

# 2015 Annual Report City of Centennial Mosquito Control Program



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# CITY OF CENTENNIAL MOSQUITO CONTROL PROGRAM ANNUAL REPORT 2015

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# **THE CITY OF CENTENNIAL 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 Centennial 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 primary objective of the City of Centennial 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 Centennial 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.



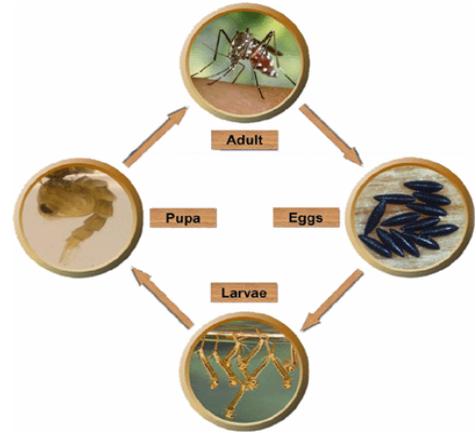
CMC currently has programs throughout the state of Colorado including municipalities, counties, HOA's, Indian Reservations, and others. Geographically, CMC reaches from the Ute Mountain Ute Reservation in the southwest corner of the state to the northeast. CMC has programs in several mountain areas including 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 Centennial, 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).

## 2015 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.



According to the National Weather Service, April was somewhat warmer and drier than normal with an average temperature of 48.7 degrees, 1.3 degrees above average. 2.65 inches of rain-based precipitation fell, 0.94 inches above the normal of 1.71 inches. 5.3 inches of snow also fell during the month, 1.5 inches less than normal.

May was both wetter and colder than average with an average temperature of 53.0 degrees, 4.1 degrees below normal, which tied the month as the 12<sup>th</sup> coldest May since records began in 1872 alongside May of 1882, 1898 and 1950. The month saw above average rainfall with 3.76 inches falling, 1.64 inches above the normal of 2.12 inches. A seven to eleven day streak of measurable precipitation ran from April 30<sup>th</sup> to May 10, with nearly 1.08 inches falling on the 9<sup>th</sup>. Snowfall was likewise above normal with 4.0 inches measured, 2.9 inches above the normal of 1.1.

June can be described as warm and wet with an average temperature of 69.5 degrees, 2.1 degrees above normal. 2.53 inches of rain fell, 0.55 inches above the normal of 1.98 inches. The Front Range saw severe weather and heavy rainfall early in the month with northern communities hardest hit.

After a stormy June weather patterns stabilized in July. Temperatures were a bit cooler than normal with an average temperature of 72.8 degrees, 1.4 degrees below normal. Precipitation for the month was 1.06 inches, a full 1.10 inches less than the normal of 2.16 inches. 0.33 inches fell in July on the 18<sup>th</sup>, the greatest daily amount for the month.

The average temperature in August was 89.8 degrees, 2.6 degrees warmer than the average of 87.2. High temperature records were equaled on both the 15<sup>th</sup> and 26<sup>th</sup> of the month with temperatures of 98 and 97 degrees respectively. Only 1.18 inches of rain fell in August, 0.51 inches below the normal of 1.69 inches. Some southern Front Range communities saw localized flooding on the 10<sup>th</sup> as severe weather affected those areas.

The 2015 season ended in a September which saw an average temperature of 69.4 degrees, a whopping 6.0 degrees above normal. This made September 2015 the warmest on record. A miserly 0.11 inches of rain fell, 0.85 inches below normal, making the month the 16<sup>th</sup> driest on record. October likewise saw much warmer temperatures with an average of 56.5 degrees, 5.6 degrees above normal, thus making the month the sixth warmest on record.

## **2015 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 18<sup>th</sup> 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 early to mid-September.

Centennial saw a total of 302 site inspections in 2015 of which 270 or 89% were wet. Of those, 57 sites, or 21%, were subsequently treated for breeding. A total of 15.0 acres were treated in 2015. 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 2015**

### **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.

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 2015

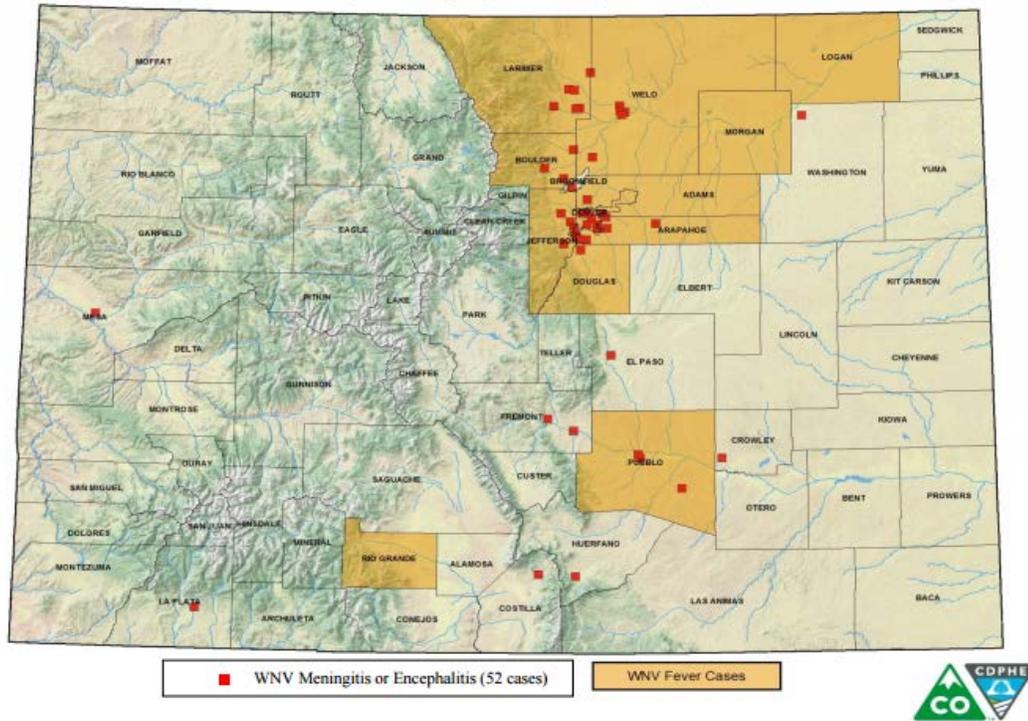
According to the latest report by the CDPHE, dated October 16<sup>th</sup>, there are 97 human WNV cases in Colorado as of this November 5<sup>th</sup> writing. Larimer County leads the state with twenty cases while Arapahoe and Boulder County each have eleven. Denver and Weld counties both have ten. There have been two fatalities related to WNV: one in Crowley County and one in Pueblo County. By contrast the state had a total of 118 human WNV cases in 2014 and four deaths while in 2013 those numbers totaled 322 and seven, respectively.

According to the CDC the U.S has over 1,560 human cases of this writing. California has the highest number of human cases with Texas the second highest. Colorado currently has the third highest number. Sixty-six deaths have thus far been reported nationwide. Last year the country saw 2,205 human cases resulting in 97 deaths.

