorado, it is clear that limiting mosquito exposure is the best way to reduce the risk of disease. A well-developed mosquito management program is only part of the picture, and CMC also emphasizes the need for personal action and educational outreach programs. *Culex tarsalis*, our primary WNV vector in the state, is more abundant today than in the past, due to current land use practices. CMC is committed to providing top quality service via data driven management and education outreach in an effort to minimize WNV and reduce mosquito annoyance in communities where we live and work.

CMC, as the contractor for the City of Louisville, uses demonstrated scientific IPM methods of survey, inspection, diagnosis, biological/biochemical controls, and limited low-toxicity pesticide applications to professionally accomplish desired control results. All of the methods and materials used by CMC have been sanctioned and registered by the Environmental Protection Agency (EPA), the CDC, the Colorado Department of Agriculture (CDA), and the American Mosquito Association (AMA).

COOPERATING ENTITIES

CMC operates in many counties and municipalities along the Front Range. In doing so we are on the frontline of developing best management practices specifically tailored to the conditions found in these Colorado communities. The experience obtained by CMC, through years of direct experience and cooperation with municipal officials, residents and county and regional health departments, has put in place the tools needed to manage future mosquito-related health and annoyance issues.

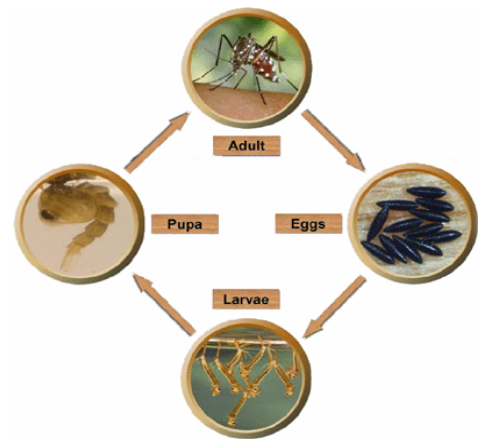
2014 SEASON PERSPECTIVE

At CMC 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 and control.

The summer of 2014 broke no major records and for the most part represented weather patterns well accustomed to longtime Front Range residents.

According to the National Weather Service April was somewhat warmer and drier than normal with an average temperature of 49.0 degrees, 1.6 degrees average. Rain-based precipitation was just 0.47 inches above average. Non-snow precipitation totaled 1.24 inches, 0.47 inches below normal. Snow-wise April saw 5.6 inches, 1.2 inches less than the normal 6.8 inches. The average temperature in March was 40.9 degrees, 0.5 degrees above normal. Six inches of snow fell in March, 4.7 inches less than the normal of 10.7 inches. 0.83 inches of rain fell in March, less than 0.09 inches below normal.

May saw near normal temperatures with an average of 57.5 degrees, just 0.4 degrees above average. The month saw above average rainfall, however, with 3.51 inches, a full 1.39 inches above the normal of 2.12 inches. 1.20 inches fell on the 21st. 1.1 inches of snow fell in May, which is the exact average for the month. June saw near average temperatures and precipitation with an average temperature of 67.3 degrees, a mere 0.1 degrees below normal. 1.82 inches of rain fell in June, 0.16 inches less than the normal of 1.98 inches.



July likewise saw near normal temperatures with an average of 74.5 degrees, 0.3 degrees above normal. Like May however it too saw a higher than average level of rainfall with 3.85 inches falling, 1.69 inches above average. 2.93 inches fell on the 29th and 30th. A nine day stretch from the 18th to the 26th saw temperatures above 90 degrees; only one day saw a temperature of 100 degrees or more. The high temperature on the 30th, 62 degrees, was the lowest high for that date since records began in 1872, however.

August was cool and wet with considerable cloud coverage, cold fronts and monsoonal moisture typically associated with the month. An average temperature of 70.6 degrees was 1.6 degrees below normal. Only four days breeched the 90 degree mark and no days saw triple digit temperatures. A low of 52 degrees was seen four times near the end of the month. 2.73 inches of rain fell, 1.04 inches greater than average.

Unlike September 2013, when historic flooding led to massive destruction and an unprecedented surge in adult mosquito activity late in the month and into October, September 2014 was by comparison dramatic. The month on the whole saw somewhat warmer temperatures and higher precipitation than normal. The average high of 64.8 degrees was 1.4 degrees above normal. 1.79 inches of rain fell, 0.83 inches above average and with much of it falling on the 29th. A low temperature of 33 degrees was recorded on the 12th with some snow falling on that same day. These weather conditions, coupled with seasonal diapause, brought to end any significant adult and larval mosquito activity for the 2014 season.

2014 Field Activities

Hiring of seasonal technicians began in March and continued into May. CMC's Annual Field Technician Classroom Training Day took place on Monday May 19th with over 50 new and returning field technicians in attendance. Field training by CMC management and veteran employees began afterwards and within a week CMC was fully staffed and in the field. Larval operations began winding down as weekly traps counts diminished throughout August and ended altogether by late-September.

Louisville saw a total of 329 site inspections in 2014 of which 305 or 93% were wet. Of those, 73 sites, or 24%, were subsequently treated for breeding. A total of 23.1 acres were treated in 2014. For prior year comparisons please see *Appendix: Larval Site Inspections by Service Area, Larval Site Treatments by Service Area, Larval Site Acreage Treated by Service Area*.

WEST NILE VIRUS 2014

Background

West Nile Virus (WNV) was first identified in Uganda in 1937. Since that time, activity has been documented throughout Africa, Europe, West and Central Asia, and areas of the Middle East. The virus made its first appearance to North America in 1999 when it was documented in New York City. WNV comes from a family of viruses known as Flaviviridae and is closely related to other viruses which can have severe effects on both humans and animals such as Japanese Encephalitis and St. Louis encephalitis.

WNV has a wide range of symptoms which can range from mild flu like symptoms to death. Of humans affected, nearly 80% will show no symptoms at all. The majority of people who do show symptoms will usually suffer from flu like symptoms. However, approximately 1% of people will develop much more severe symptoms including meningitis (inflammation of the linings surrounding the brain and spinal cord), encephalitis (inflammation of the brain), or very rarely poliomyelitis which can cause paralysis in parts of the body. 2014 has seen a particularly high percentage of such neuroinvasive diseases, for reasons still unknown.

Since the introduction of WNV to the United States in New York City 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 progressed through the South, the Midwest, the Rocky Mountain region and the rest of the nation

Colorado first saw activity of the virus late in the summer of 2002. In 2003 Colorado was the hardest hit state in the country compiling 2,947 human cases and 63 deaths most of which occurred along the Front Range. Totals since then have differed from year to year with no single year surpassing 2003's totals thus far.

WNV Activity 2014

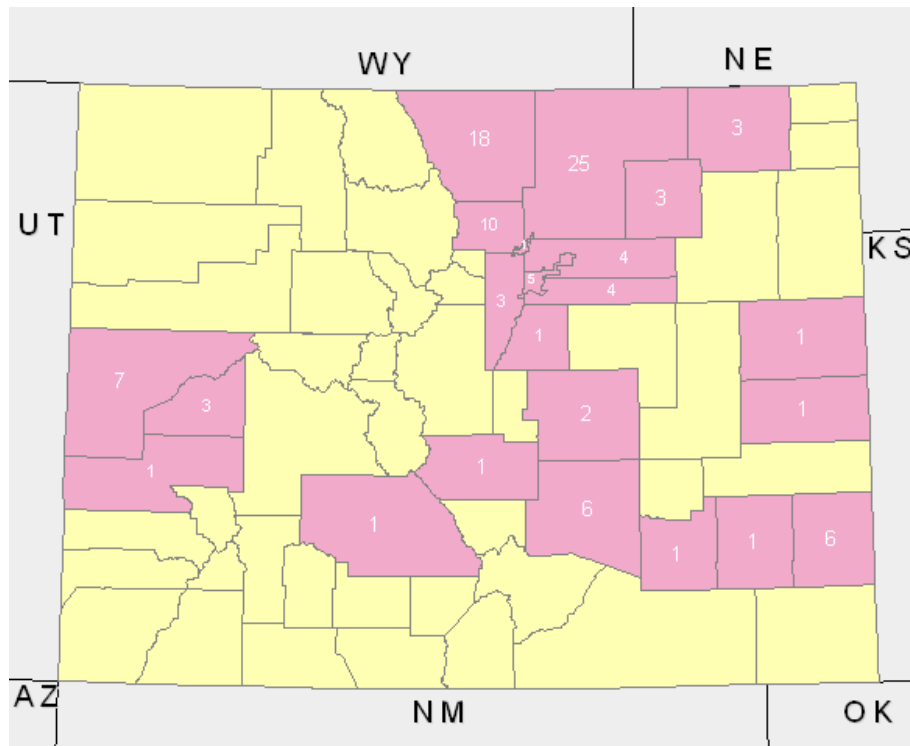
There are 108 human WNV cases in Colorado as of this writing (October 27th). Weld County leads the state with twenty-five cases while Larimer County has eighteen cases and Boulder County ten. There have been three fatalities related to WNV: two in Denver County and one in Pueblo County. By contrast the state had a total of 322 human WNV cases in 2013 and seven deaths.

According to the CDC the U.S has over 1,300 human cases of this writing. California has the highest number of human cases with Texas the second highest. Louisiana has the third highest number. Forty-seven deaths have been reported thus far nationwide. Last year the country saw 2,469 human cases resulting in 119 deaths.