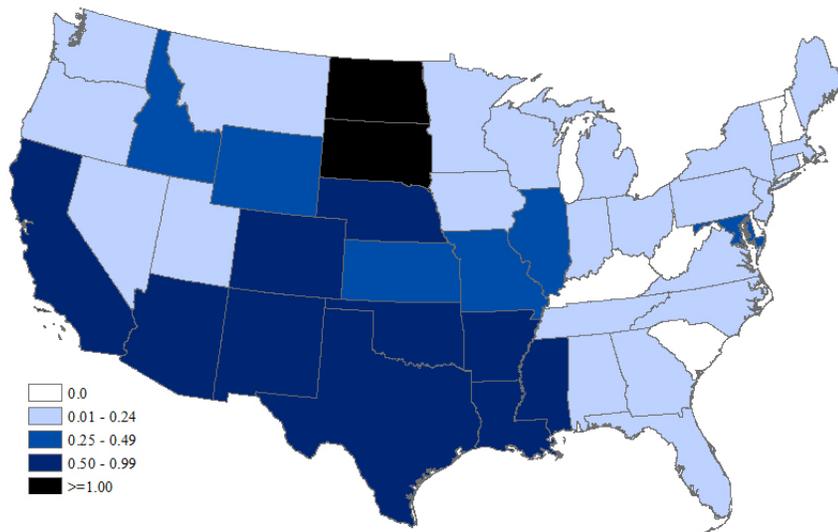
### Human West Nile Virus Infection Colorado, October 16, 2015

	Fever	Meningitis	Encephalitis	Asymptomatic Blood Donors	Total Cases	Total Deaths
Adams	4		1		5	
Alamosa				1	1	
Arapahoe	2	3	9		11	
Boulder	8	1	2		11	
Broomfield		1			1	
Costilla			1		1	
Crowley			1		1	1
Denver	1	7	1	1	10	
Douglas	1	1			2	
El Paso			1		1	
Fremont		1	1		2	
Huerfano			1		1	
Jefferson	1	3	1		5	
La Plata		1			1	
Larimer	10	2	4	4	20	
Logan	1				1	
Mesa	1		1	1	3	
Morgan	2				2	
Pueblo	1	1	2		4	1
Rio Grande	1				1	
Sedgwick			1		1	
Washington		1			1	
Weld	5	4	1		10	
<b>Total</b>	<b>38</b>	<b>26</b>	<b>26</b>	<b>7</b>	<b>97</b>	<b>2</b>

### West Nile Virus Human Surveillance in Colorado January 1, 2015 through October 16, 2015 [97 Total Cases]



### West Nile Virus Neuroinvasive Disease Incidence by State - United States, 2015 (as of October 27, 2015)



This map shows the incidence of human West Nile virus neuroinvasive disease (e.g., meningitis, encephalitis, or acute flaccid paralysis) by state for 2015 with shading ranging from 0.01-0.24, 0.25-0.49, 0.50-0.99, and greater than 1.00 per 100,000 population.

Neuroinvasive disease cases have been reported to ArboNET from the following states for 2015: Alabama, Arizona, Arkansas, California, Colorado, Connecticut, District of Columbia, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, Wisconsin, and Wyoming.

## 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 CO<sub>2</sub>, 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 2015, 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 2015 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 Centennial collected a total of 1,170 mosquitoes in 2015. The percent composition of mosquitoes collected included 58.5% (684) *Culex* spp., 39.6% (463) *Aedes/Ochlerotatus* spp., and 2.0% (23) *Culiseta* spp. mosquitoes. Please see *Appendix: 2015 CDC Trap Composite Data* as well as the respective charts for each trap for more information.

## 2015 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 2015 CMC utilized the water-based products AquaLuer 20-20 and AquaKontrol 30-30 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. Daytime backpack barrier applications using the product Talstar Pro and utilizing the pyrethroid Bifenthrin are also effective in controlling adult mosquitoes. A total of 0 miles of adulticide applications took place in Centennial in 2015. 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](http://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, 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. We have clearly demonstrated this commitment by proactively incorporating numerous innovative programs, activities and services into the South Metro Cooperative Mosquito Control Programs. .

### **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.

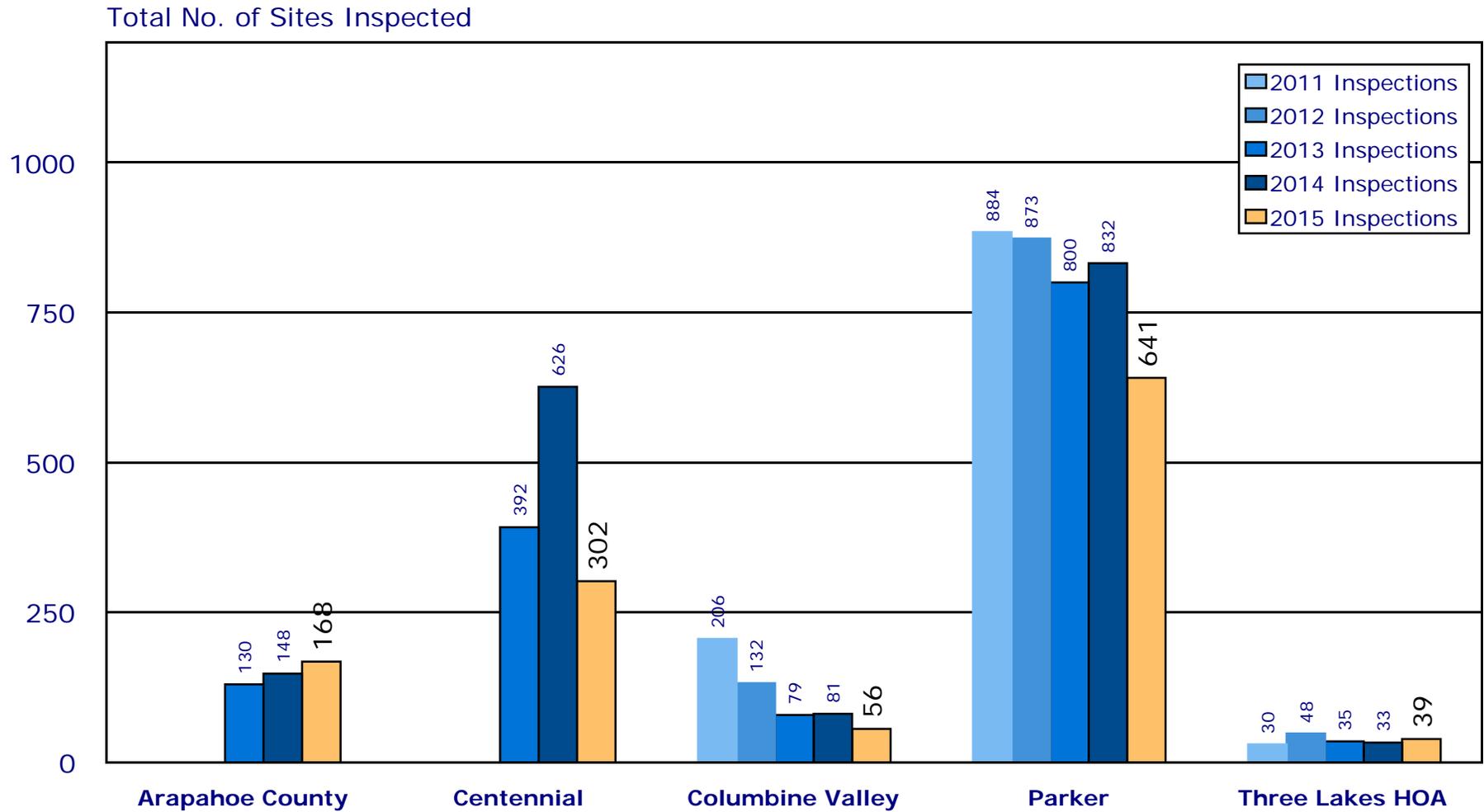
## **SUMMARY**

After the wet months of May and June and with the latter's warm temperatures the 2015 season started with large numbers of adult mosquitoes and many residential concerns. Extensive adulticide applications therefore resulted. This trend fortunately stabilized in July with slightly cooler than average temperatures and below average precipitation. The overall numbers of adult mosquitoes continued its noticeable and welcome drop in August as warm, dry weather predominated. The season ended with the warmest September on record and little if any significant adult mosquito activity. Mosquitoes from neighboring areas with substandard control or less however presented challenges and will continue to do so in the future. Human West Nile Virus cases in 2015 will in all likelihood come close to 2014 totals with deaths at half that number. 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 Centennial staff, officials and residents for their continuing support and we look forward to providing Centennial with mosquito control services in 2016 and beyond.

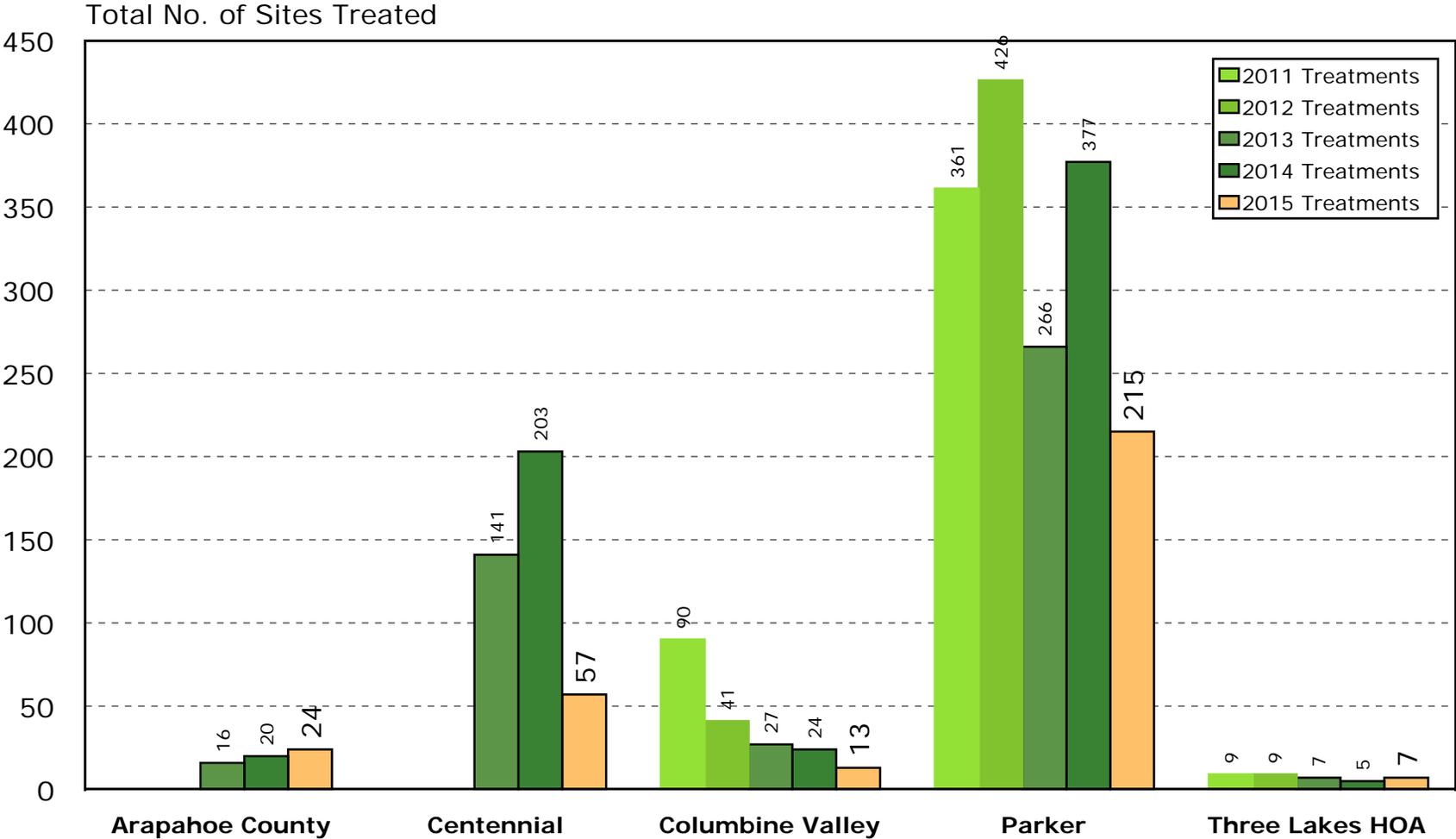
# Larval Site Inspections by Service Area

## '11-'15 South Metro Denver Mosquito Control Programs



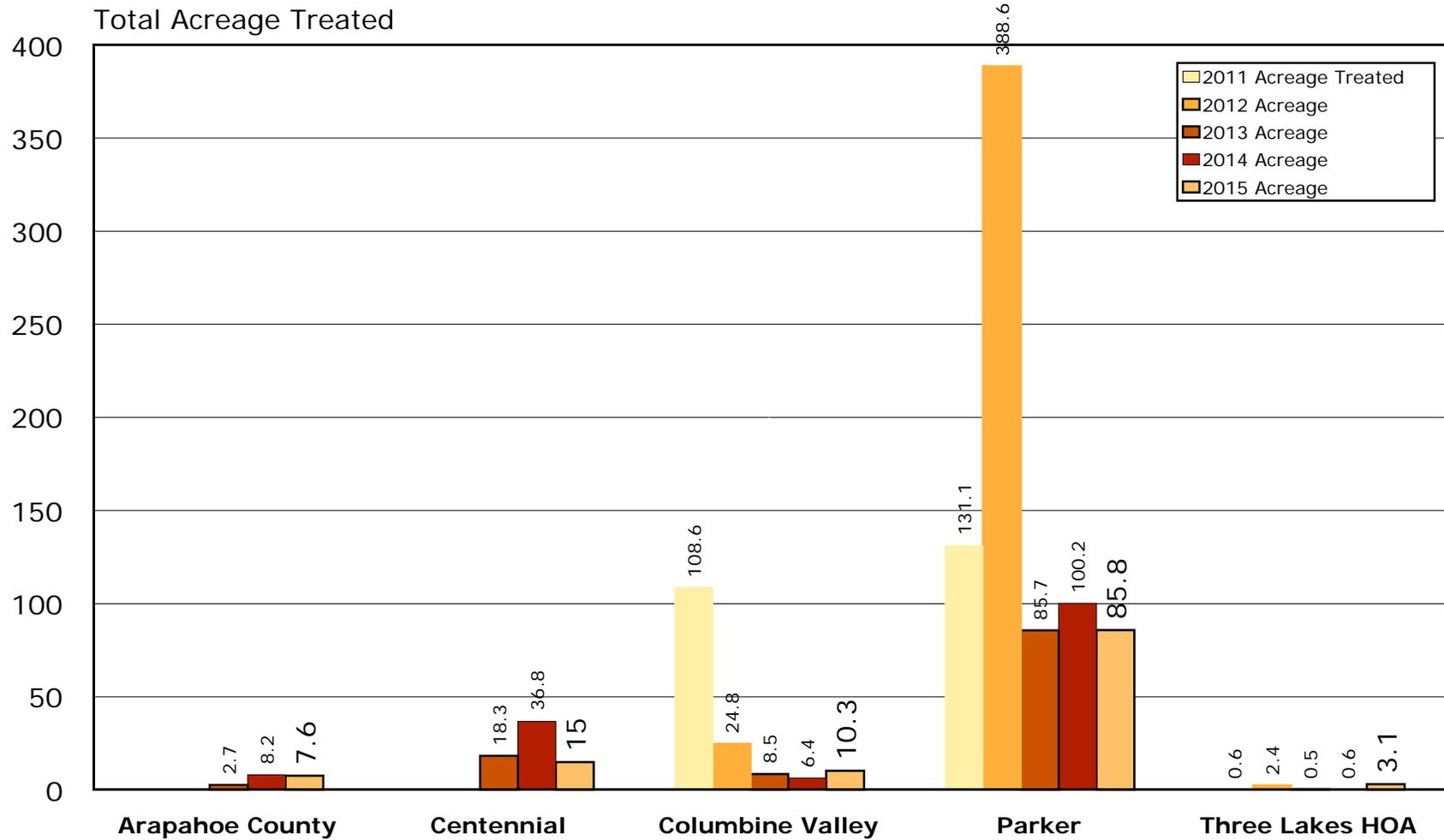
# Larval Site Treatments by Service Area