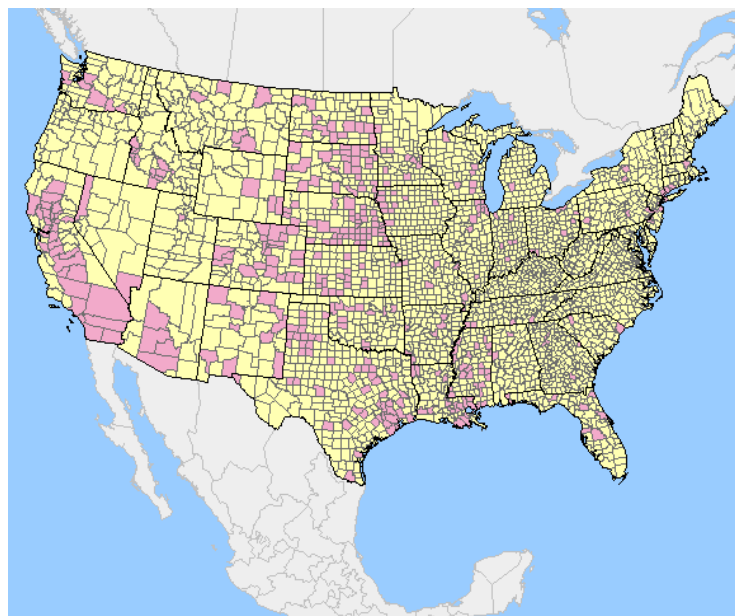
Colorado West Nile Virus Neuroinvasive Disease Incidence by County Chart (as of
October 27, 2014)

	Clinical diagnosis			Total cases	Total deaths
	Fever	Meningitis	Encephalitis		
County of Residence					
Adams	1	1	2	4	
Arapahoe	3	1		4	
Bent	1			1	
Boulder	7	3		10	
Broomfield			1	1	
Cheyenne	1			1	
Delta	3			3	
Denver	1	2	2	5	2
Douglas		1		1	
El Paso	1		1	2	
Fremont	1			1	
Jefferson		2	1	3	
Kit Carson	1			1	
Larimer	15	3		18	
Logan	1	1	1	3	
Mesa	2	4	1	7	
Montrose		1		1	
Morgan	1	1	1	3	
Otero		1	1		
Prowers	6			6	
Pueblo	2	2	2	6	1
Saguache	1	.		1	
Weld	19	1	5	25	
COLORADO	67	24	17	108	3

Colorado West Nile Virus Neuroinvasive Disease Incidence by County Map (as of October 27, 2014)



West Nile Virus Neuroinvasive Disease Incidence by State (as of October 22, 2014)



LARVAL MOSQUITO CONTROL

Years of research and practical experience have shown that the most effective way to control mosquito populations is through an aggressive Integrated Pest Management (IPM) approach. This approach aims at using a variety of concepts, tools, and products to reduce a pest population to a tolerable level. Translating these ideas to mosquito control, CMC has found the most environmentally and economically sound approach is through targeting the aquatic larval stage of the mosquito. Targeting this stage prevents the emergence of the adult mosquito and thus the inevitable result of disease and nuisance. Over 93% of Colorado Mosquito Control, Inc. (CMC) operational efforts are focused on larval control.

Larval mosquito control can be achieved in several ways including biological, biochemical, chemical, and mechanical means. Although there are a variety of methods of reducing larval populations some may have greater consequence than benefit. Mechanical or habitat modification is a technique which may be used, but the area to be modified and the extent to which the work will affect the surrounding area must be carefully reviewed. Permanent ecological damage may occur if extensive habitat change has taken place. True biological controls may, too, have costs which outweigh the benefits or competency of their control capacity. Predatory fish serve as a good example of this.



The mosquito fish (*Gambusia affinis*), an introduced species, while an effective predator on mosquito larvae, may have much larger dangers to native fish of Colorado waters. A very aggressive eater and rapid reproducer, *Gambusia* often out-compete their native counterparts. Due to these factors the Colorado Division of Wildlife (CDOW) has placed restrictions on the stocking and use of the fish. However, this year CMC obtained, stocked and distributed a supply of fathead minnows (*Pimephales promelas*), a native Colorado species. Fish were made available to residents for placement in irrigation or ornamental ponds. In general however, predatory fish and other biological controls such as bird and bats do not provide sufficient control of mosquito populations to be used as the sole mechanism. Other methods must be used to gain adequate larval mosquito population reductions.

CMC's favored method of larval mosquito control is through bacterial bio-rational products. The main product used by CMC 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 properly successful control without impact to aquatic invertebrates, birds, mammals, fish, amphibians, reptiles, or humans can be achieved.

Another bacterial product closely related to *Bti* is *Bacillus sphaericus* (*Bs*). In addition to all of the benefits of *Bti*, *Bs* is by definition a true biological control agent in that it remains in the system through multiple broods, or generations, of mosquitoes. Unfortunately the residual benefit of the control comes at a cost in price of approximately three times that of *Bti*.

Other larval control products include a growth regulators (methoprene, in the form of the product Altosid), mineral oils (Bonide, BVA), and an organophosphate (Abate). Methoprene is a synthetic copy of a juvenile growth hormone in larval mosquitoes. The hormone prevents normal development of the adult mosquito in the pupal stage eventually causing death. While a good control product, the cost is prohibitive to be the predominant product in a large scale program. Abate, the one chemical larval control product CMC uses, serves as an effective product, but label restrictions limit its use in many areas. CMC limits the use of chemical larvicides to areas with little biodiversity, such as road side ditches, or areas which chronically produce large amounts of mosquitoes and use them only as a last resort when other solutions are not present. The benefits of these products are the availability of 30 and 150 day formulations. Mineral oil is the only product effective on the pupal stage and therefore is an essential tool when pupae are found.

CMC constantly strives to improve its operations. We utilize "CMMS" (Computerized Mosquito Management System) utilizes historical data to analyze and identify areas and sites of particular importance. Targeted inspections then allow for resources to be allocated efficiently.

CMC SURVEILLANCE LABORATORY

Information about mosquito abundance and species identity is critical to a successful mosquito control program. Colorado Mosquito Control employs 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 Gravid Trap uses 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 identified by technicians trained to recognize the Colorado mosquito species.

In 2014, Colorado Mosquito Control monitored a statewide network of hundreds of weekly trap sites, collecting adult mosquitoes that were then counted and identified to species by the CMC Surveillance Laboratory. 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 Laboratory at Colorado Mosquito Control, Inc. are trained to provide accurate species-level identification of mosquito specimens, for both adults and larvae. More than 50 mosquito species are believed to occur in Colorado, with dozens identified from samples processed during the 2014 season from across the state.



Additionally, the CMC 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 effectiveness 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 which helps illustrate the threat of mosquito-borne disease amplification and transmission.
- Determining where adult control efforts were necessary. While mosquito eradication is impossible, significant population reduction is achievable. In places where larval control was insufficient, especially in neighborhoods where adult mosquitoes migrated in from larval sources outside of the control area, it may be necessary to use adulticide methods such as ULV truck fogging or barrier sprays of nearby harborage areas. Trap counts that were in excess of an acceptable threshold for the area would trigger adult control measures.
- Surveillance for Mosquito-borne Disease. Historically, CMC 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.

CDC Surveillance Light Trap Data Comparison

Traps in Louisville collected a total of 1,561 mosquitoes in 2014. The percent composition of mosquitoes collected included 47.9% (747) *Culex* spp., 49.8% (777) *Aedes/Ochlerotatus* spp., and 2.3% (36) *Culiseta* spp. mosquitoes. Please see *Appendix: 2014 CDC Trap Composite Data* as well as the respective charts for each trap for more information.

2014 ADULT CONTROL

The goal of CMC is to provide all residents with the best options for safe, effective, modern mosquito management. The primary emphasis of our mosquito management program is to control mosquitoes in the larval stage. This environmentally focused program maintains adulticiding as a final resort when adult mosquito populations surpass nuisance or risk thresholds. Mosquito surveillance results are used to make data driven decisions regarding areas that need to be sprayed for adult mosquito control. Such spraying is targeted to specific sectors determined by said data thereby reducing the size and frequency of spraying a given area.

CMC uses all available data from CDC light traps, Mosquito Hotline annoyance calls, and field technician reports to focus adult mosquito control efforts on specific, very limited “targeted” areas. In parts of the community where high numbers of mosquito annoyance calls are received, “floater” CDC light traps are set to evaluate adult population levels and species make-up. In most cases, a direct correlation is evident between areas with high complaint calls and high trap counts. While this correlation allows us to focus adult control in these areas, the emphasis is placed on finding the source of breeding and continued larval control measures.

Colorado Mosquito Control uses state of the art technology, calibrated application timing, and least-toxic products to minimize all non-target impact. All adult mosquito control is accomplished using calibrated Ultra Low Volume (ULV) equipment and performed after dusk. 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 activity is greatly reduced. Using this application technique, the overall goal of minimal environmental impact and effective adult control is achieved in the targeted area.

In 2014 CMC utilized the water-based product AquaLuer 20-20 for ULV adult mosquito control. Both use the highly effective pyrethroid Permethrin as their active ingredient, while the water-base provides a much more environmentally sound solution to traditional oil-based adulticides. No miles were fogged in Louisville in 2014. Additional adulticide measures in the form of backpack barriers were utilized where appropriate and effective, however. Please see *Appendix: ULV Adulticide Comparison by Service Area* for more information.

TECHNOLOGY

CMC has strived to improve the programs offered to its customers with novel and progressive advancements, continually evaluating and implementing new products and new technologies, not only with regard to control efforts but also for data processing and information reporting. CMC shares the belief that timely information should be accessible to customers and residents, so that the people who fund the programs can access the work that is being performed. CMC also believes that the ability to access the data will improve both the resident's and municipality's ability to stay informed about West Nile Virus risk in their community.

CMC WEBSITE

Our website, www.comosquitocontrol.com, is the leading website in Colorado when it comes to providing up-to-date, factual, and comprehensive information on, and links to, mosquito biology and control, mosquito-borne diseases, pesticide toxicology information, and a wealth of topics relating to mosquitoes. Our website continues to be an integral tool for dissemination of operational data to the citizens we serve, minimizing the resources and time required by the city and its employees for answering for fielding public inquiries.



PUBLIC OUTREACH & DATA DISSEMINATION

For over two and half decades years, CMC has demonstrated that strong Public Outreach programs, quality Data Dissemination and outstanding Customer Service standards are the keys to success in providing large-scale municipal mosquito control programs. Citizen feedback, inquiry, and satisfaction surveys aid in evaluating the effectiveness of our program. CMC constantly looks for ways to better serve the communities we work with and appreciates the citizen involvement in improving the programs that we offer. See *Appendix: MosquitoLine Calls by Service Area* for season summaries.