## '11-'15 South Metro Denver Mosquito Control Programs



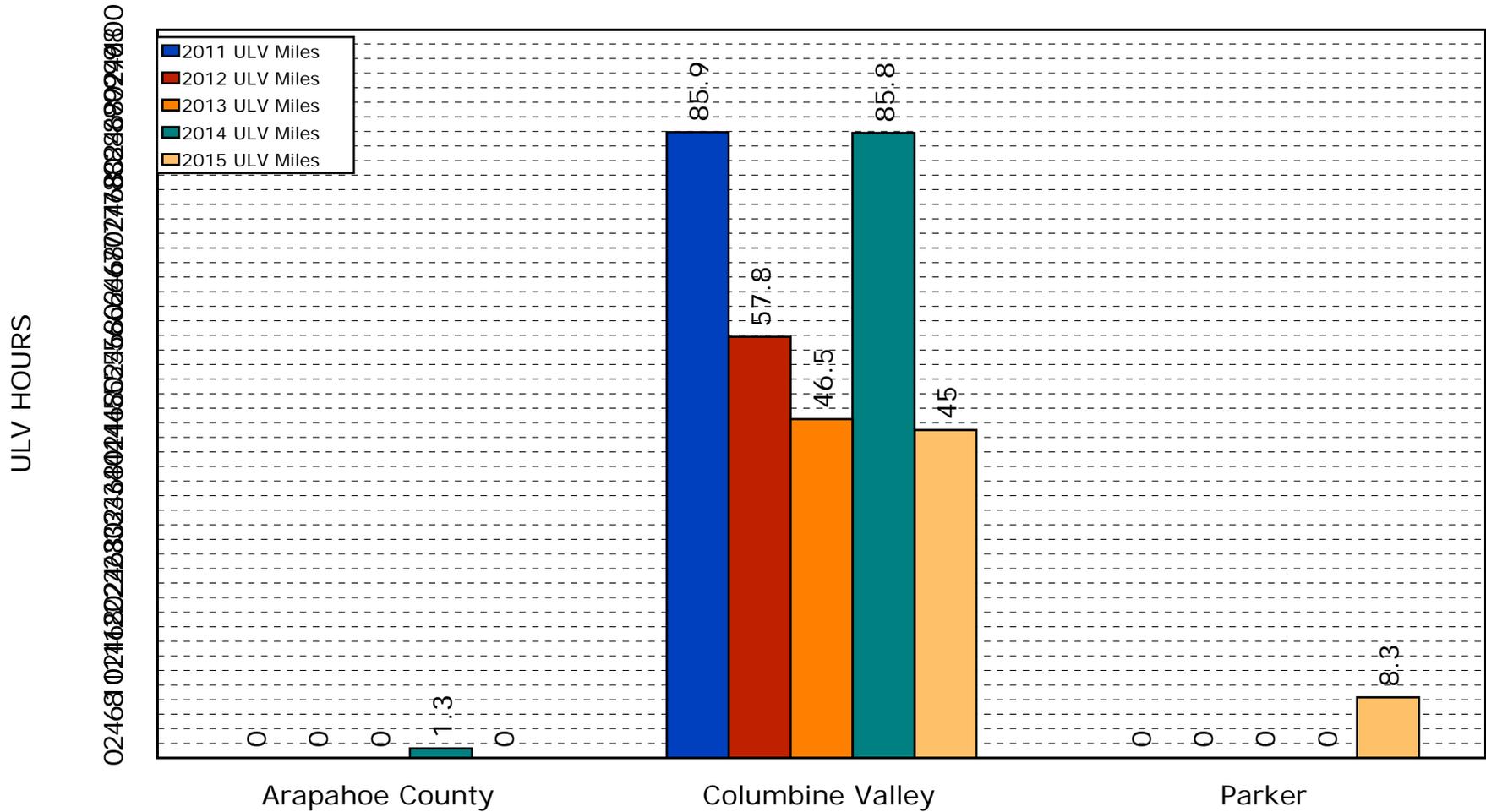
# Larval Acreage Treated by Service Area

## '11-'15 South Metro Denver Mosquito Control Programs



# ULV Adulicide Comparison By Service Area

## '11-'15 South Metro Denver Mosquito Control Programs

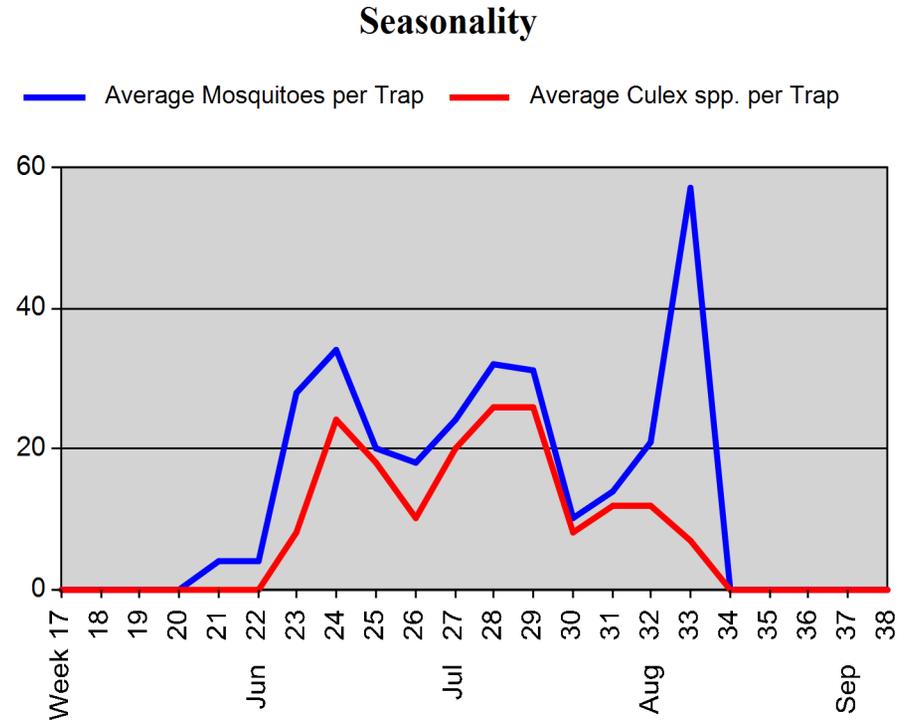


# 2015 Centennial Light Trap Composite Data

**Total number of trap/nights set:** 48  
**Total number of mosquitoes collected:** 1,170  
**Average mosquitoes per trap/night:** 24  
**Average Culex per trap/night:** 14

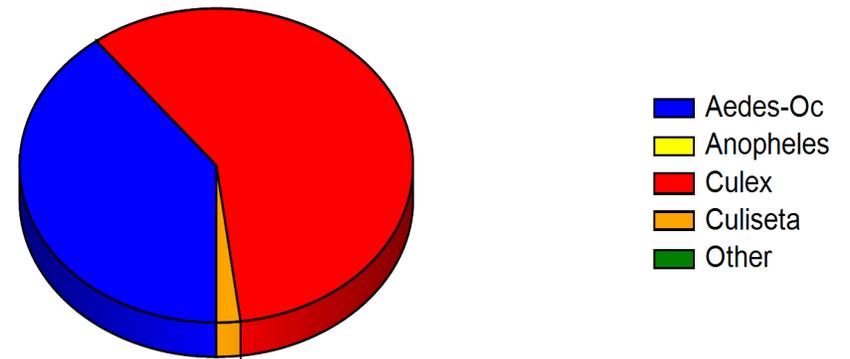
## Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	9	0.8 %
<i>Aedes (Oc.) hendersoni</i>	3	0.3 %
<i>Aedes (Oc.) increpitus</i>	2	0.2 %
<i>Aedes (Oc.) nigromaculis</i>	2	0.2 %
<i>Aedes (Oc.) trivittatus</i>	38	3.2 %
<i>Aedes vexans</i>	409	35.0 %
<i>Culex pipiens</i>	110	9.4 %
<i>Culex salinarius</i>	96	8.2 %
<i>Culex tarsalis</i>	478	40.9 %
<i>Culiseta inornata</i>	23	2.0 %



## Genus proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	463	39.6 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	684	58.5 %
<i>Culiseta</i>	23	2.0 %
Other	0	0.0 %