CALL NOTIFICATION & SHUTOFF SYSTEM

CMC maintains a comprehensive Call Notification & Shutoff database, and will notify residents on this list whenever ULV adulticide spray applications will be conducted within 2 blocks of their property or within the effective ULV spray drift distance (300-500 ft. depending on wind speed and direction). All Shutoff locations are updated annually. Call & Shutoff forms are available online and may be submitted via the CMC website or by mail and fax.

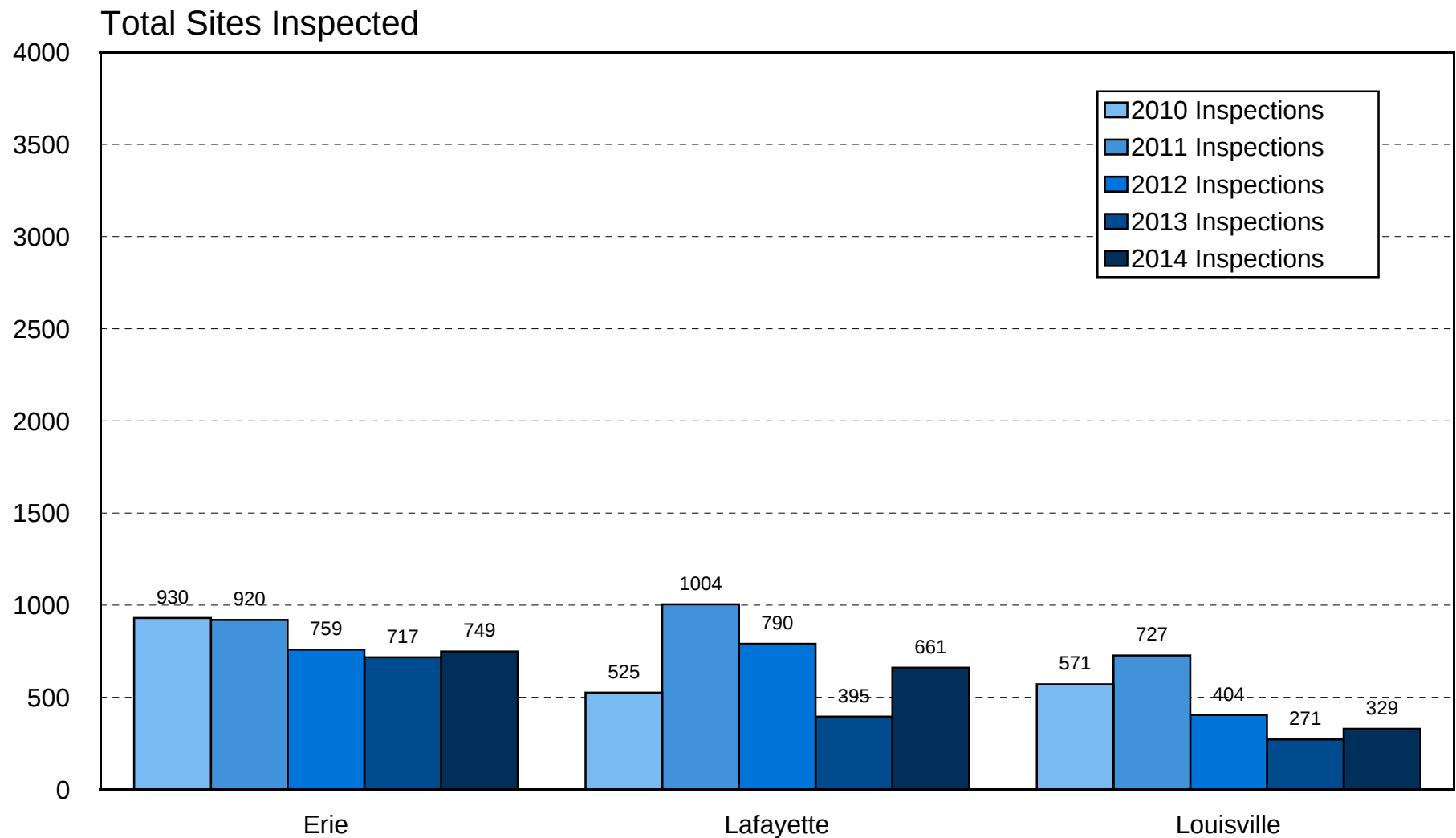
SUMMARY

While parts of the northern Front Range saw moderately damaging early season flooding most of the Front Range saw little in the way of dramatic weather related events during the summer of 2014. Temperatures hovered at near normal temperatures for most of the summer with somewhat higher than average precipitation levels. Increased rainfall activity coupled with snow pack runoff nearly double normal amounts led to more standing water in addition to water used for agriculturally related flood irrigation. This in turn led to a broad based increase in the number of adult mosquitoes than the 2013 season in numerous Front Range communities. Mosquitoes from neighboring areas with no or substandard control also presented challenges in 2014 and will continue to do so in the future. However, human West Nile Virus cases will in all likelihood fall to less than half of the total cases in 2013. While this development is obviously welcome it is equally vital to remain vigilant in monitoring West Nile Virus and all mosquito related activity in general.

Colorado Mosquito Control wishes to thank all City of Louisville staff, officials and residents for their continuing support and we look forward to providing Louisville with mosquito control services in 2015 and beyond.

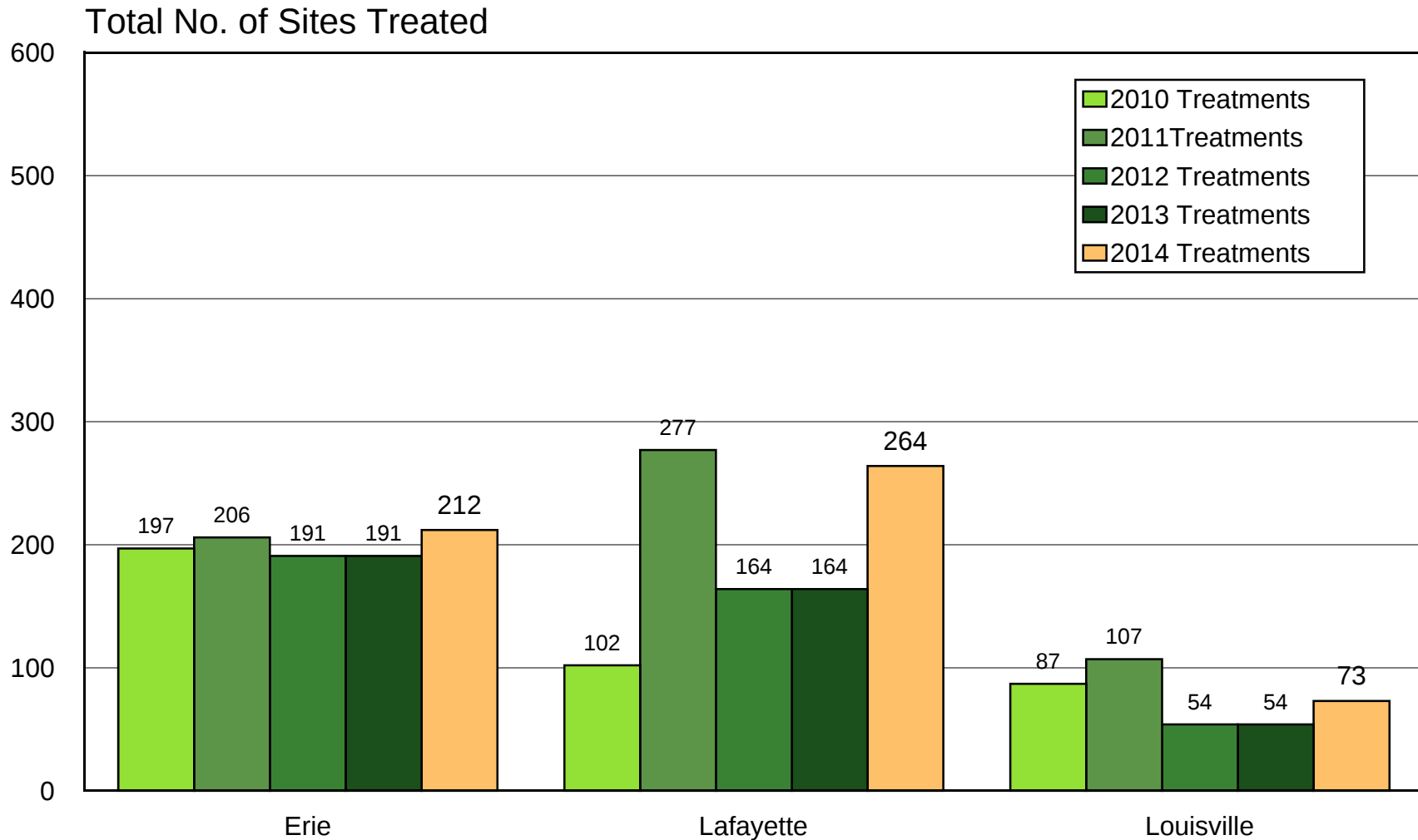
Larval Site Inspections by Service Area

'10- '14 Boulder County Mosquito Control Programs



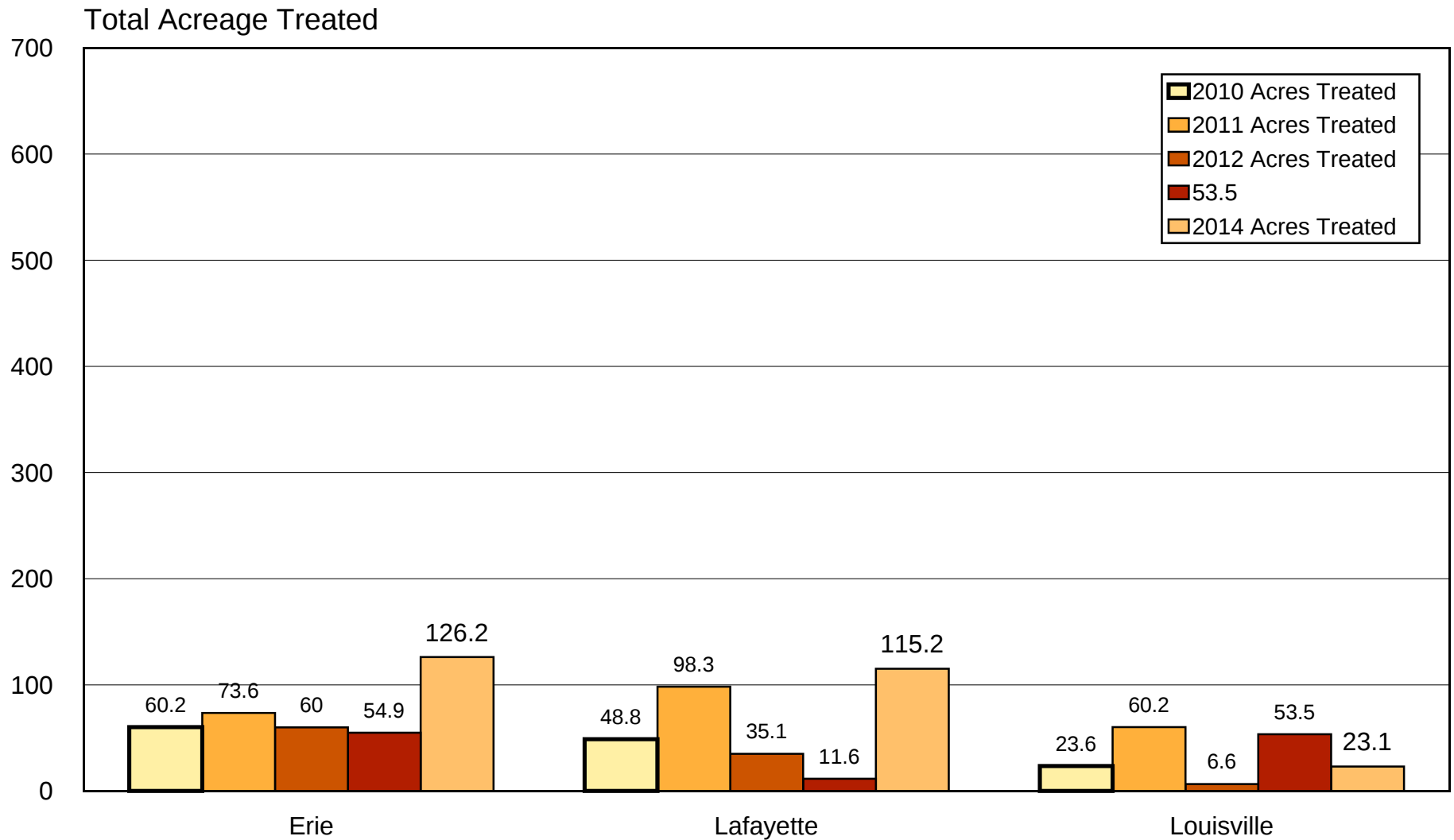
Larval Site Treatments by Service Area

'10- '14 Boulder County Mosquito Control Programs



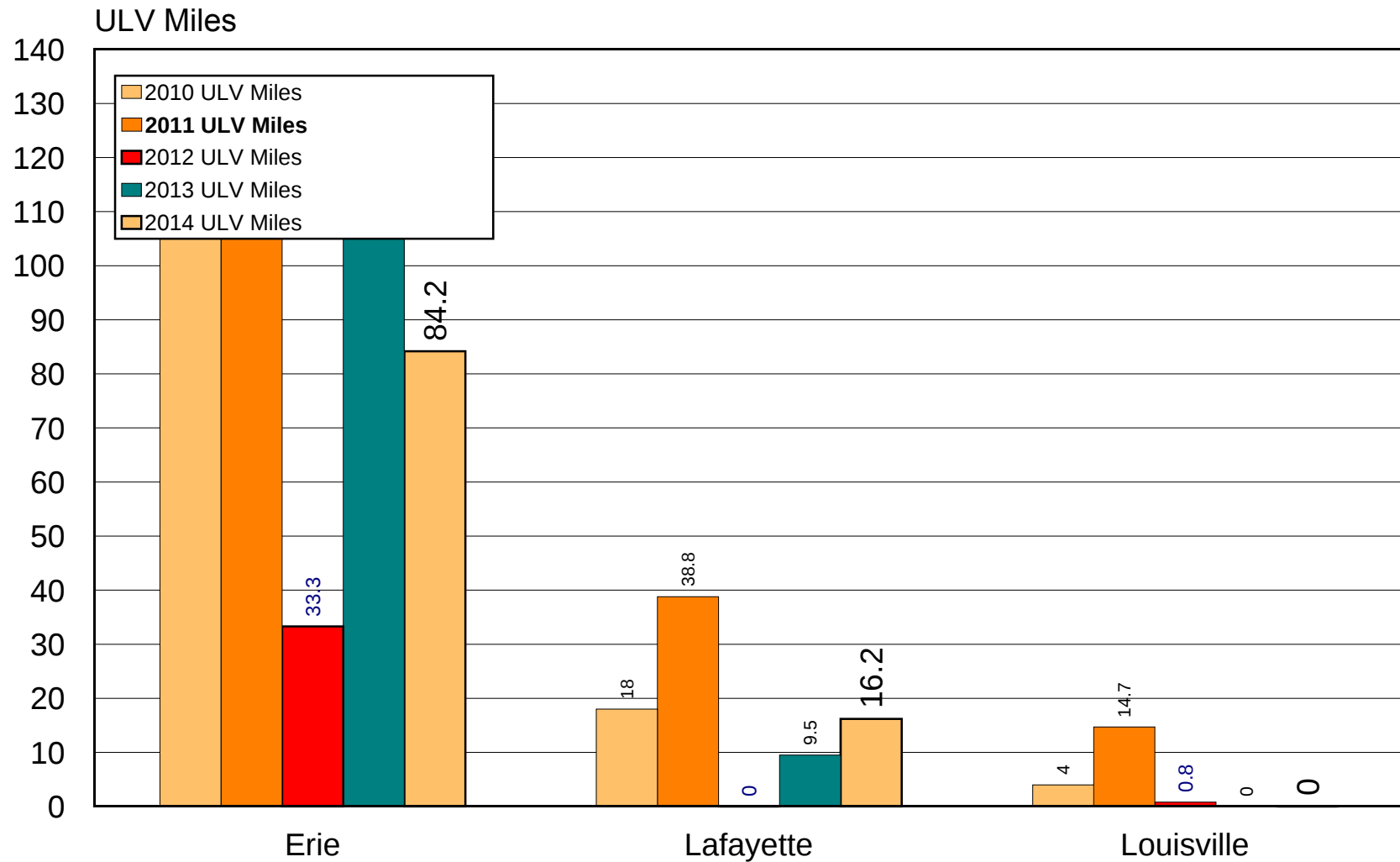
Larval Acreage Treated by Service Area

'10 -'14 Boulder County Mosquito Control Programs



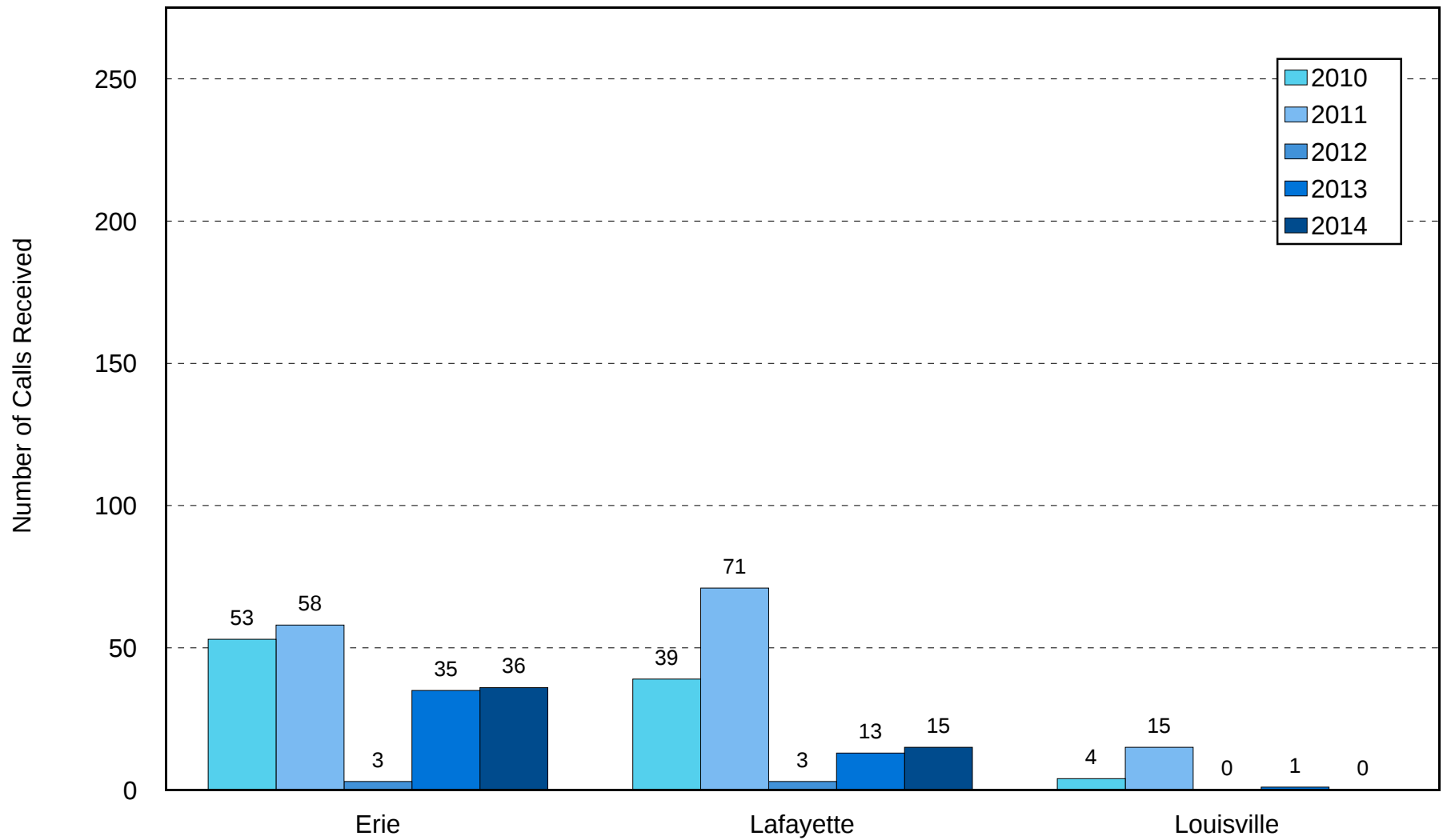
ULV Adulticide Miles Comparison By Service Area