# CN-01: Centennial Piney Creek

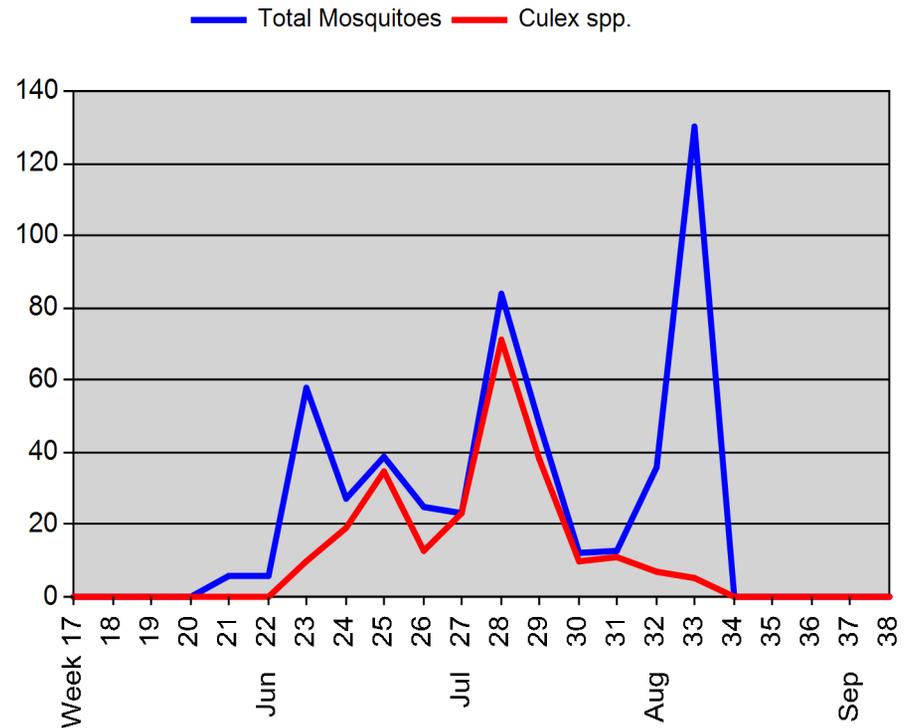
**Season:** 2015  
**Trap Type:** Light/CO2  
**Location:** north of Kittredtge St. at Orchard Pl.  
**GPS:** N39° 36.545', W104° 48.215'

**Total number of trap/nights set:** 12  
**Total number of mosquitoes collected:** 501  
**Average mosquitoes per trap/night:** 42  
**Average Culex per trap/night:** 20

## Species collected and abundance:

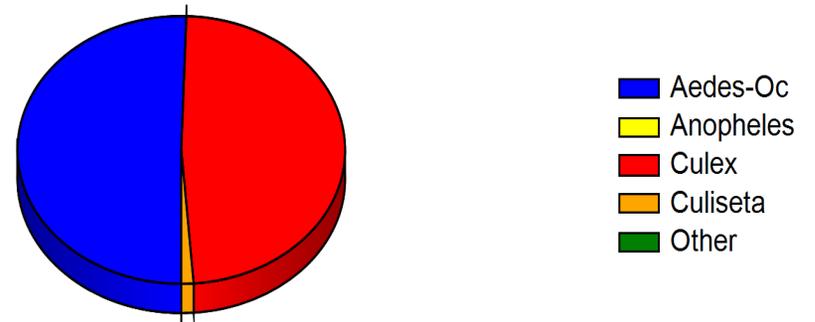
<i>Aedes (Oc.) dorsalis</i>	1	0.2 %
<i>Aedes (Oc.) nigromaculis</i>	1	0.2 %
<i>Aedes (Oc.) trivittatus</i>	23	4.6 %
<i>Aedes vexans</i>	228	45.5 %
<i>Culex pipiens</i>	21	4.2 %
<i>Culex salinarius</i>	23	4.6 %
<i>Culex tarsalis</i>	198	39.5 %
<i>Culiseta inornata</i>	6	1.2 %

## Seasonality



## Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	253	50.5 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	242	48.3 %
<i>Culiseta</i>	6	1.2 %
Other	0	0.0 %



# CN-02: Centennial Airport Center

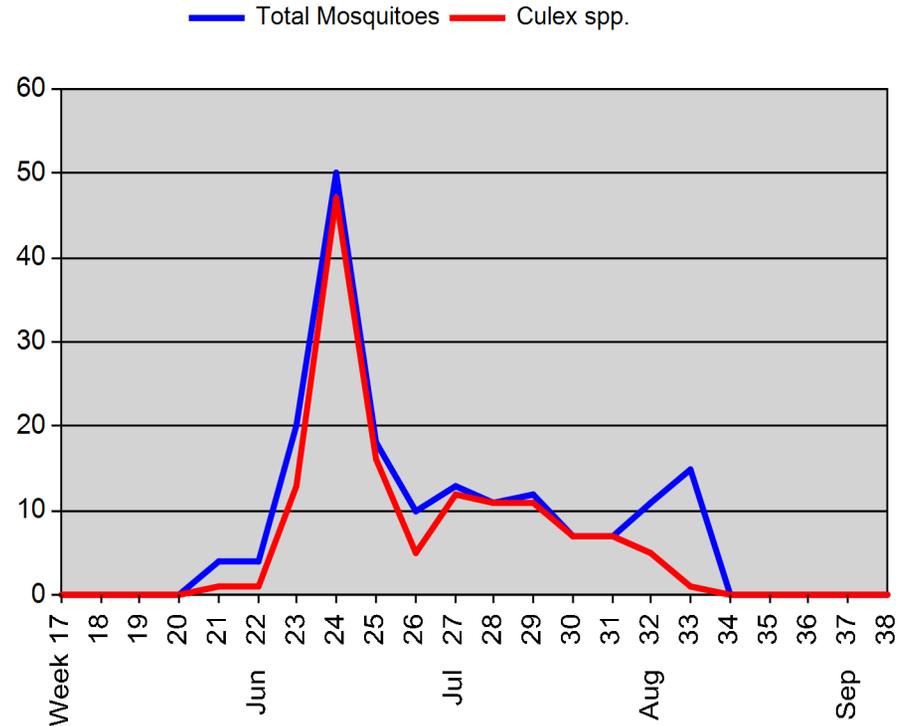
**Season:** 2015  
**Trap Type:** Light/CO2  
**Location:** SW of 6803 S, Tucson Way, Centennial 80112  
**GPS:** N39° 35.390', W104° 50.290'

**Total number of trap/nights set:** 12  
**Total number of mosquitoes collected:** 178  
**Average mosquitoes per trap/night:** 15  
**Average Culex per trap/night:** 11

## Species collected and abundance:

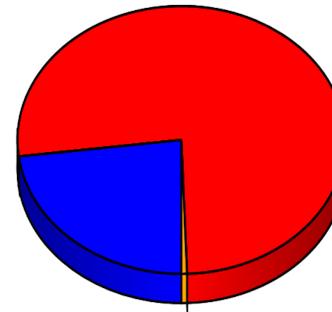
<i>Aedes (Oc.) dorsalis</i>	4	2.2 %
<i>Aedes (Oc.) trivittatus</i>	13	7.3 %
<i>Aedes vexans</i>	24	13.5 %
<i>Culex pipiens</i>	3	1.7 %
<i>Culex salinarius</i>	1	0.6 %
<i>Culex tarsalis</i>	132	74.2 %
<i>Culiseta inornata</i>	1	0.6 %

## Seasonality



## Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	41	23.0 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	136	76.4 %
<i>Culiseta</i>	1	0.6 %
Other	0	0.0 %



■ Aedes-Oc  
■ Anopheles  
■ Culex  
■ Culiseta  
■ Other

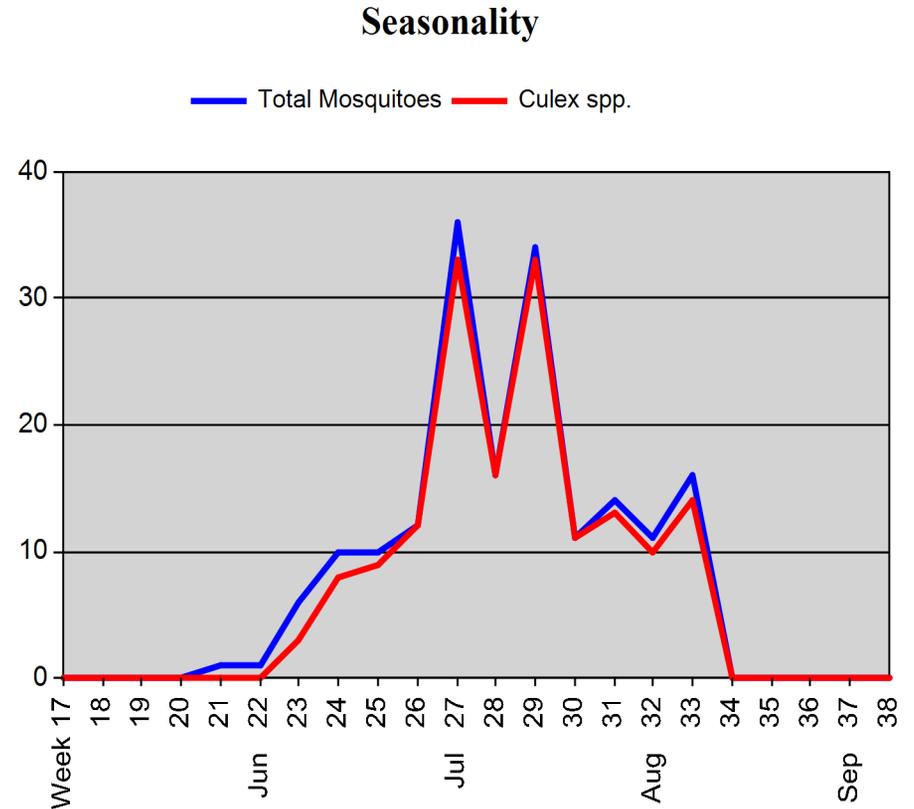
# CN-03: Centennial Quebec at Little Dry Creek