'10 - '14 Boulder County Mosquito Control Programs



MosquitoLine Calls by Service Area

'10 - '14 Boulder County Mosquito Control Programs



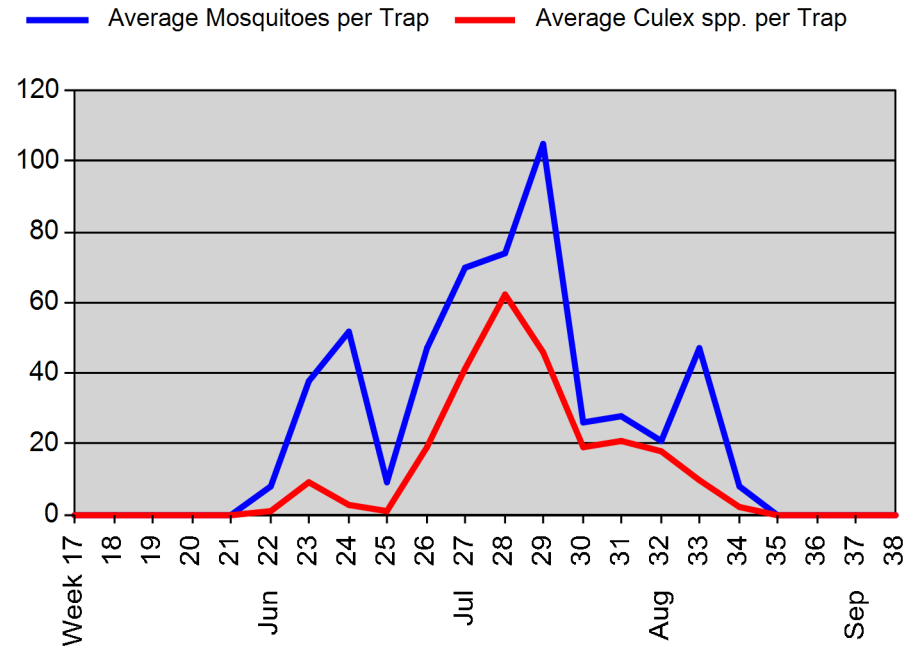
2014 Louisville Light Trap Composite Data

Total number of trap/nights set: 38
 Total number of mosquitoes collected: 1,561
 Average mosquitoes per trap/night: 41
 Average Culex per trap/night: 20

Species collected and abundance:

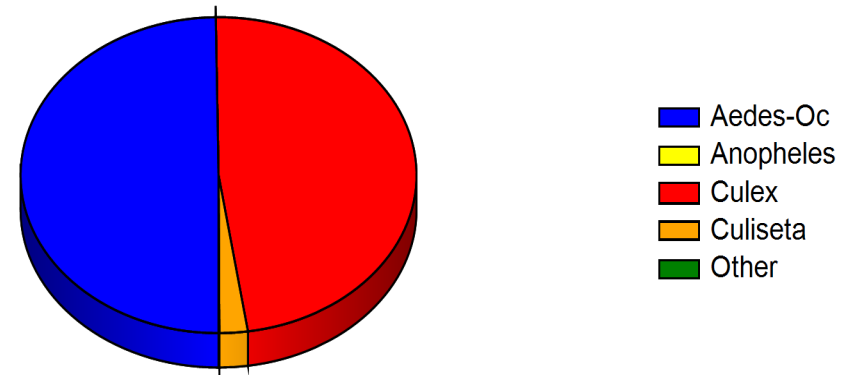
<i>Aedes (Oc.) dorsalis</i>	8	0.5 %
<i>Aedes (Oc.) increpitus</i>	76	4.9 %
<i>Aedes (Oc.) melanimon</i>	42	2.7 %
<i>Aedes (Oc.) trivittatus</i>	25	1.6 %
<i>Aedes vexans</i>	626	40.1 %
<i>Coquillettidia perturbans</i>	1	0.1 %
<i>Culex pipiens</i>	14	0.9 %
<i>Culex salinarius</i>	32	2.0 %
<i>Culex tarsalis</i>	701	44.9 %
<i>Culiseta inornata</i>	36	2.3 %

Seasonality



Genus proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	777	49.8 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	747	47.9 %
<i>Culiseta</i>	36	2.3 %
Other	1	0.1 %



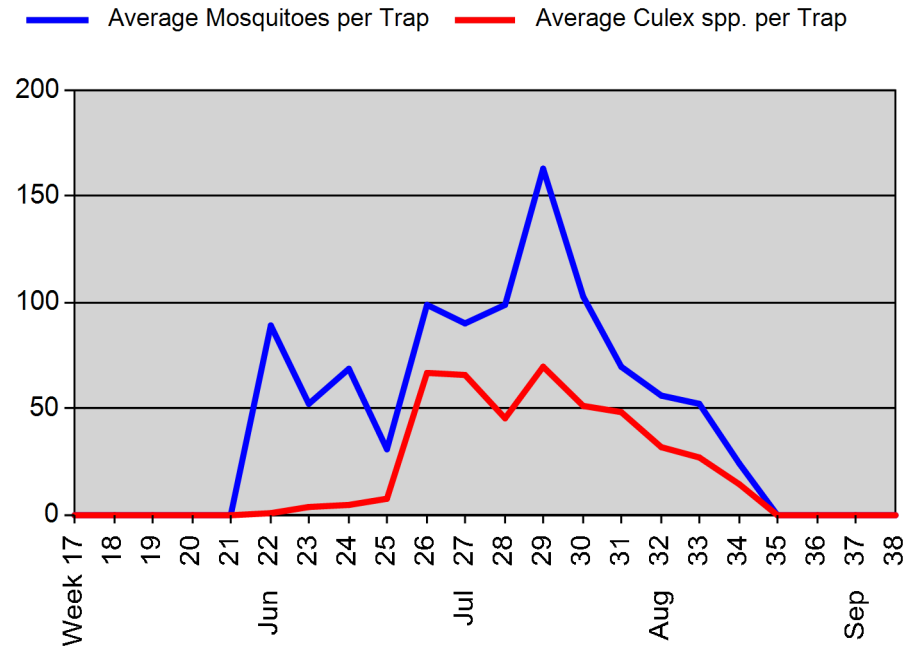
2014 Eastern Boulder County Trap Composite Data

Total number of trap/nights set: 136
 Total number of mosquitoes collected: 10,650
 Average mosquitoes per trap/night: 78
 Average Culex per trap/night: 35

Species collected and abundance:

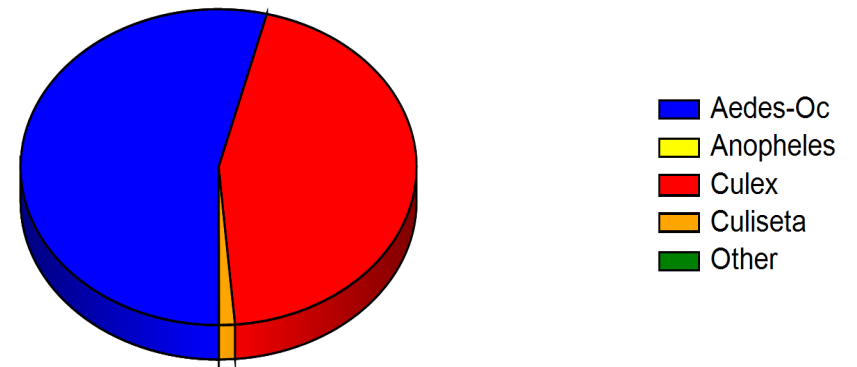
<i>Aedes (Oc.) dorsalis</i>	178	1.7 %
<i>Aedes (Oc.) hendersoni</i>	2	0.0 %
<i>Aedes (Oc.) increpitus</i>	86	0.8 %
<i>Aedes (Oc.) melanimon</i>	654	6.1 %
<i>Aedes (Oc.) trivittatus</i>	440	4.1 %
<i>Aedes vexans</i>	4383	41.2 %
<i>Coquillettidia perturbans</i>	2	0.0 %
<i>Culex pipiens</i>	139	1.3 %
<i>Culex salinarius</i>	161	1.5 %
<i>Culex tarsalis</i>	4466	41.9 %
<i>Culiseta inornata</i>	139	1.3 %

Seasonality



Genus proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	5,743	53.9 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	4,766	44.8 %
<i>Culiseta</i>	139	1.3 %
Other	2	0.0 %



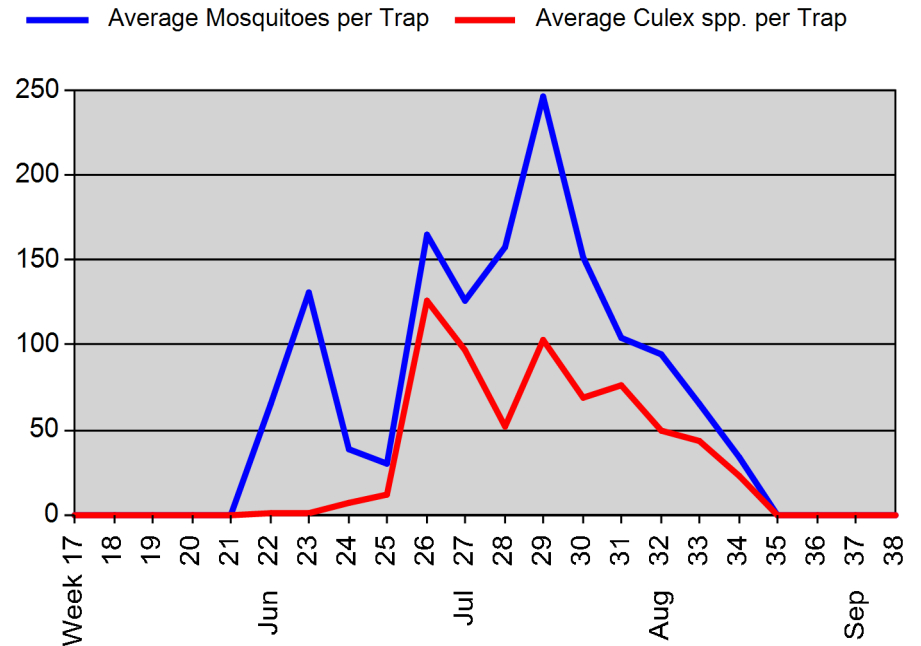
2014 Erie Light Trap Composite Data

Total number of trap/nights set: 61
 Total number of mosquitoes collected: 6,512
 Average mosquitoes per trap/night: 107
 Average Culex per trap/night: 54

Species collected and abundance:

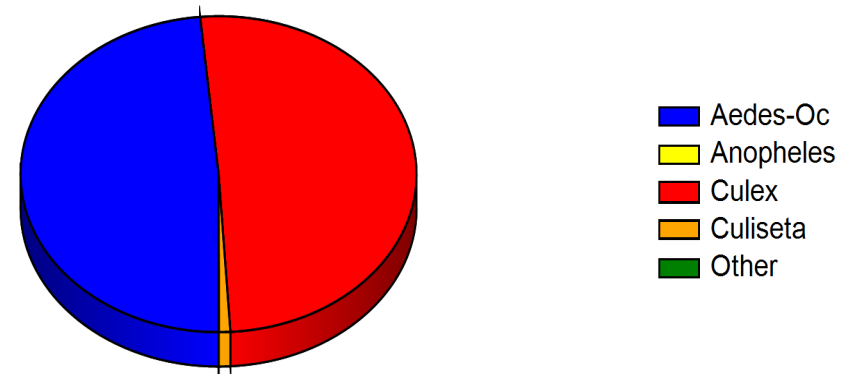
<i>Aedes (Oc.) dorsalis</i>	107	1.6 %
<i>Aedes (Oc.) hendersoni</i>	2	0.0 %
<i>Aedes (Oc.) increpitus</i>	2	0.0 %
<i>Aedes (Oc.) melanimon</i>	380	5.8 %
<i>Aedes (Oc.) trivittatus</i>	402	6.2 %
<i>Aedes vexans</i>	2266	34.8 %
<i>Coquillettidia perturbans</i>	1	0.0 %
<i>Culex pipiens</i>	87	1.3 %
<i>Culex salinarius</i>	76	1.2 %
<i>Culex tarsalis</i>	3128	48.0 %
<i>Culiseta inornata</i>	61	0.9 %

Seasonality



Genus proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	3,159	48.5 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	3,291	50.5 %
<i>Culiseta</i>	61	0.9 %
Other	1	0.0 %



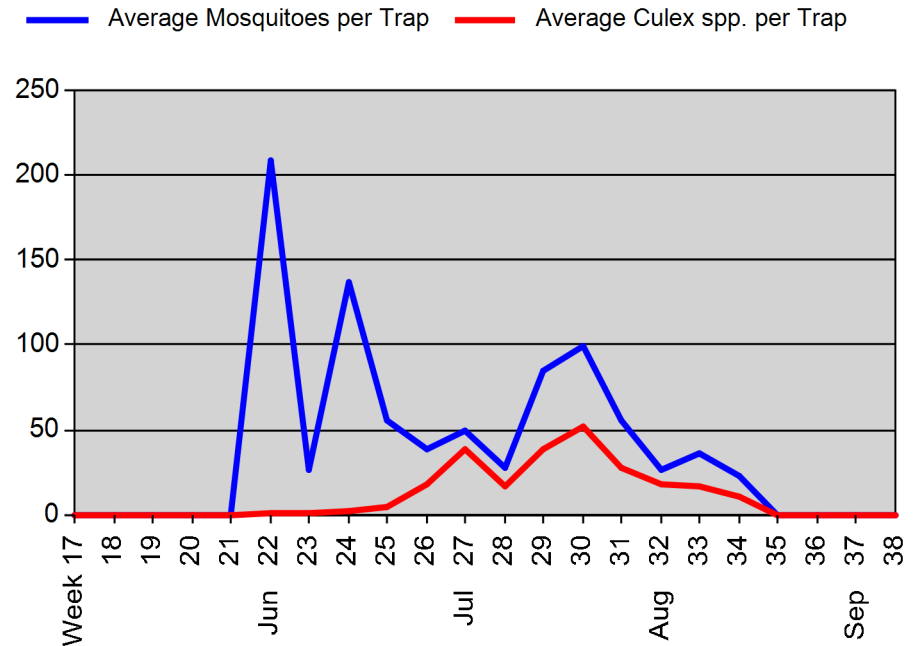
2014 Lafayette Light Trap Composite Data

Total number of trap/nights set: 37
 Total number of mosquitoes collected: 2,577
 Average mosquitoes per trap/night: 70
 Average Culex per trap/night: 20

Species collected and abundance:

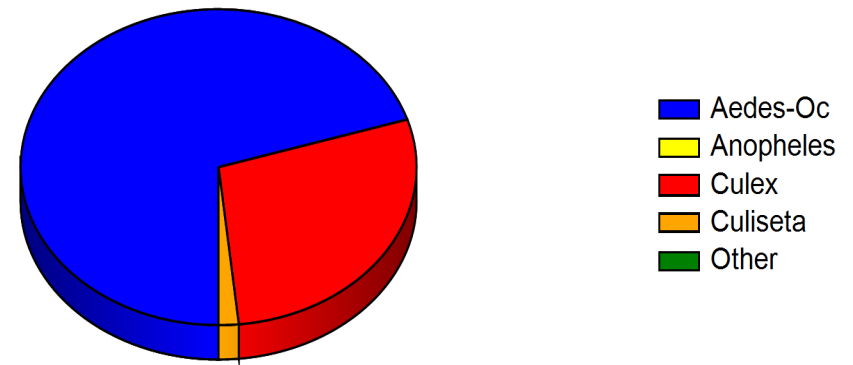
<i>Aedes (Oc.) dorsalis</i>	63	2.4 %
<i>Aedes (Oc.) increpitus</i>	8	0.3 %
<i>Aedes (Oc.) melanimon</i>	232	9.0 %
<i>Aedes (Oc.) trivittatus</i>	13	0.5 %
<i>Aedes vexans</i>	1491	57.9 %
<i>Culex pipiens</i>	38	1.5 %
<i>Culex salinarius</i>	53	2.1 %
<i>Culex tarsalis</i>	637	24.7 %
<i>Culiseta inornata</i>	42	1.6 %

Seasonality



Genus proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	1,807	70.1 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	728	28.3 %
<i>Culiseta</i>	42	1.6 %
Other	0	0.0 %



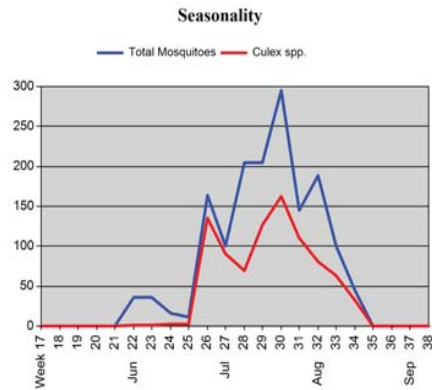
ER-01: Old Town Erie

Season: 2014
 Trap Type: Light/CO2
 Location: 525 Holbrook Street
 GPS: N40° 2.960', W105° 2.985'

Total number of trap/nights set: 12
 Total number of mosquitoes collected: 1,509
 Average mosquitoes per trap/night: 126
 Average Culex per trap/night: 73

Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	15	1.0 %
<i>Aedes (Oc.) hendersoni</i>	2	0.1 %
<i>Aedes (Oc.) melanimon</i>	7	0.5 %
<i>Aedes (Oc.) trivittatus</i>	44	2.9 %
<i>Aedes vexans</i>	556	36.8 %
<i>Culex pipiens</i>	19	1.3 %
<i>Culex salinarius</i>	12	0.8 %
<i>Culex tarsalis</i>	844	55.9 %
<i>Culiseta inornata</i>	10	0.7 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	624	41.4 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	875	58.0 %
<i>Culiseta</i>	10	0.7 %
Other	0	0.0 %



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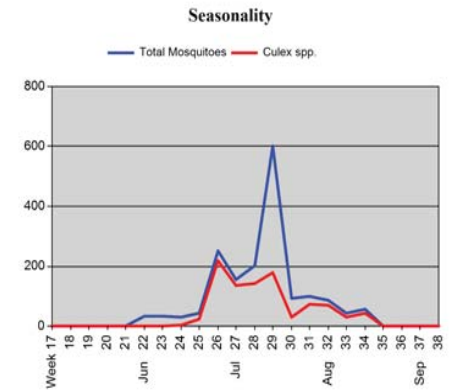
ER-02: Erie Vista Point

Season: 2014
 Trap Type: Light/CO2
 Location: along Coal Creek just north of Vista Parkway
 GPS: N40° 1.290', W105° 2.785'

Total number of trap/nights set: 12
 Total number of mosquitoes collected: 1,688
 Average mosquitoes per trap/night: 141
 Average Culex per trap/night: 79

Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	54	3.2 %
<i>Aedes (Oc.) increpitus</i>	2	0.1 %
<i>Aedes (Oc.) melanimon</i>	20	1.2 %
<i>Aedes (Oc.) trivittatus</i>	8	0.5 %
<i>Aedes vexans</i>	640	37.9 %
<i>Culex pipiens</i>	18	1.1 %
<i>Culex salinarius</i>	34	2.0 %
<i>Culex tarsalis</i>	894	53.0 %
<i>Culiseta inornata</i>	18	1.1 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	724	42.9 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	946	56.0 %
<i>Culiseta</i>	18	1.1 %
Other	0	0.0 %