**Season:** 2015  
**Trap Type:** Light/CO2  
**Location:** NW corner of Quebec St. at Costilla Ave.  
**GPS:** N39° 35.515', W104° 54.270'

**Total number of trap/nights set:** 12  
**Total number of mosquitoes collected:** 177  
**Average mosquitoes per trap/night:** 15  
**Average Culex per trap/night:** 14

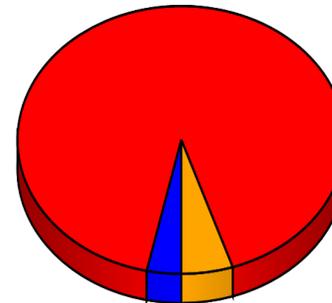
## Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	1	0.6 %
<i>Aedes (Oc.) trivittatus</i>	1	0.6 %
<i>Aedes vexans</i>	4	2.3 %
<i>Culex pipiens</i>	60	33.9 %
<i>Culex salinarius</i>	48	27.1 %
<i>Culex tarsalis</i>	54	30.5 %
<i>Culiseta inornata</i>	9	5.1 %



## Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	6	3.4 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	162	91.5 %
<i>Culiseta</i>	9	5.1 %
Other	0	0.0 %



■ Aedes-Oc  
■ Anopheles  
■ Culex  
■ Culiseta  
■ Other

# CN-04: Centennial DeKoevend Park

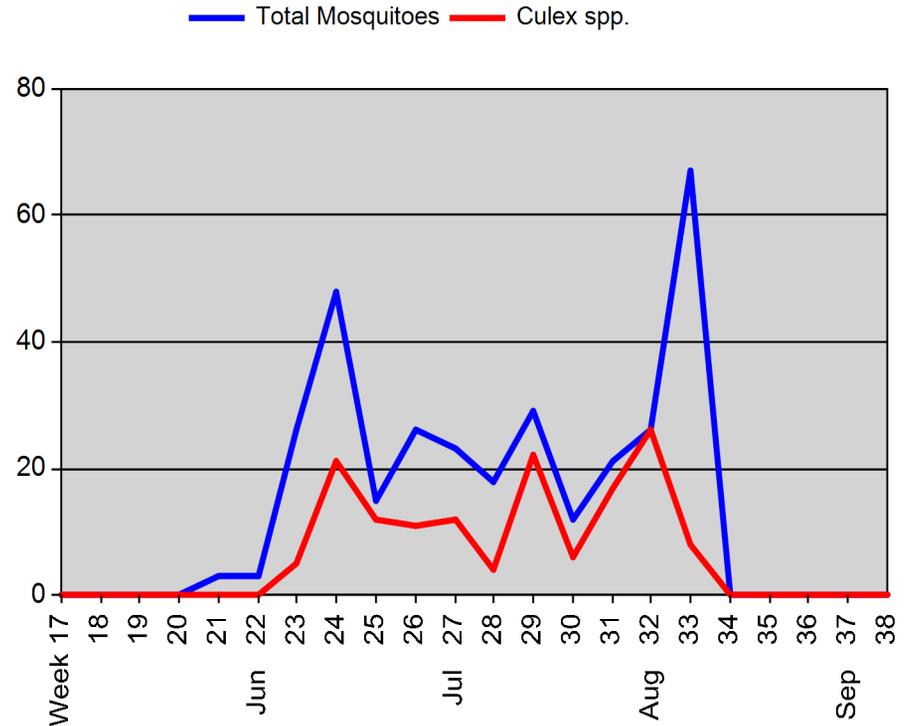
**Season:** 2015  
**Trap Type:** Light/CO2  
**Location:** NW of the Goodson Rec Center in DeKoevend Park  
**GPS:** N39° 36.190', W104° 57.820'

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

## Species collected and abundance:

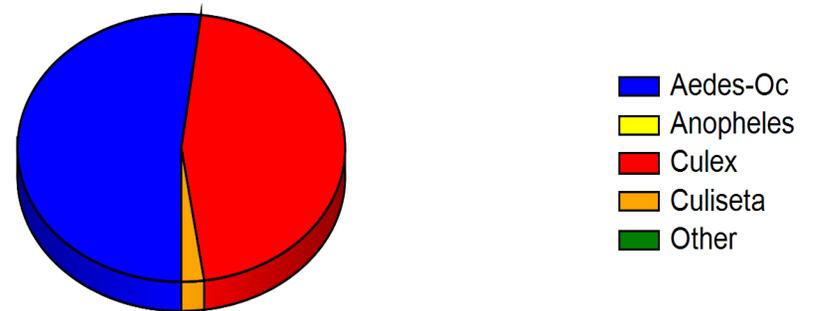
<i>Aedes (Oc.) dorsalis</i>	3	1.0 %
<i>Aedes (Oc.) hendersoni</i>	3	1.0 %
<i>Aedes (Oc.) increpitus</i>	2	0.6 %
<i>Aedes (Oc.) nigromaculis</i>	1	0.3 %
<i>Aedes (Oc.) trivittatus</i>	1	0.3 %
<i>Aedes vexans</i>	153	48.7 %
<i>Culex pipiens</i>	26	8.3 %
<i>Culex salinarius</i>	24	7.6 %
<i>Culex tarsalis</i>	94	29.9 %
<i>Culiseta inornata</i>	7	2.2 %

## Seasonality



## Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	163	51.9 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	144	45.9 %
<i>Culiseta</i>	7	2.2 %
Other	0	0.0 %



# AC-01: Arapahoe County Fairgrounds

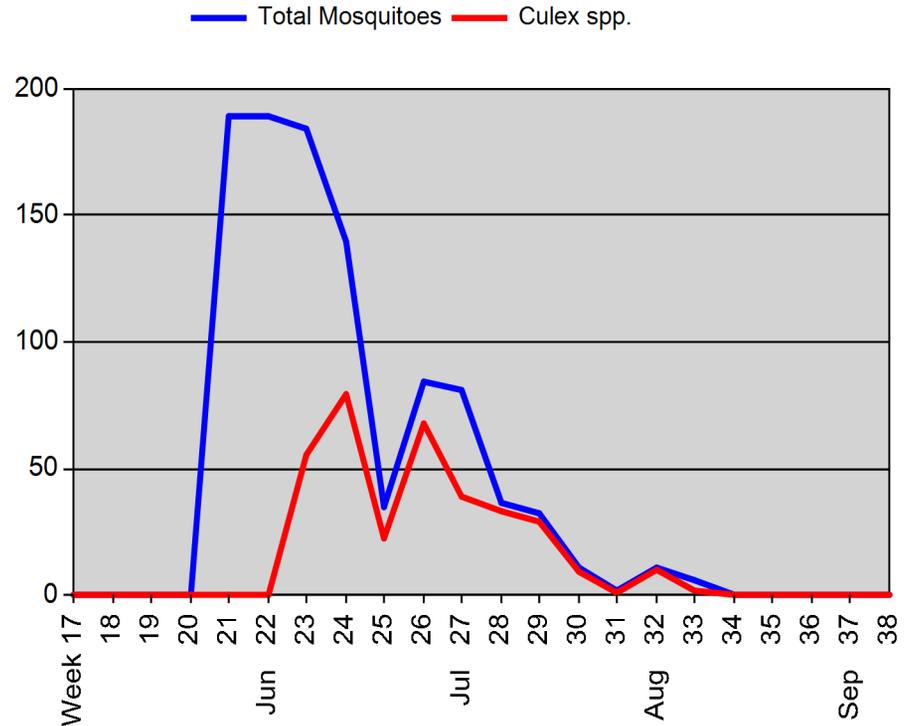
**Season:** 2015  
**Trap Type:** Light/CO2  
**Location:** E. Quincy Ave. at S. Harvard Rd.  
**GPS:** N39° 38.285', W104° 41.840'