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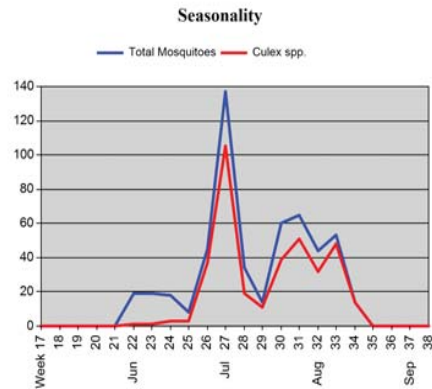
ER-03: Erie West-Canyon Creek

Season: 2014
 Trap Type: Light/CO2
 Location: along Canyon Creek drainage north of Erie Parkway
 GPS: N40° 2.295', W105° 4.070'

Total number of trap/nights set: 12
 Total number of mosquitoes collected: 511
 Average mosquitoes per trap/night: 43
 Average Culex per trap/night: 30

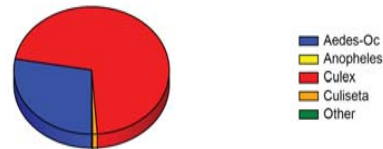
Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	7	1.4 %
<i>Aedes (Oc.) melanimon</i>	13	2.5 %
<i>Aedes vexans</i>	122	23.9 %
<i>Coquillettidia perturbans</i>	1	0.2 %
<i>Culex pipiens</i>	28	5.5 %
<i>Culex salinarius</i>	23	4.5 %
<i>Culex tarsalis</i>	312	61.1 %
<i>Culiseta inornata</i>	5	1.0 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	142	27.8 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	363	71.0 %
<i>Culiseta</i>	5	1.0 %
Other	1	0.2 %



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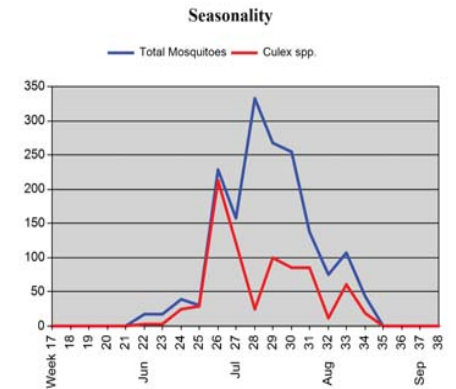
ER-04: Erie Village-Kenosha Estates

Season: 2014
 Trap Type: Light/CO2
 Location: in tall trees along creek behind 1361 Washburn Ave.
 GPS: N40° 3.915', W105° 3.425'

Total number of trap/nights set: 12
 Total number of mosquitoes collected: 1,691
 Average mosquitoes per trap/night: 141
 Average Culex per trap/night: 65

Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	23	1.4 %
<i>Aedes (Oc.) melanimon</i>	12	0.7 %
<i>Aedes (Oc.) trivittatus</i>	337	19.9 %
<i>Aedes vexans</i>	514	30.4 %
<i>Culex pipiens</i>	19	1.1 %
<i>Culex salinarius</i>	6	0.4 %
<i>Culex tarsalis</i>	754	44.6 %
<i>Culiseta inornata</i>	26	1.5 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	886	52.4 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	779	46.1 %
<i>Culiseta</i>	26	1.5 %
Other	0	0.0 %



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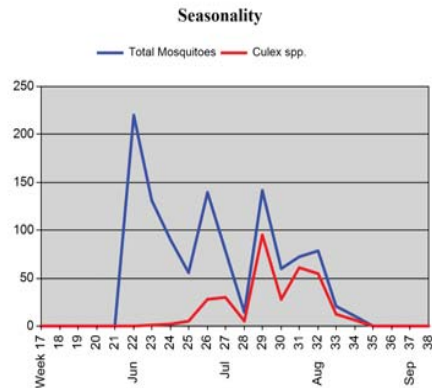
ER-05: Erie Arapahoe Ridge

Season: 2014
 Trap Type: Light/CO2
 Location: 2785 Odell Dr., Erie 80516
 GPS: N40° 1.230', W105° 5.455'

Total number of trap/nights set: 13
 Total number of mosquitoes collected: 1,113
 Average mosquitoes per trap/night: 86
 Average Culex per trap/night: 25

Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	8	0.7 %
<i>Aedes (Oc.) melanimon</i>	328	29.5 %
<i>Aedes (Oc.) trivittatus</i>	13	1.2 %
<i>Aedes vexans</i>	434	39.0 %
<i>Culex pipiens</i>	3	0.3 %
<i>Culex salinarius</i>	1	0.1 %
<i>Culex tarsalis</i>	324	29.1 %
<i>Culiseta inornata</i>	2	0.2 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	783	70.4 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	328	29.5 %
<i>Culiseta</i>	2	0.2 %
Other	0	0.0 %



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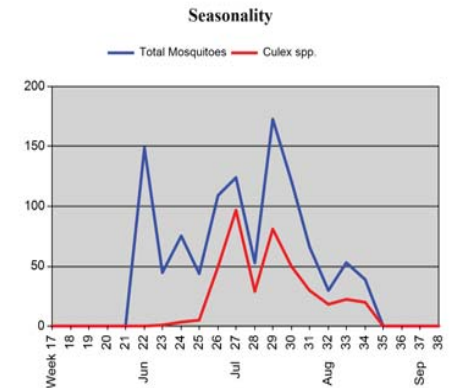
LA-01: Waneka Lake Park

Season: 2014
 Trap Type: Light/CO2
 Location: north of Atlantis Avenue at Caria Drive
 GPS: N39° 59.445', W105° 6.475'

Total number of trap/nights set: 13
 Total number of mosquitoes collected: 1,081
 Average mosquitoes per trap/night: 83
 Average Culex per trap/night: 31

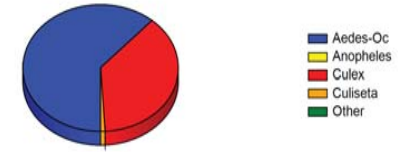
Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	23	2.1 %
<i>Aedes (Oc.) increpitus</i>	5	0.5 %
<i>Aedes (Oc.) melanimon</i>	65	6.0 %
<i>Aedes (Oc.) trivittatus</i>	9	0.8 %
<i>Aedes vexans</i>	563	52.1 %
<i>Culex pipiens</i>	22	2.0 %
<i>Culex salinarius</i>	29	2.7 %
<i>Culex tarsalis</i>	355	32.8 %
<i>Culiseta inornata</i>	10	0.9 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	665	61.5 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	406	37.6 %
<i>Culiseta</i>	10	0.9 %
Other	0	0.0 %



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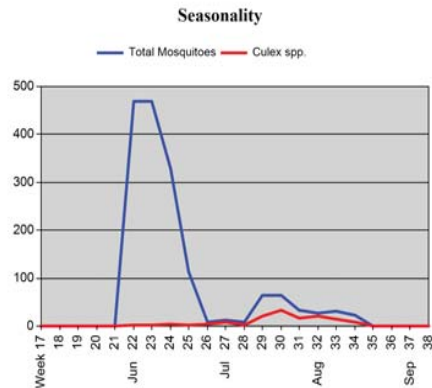
LA-05: Blue Heron

Season: 2014
 Trap Type: Light/CO2
 Location: south of Lake Meadow Drive near Heron Lake
 GPS: N40° 1.320', W105° 7.490'

Total number of trap/nights set: 12
 Total number of mosquitoes collected: 1,182
 Average mosquitoes per trap/night: 98
 Average Culex per trap/night: 12

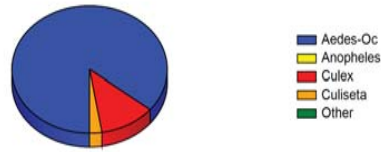
Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	7	0.6 %
<i>Aedes (Oc.) increpitus</i>	2	0.2 %
<i>Aedes (Oc.) melanimon</i>	153	12.9 %
<i>Aedes (Oc.) trivittatus</i>	4	0.3 %
<i>Aedes vexans</i>	848	71.7 %
<i>Culex pipiens</i>	2	0.2 %
<i>Culex salinarius</i>	8	0.7 %
<i>Culex tarsalis</i>	128	10.8 %
<i>Culiseta inornata</i>	30	2.5 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	1,014	85.8 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	138	11.7 %
<i>Culiseta</i>	30	2.5 %
Other	0	0.0 %



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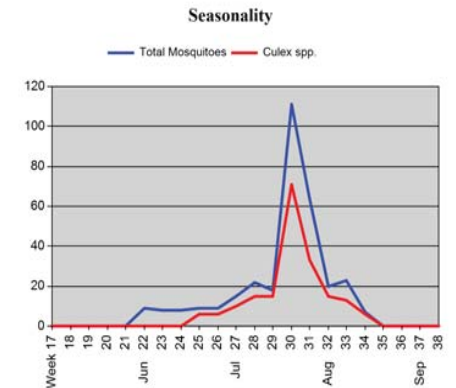
LA-10: Lafayette Finch at Elm

Season: 2014
 Trap Type: Light/CO2
 Location: North of Elm Street off Finch Avenue
 GPS: N40° 0.160', W105° 5.040'

Total number of trap/nights set: 12
 Total number of mosquitoes collected: 314
 Average mosquitoes per trap/night: 26
 Average Culex per trap/night: 15

Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	33	10.5 %
<i>Aedes (Oc.) increpitus</i>	1	0.3 %
<i>Aedes (Oc.) melanimon</i>	14	4.5 %
<i>Aedes vexans</i>	80	25.5 %
<i>Culex pipiens</i>	14	4.5 %
<i>Culex salinarius</i>	16	5.1 %
<i>Culex tarsalis</i>	154	49.0 %
<i>Culiseta inornata</i>	2	0.6 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	128	40.8 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	184	58.6 %
<i>Culiseta</i>	2	0.6 %
Other	0	0.0 %



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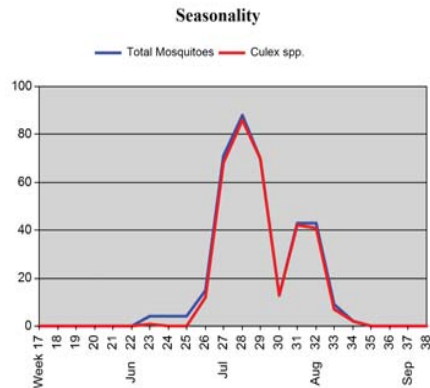
LO-01: Coal Creek Golf Course

Season: 2014
 Trap Type: Light/CO2
 Location: Dillon Road at bridge over Coal Creek
 GPS: N39° 57.465', W105° 9.120'

Total number of trap/nights set: 13
 Total number of mosquitoes collected: 362
 Average mosquitoes per trap/night: 28
 Average Culex per trap/night: 26

Species collected and abundance:

<i>Aedes (Oc.) inereptus</i>	1	0.3 %
<i>Aedes (Oc.) melanimon</i>	6	1.7 %
<i>Aedes (Oc.) trivittatus</i>	2	0.6 %
<i>Aedes vexans</i>	6	1.7 %
<i>Culex pipiens</i>	7	1.9 %
<i>Culex salinarius</i>	2	0.6 %
<i>Culex tarsalis</i>	333	92.0 %
<i>Culiseta inornata</i>	5	1.4 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	15	4.1 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	342	94.5 %
<i>Culiseta</i>	5	1.4 %
Other	0	0.0 %



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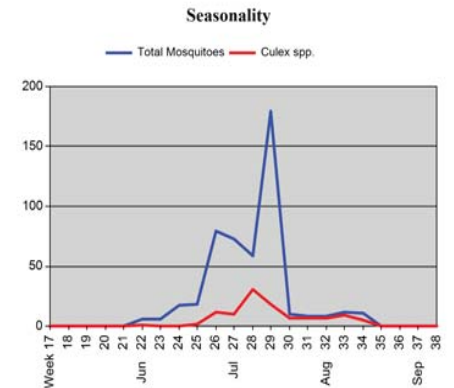
LO-04: Annette A. Brand Park

Season: 2014
 Trap Type: Light/CO2
 Location: Annette A. Brand Park at entrance to Louisville Res.
 GPS: N39° 59.415', W105° 9.495'

Total number of trap/nights set: 12
 Total number of mosquitoes collected: 472
 Average mosquitoes per trap/night: 39
 Average Culex per trap/night: 8

Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	2	0.4 %
<i>Aedes (Oc.) inereptus</i>	72	15.3 %
<i>Aedes (Oc.) melanimon</i>	8	1.7 %
<i>Aedes (Oc.) trivittatus</i>	21	4.4 %
<i>Aedes vexans</i>	255	54.0 %
<i>Culex salinarius</i>	3	0.6 %
<i>Culex tarsalis</i>	99	21.0 %
<i>Culiseta inornata</i>	12	2.5 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	358	75.8 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	102	21.6 %
<i>Culiseta</i>	12	2.5 %
Other	0	0.0 %



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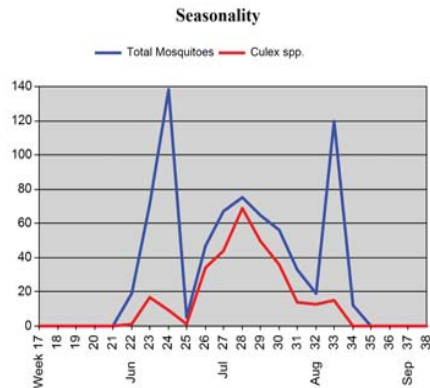
LO-08: Coal Creek Trail

Season: 2014
 Trap Type: Light/CO2
 Location: Coal Creek Trailhead off Aspen Way
 GPS: N39° 58.090', W105° 7.965'

Total number of trap/nights set: 13
 Total number of mosquitoes collected: 727
 Average mosquitoes per trap/night: 56
 Average Culex per trap/night: 23

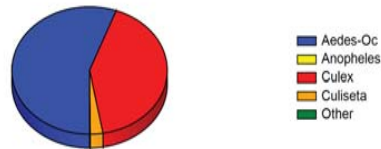
Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	6	0.8 %
<i>Aedes (Oc.) inereptus</i>	3	0.4 %
<i>Aedes (Oc.) melanimon</i>	28	3.9 %
<i>Aedes (Oc.) trivittatus</i>	2	0.3 %
<i>Aedes vexans</i>	365	50.2 %
<i>Coquilletidia perturbans</i>	1	0.1 %
<i>Culex pipiens</i>	7	1.0 %
<i>Culex salinarius</i>	27	3.7 %
<i>Culex tarsalis</i>	269	37.0 %
<i>Culiseta inornata</i>	19	2.6 %



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	404	55.6 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	303	41.7 %
<i>Culiseta</i>	19	2.6 %
Other	1	0.1 %



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Colorado Mosquito Control, Inc.

Larvicide Data Summary

by REPORT DATE: 1/28/2014 to 10/28/2014

by ACCOUNT: LO

	Total Site Inspections	No. Wet Sites	Percentage Wet Sites	No Sites Treated	Percentage Breeding*	Total Acres Treated
Louisville, City of	329	305	93 %	73	24 %	23.1

* (Sites Treated/Wet Sites)



Colorado Mosquito Control, Inc.

Visit Analysis - Summary

by REPORT DATE: 1/28/2014 to 10/28/2014

by ACCOUNT: LO

Site ID	Visits	Wet Sites	Dips w/ Larvae	Acres	Vectobac	Vectolex	Altosid	Oil
LO 0001	9	9 100.0 %	3 33.3 %	4.5	35.0	0.0	0.0	0.0
LO 0002	3	3 100.0 %	2 66.7 %	0.0	0.1	0.0	0.0	0.0
LO 0002	11	10 90.9 %	5 45.5 %	0.1	0.7	0.0	0.0	0.0
LO 0007	1	1 100.0 %	1 100.0 %	0.5	0.0	0.0	0.0	0.3
LO 0007	11	11 100.0 %	5 45.5 %	8.5	56.0	0.0	0.0	0.0
LO 0009	6	6 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0010	12	12 100.0 %	3 25.0 %	1.0	5.0	0.0	0.0	0.3
LO 0012	11	11 100.0 %	2 18.2 %	1.0	4.0	0.0	0.0	0.0
LO 0013	4	4 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0014	1	1 100.0 %	1 100.0 %	0.1	0.5	0.0	0.0	0.0
LO 0014	11	10 90.9 %	4 36.4 %	1.4	2.5	0.0	0.0	0.8
LO 0016	4	4 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0017	1	1 100.0 %	1 100.0 %	0.0	0.2	0.0	0.0	0.0
LO 0017	13	13 100.0 %	2 15.4 %	0.0	0.0	0.0	0.0	0.0
LO 0018	7	7 100.0 %	1 14.3 %	0.4	4.0	0.0	0.0	0.0
LO 0024	2	2 100.0 %	1 50.0 %	0.0	0.0	0.0	0.0	0.0
LO 0024	7	7 100.0 %	1 14.3 %	0.0	0.0	0.0	0.0	0.0
LO 0025	12	12 100.0 %	7 58.3 %	0.1	0.4	0.0	0.0	0.0
LO 0027	6	2 33.3 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0029	13	13 100.0 %	3 23.1 %	0.3	1.5	0.0	0.0	0.0
LO 0033	6	3 50.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0034	6	6 100.0 %	1 16.7 %	0.6	6.0	0.0	0.0	0.0
LO 0035	14	14 100.0 %	2 14.3 %	1.0	9.0	0.0	0.0	0.0
LO 0037	3	1 33.3 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0038	6	6 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0039	6	6 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0043	6	6 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0052	12	12 100.0 %	2 16.7 %	0.4	2.5	0.0	0.0	0.0
LO 0053	6	6 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0056	1	0 0.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0056	1	0 0.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0059	6	6 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0062	5	5 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0063	3	3 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0064	3	2 66.7 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0066	1	1 100.0 %	1 100.0 %	0.1	0.0	0.0	0.0	0.0
LO 0066	10	9 90.0 %	6 60.0 %	0.3	1.3	0.0	0.0	0.3
LO 0071	13	13 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0072	6	6 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0073	6	2 33.3 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0074	6	6 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0075	1	1 100.0 %	1 100.0 %	0.2	2.0	0.0	0.0	0.0

CM MS - Comprehensive Mosquito Management System

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Tuesday, October 28, 2014

LARVAE-005

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Colorado Mosquito Control, Inc.

Visit Analysis - Summary

by REPORT DATE: 1/28/2014 to 10/28/2014

by ACCOUNT: LO

Site ID	Visits	Wet Sites	Dips w/ Larvae	Acres	Vectobac	Vectolex	Altosid	Oil
LO 0075	13	11 84.6 %	7 53.8 %	1.3	11.0	0.0	0.0	0.0
LO 0078	10	8 80.0 %	4 40.0 %	0.8	8.0	0.0	0.0	0.0
LO 0081	6	6 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
LO 0085	14	14 100.0 %	4 28.6 %	0.2	0.9	0.0	0.0	0.0
LO 0087	4	3 75.0 %	1 25.0 %	0.0	0.1	0.0	0.0	0.0
LO 0088	2	2 100.0 %	1 50.0 %	0.3	0.0	0.0	0.0	0.3
LO 0088	7	7 100.0 %	1 14.3 %	0.3	2.0	0.0	0.0	0.0
LO 9999	1	1 100.0 %	0 0.0 %	0.0	0.0	0.0	0.0	0.0
	329	305 92.7 %	73 22.2 %	23.1	152.7	0.0	0.0	1.8



Colorado Mosquito Control, Inc.

Adulticide Data

Customer	Subdiv/Area	Material	Start Time	End Time	Miles
Louisville, City of					
Backpack Barrier					
06/18/2014	COAL CREEK TRAIL	Talstar	09:50:00	10:10:00	0.5
07/23/2014	LOUISVILLE RES TRAP	Talstar	11:05:00	11:21:00	0.3
08/21/2014	COAL CREEK HARBORAGE	Talstar	10:25:00	10:50:00	0.5
Backpack Barrier				Sum	1.3
				Avg	0.4
				Min	0.3
				Max	0.5
Grand Total					1.3



COLORADO MOSQUITO CONTROL, INC.
Protecting Colorado From Annoyance & Disease Since 1986