**Total number of trap/nights set:** 12  
**Total number of mosquitoes collected:** 811  
**Average mosquitoes per trap/night:** 68  
**Average Culex per trap/night:** 29

## Species collected and abundance:

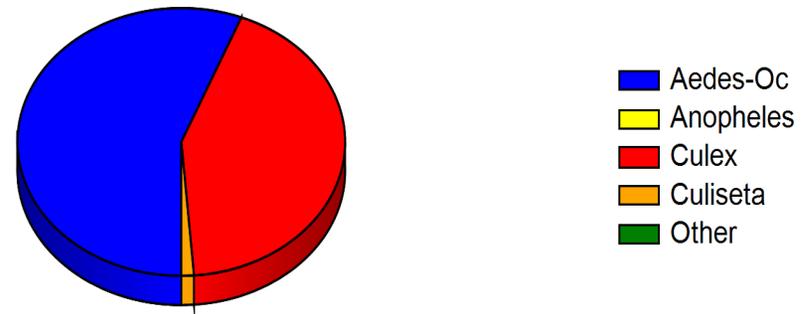
<i>Aedes (Oc.) dorsalis</i>	21	2.6 %
<i>Aedes (Oc.) increpitus</i>	1	0.1 %
<i>Aedes (Oc.) nigromaculis</i>	4	0.5 %
<i>Aedes (Oc.) trivittatus</i>	134	16.5 %
<i>Aedes vexans</i>	294	36.3 %
<i>Culex pipiens</i>	6	0.7 %
<i>Culex salinarius</i>	2	0.2 %
<i>Culex tarsalis</i>	339	41.8 %
<i>Culiseta inornata</i>	10	1.2 %

## Seasonality



## Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	454	56.0 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	347	42.8 %
<i>Culiseta</i>	10	1.2 %
Other	0	0.0 %



# AC-02: Arapahoe Co. Dove Valley Park

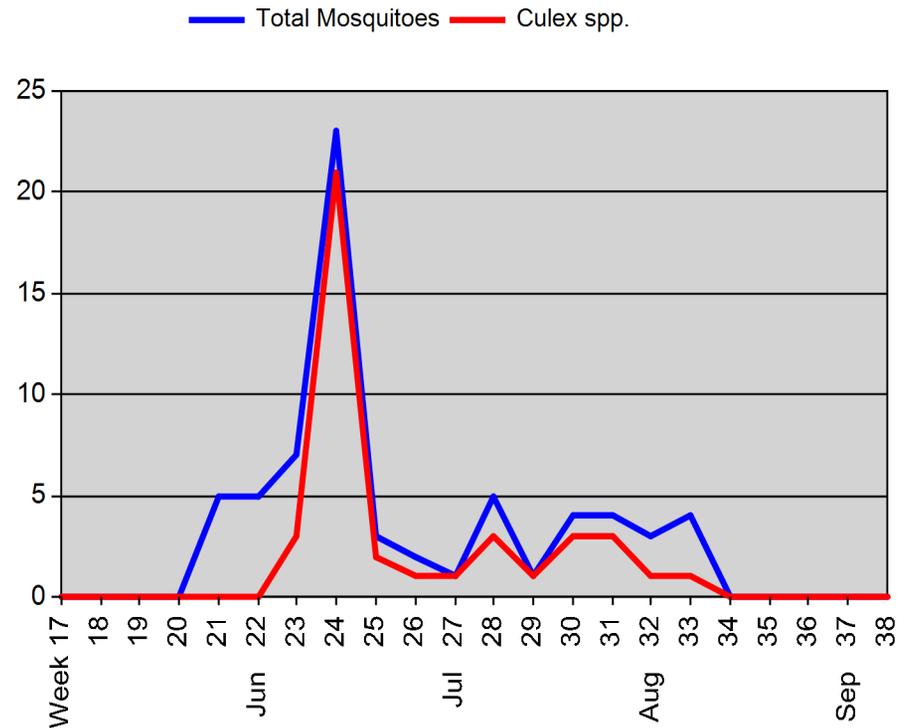
**Season:** 2015  
**Trap Type:** Light/CO2  
**Location:** drainage at NE corner of Dove Valley Regional Park  
**GPS:** N39° 34.670', W104° 49.435'

**Total number of trap/nights set:** 12  
**Total number of mosquitoes collected:** 58  
**Average mosquitoes per trap/night:** 5  
**Average Culex per trap/night:** 3

## Species collected and abundance:

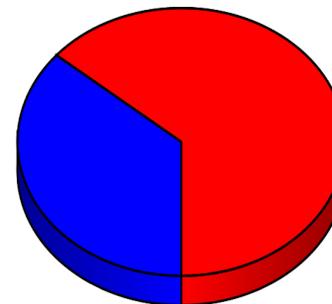
<i>Aedes (Oc.) dorsalis</i>	7	12.1 %
<i>Aedes (Oc.) nigromaculis</i>	2	3.4 %
<i>Aedes (Oc.) trivittatus</i>	3	5.2 %
<i>Aedes vexans</i>	9	15.5 %
<i>Culex pipiens</i>	1	1.7 %
<i>Culex salinarius</i>	1	1.7 %
<i>Culex tarsalis</i>	35	60.3 %

## Seasonality



## Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	21	36.2 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	37	63.8 %
<i>Culiseta</i>	0	0.0 %
Other	0	0.0 %



■ Aedes-Oc  
■ Anopheles  
■ Culex  
■ Culiseta  
■ Other

# AC-03: Arapahoe Co. Ecological Park

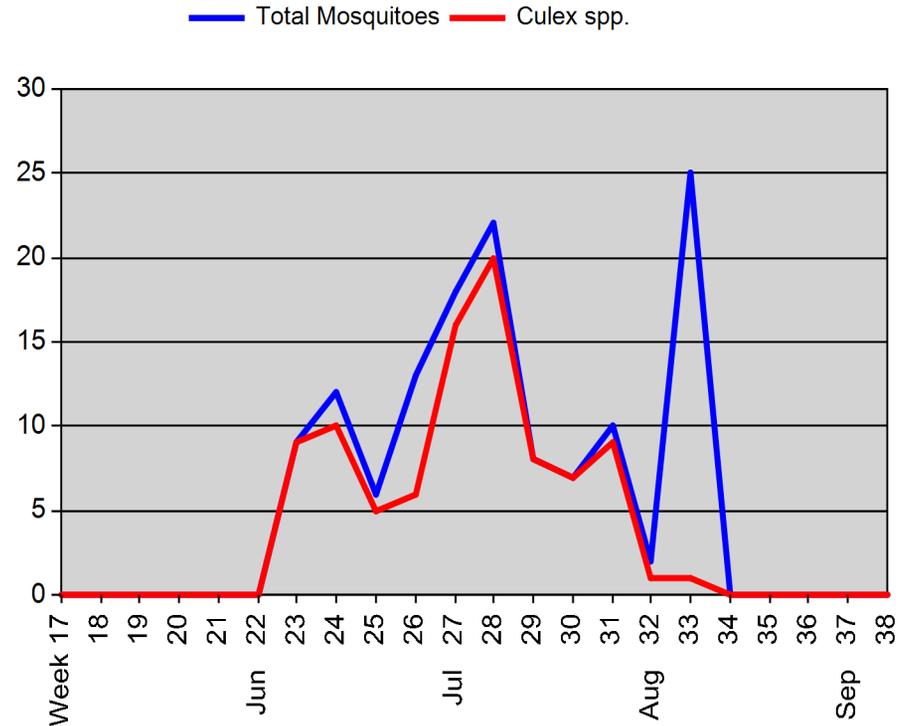
**Season:** 2015  
**Trap Type:** Light/CO2  
**Location:** Trailhead Parking west of Tagawa Gardens  
**GPS:** N39° 34.675', W104° 47.885'

**Total number of trap/nights set:** 12  
**Total number of mosquitoes collected:** 132  
**Average mosquitoes per trap/night:** 11  
**Average Culex per trap/night:** 8

## Species collected and abundance:

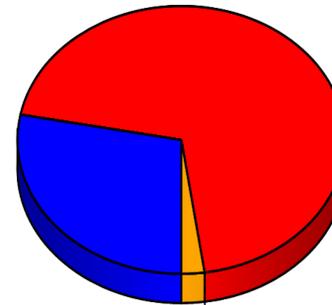
<i>Aedes (Oc.) trivittatus</i>	11	8.3 %
<i>Aedes vexans</i>	26	19.7 %
<i>Culex salinarius</i>	8	6.1 %
<i>Culex tarsalis</i>	84	63.6 %
<i>Culiseta inornata</i>	3	2.3 %

## Seasonality



## Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	37	28.0 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	92	69.7 %
<i>Culiseta</i>	3	2.3 %
Other	0	0.0 %



■ Aedes-Oc  
■ Anopheles  
■ Culex  
■ Culiseta  
■ Other

# CV-01: Columbine Valley Fairway Ln

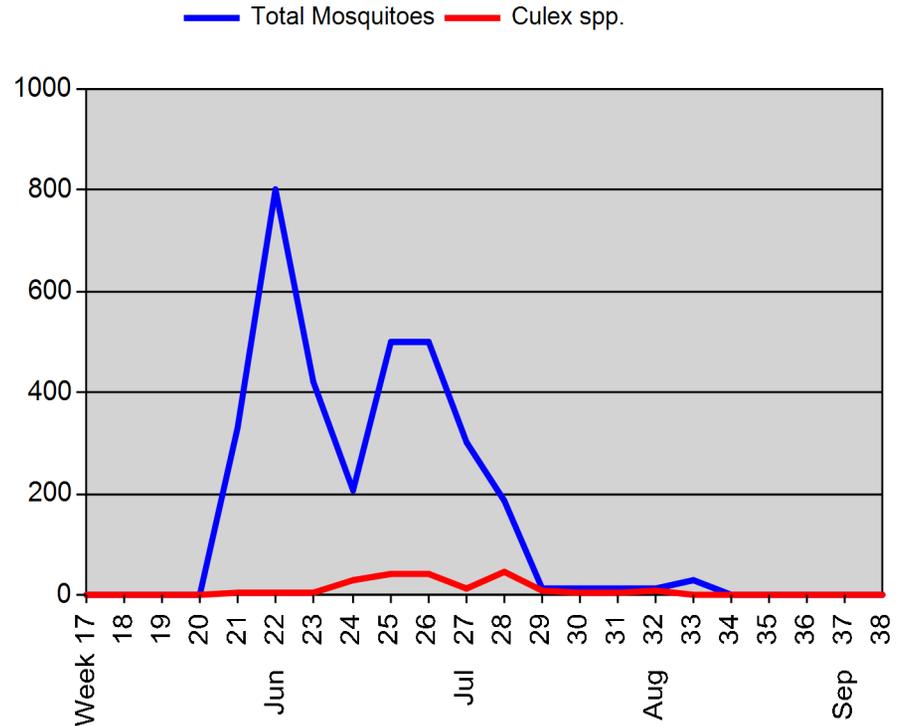
**Season:** 2015  
**Trap Type:** Light/CO2  
**Location:** 6700 So. Fairway Lane, Columbine Valley 80123  
**GPS:** N39° 35.705', W105°1.820'

**Total number of trap/nights set:** 12  
**Total number of mosquitoes collected:** 2,828  
**Average mosquitoes per trap/night:** 236  
**Average Culex per trap/night:** 13

## Species collected and abundance:

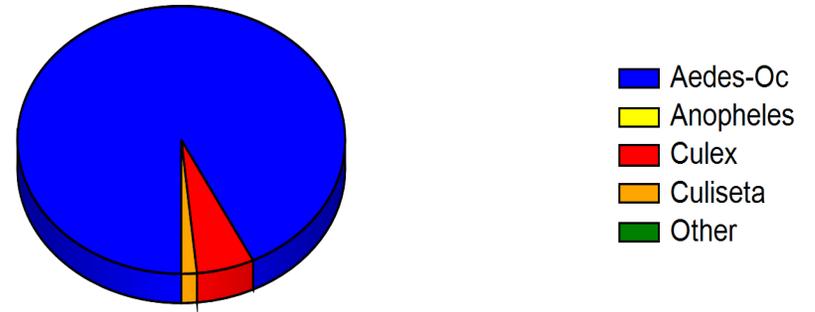
<i>Aedes (Oc.) dorsalis</i>	4	0.1 %
<i>Aedes (Oc.) hendersoni</i>	1	0.0 %
<i>Aedes (Oc.) increpitus</i>	8	0.3 %
<i>Aedes (Oc.) melanimon</i>	2	0.1 %
<i>Aedes (Oc.) trivittatus</i>	100	3.5 %
<i>Aedes vexans</i>	2509	88.7 %
<i>Culex pipiens</i>	14	0.5 %
<i>Culex salinarius</i>	1	0.0 %
<i>Culex tarsalis</i>	146	5.2 %
<i>Culiseta inornata</i>	43	1.5 %

## Seasonality



## Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	2,624	92.8 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	161	5.7 %
<i>Culiseta</i>	43	1.5 %
Other	0	0.0 %



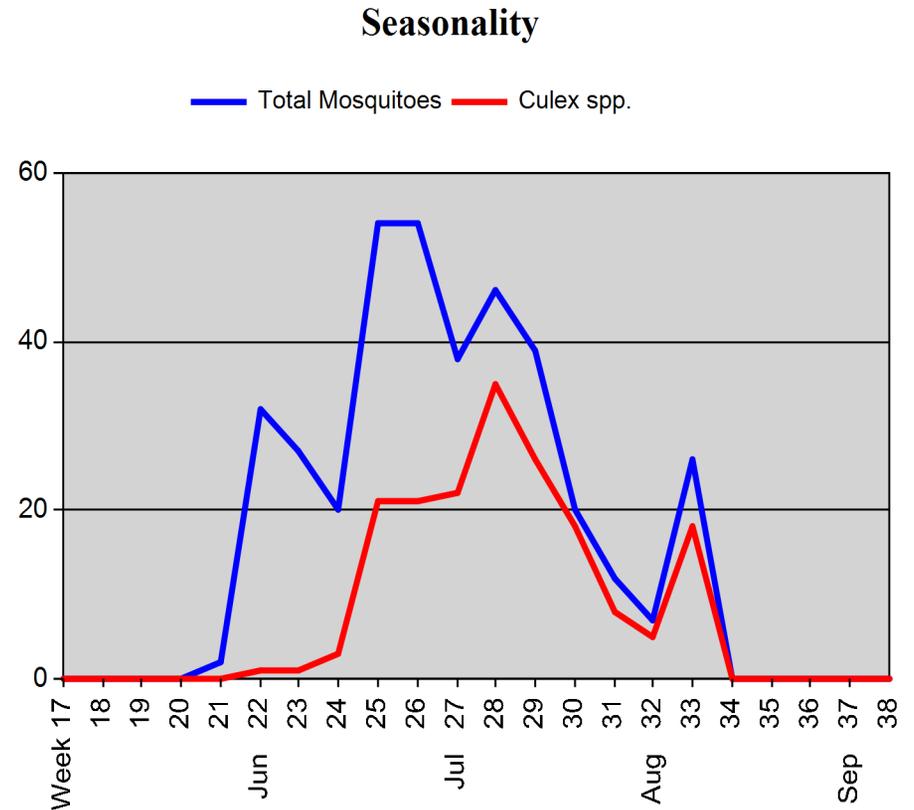
# CV-02: Columbine Valley Watson Ln

**Season:** 2015  
**Trap Type:** Light/CO2  
**Location:** 600 Watson Lane, Columbine Valley 80123  
**GPS:** N39° 36.365', W105° 1.810'

**Total number of trap/nights set:** 12  
**Total number of mosquitoes collected:** 323  
**Average mosquitoes per trap/night:** 27  
**Average Culex per trap/night:** 13

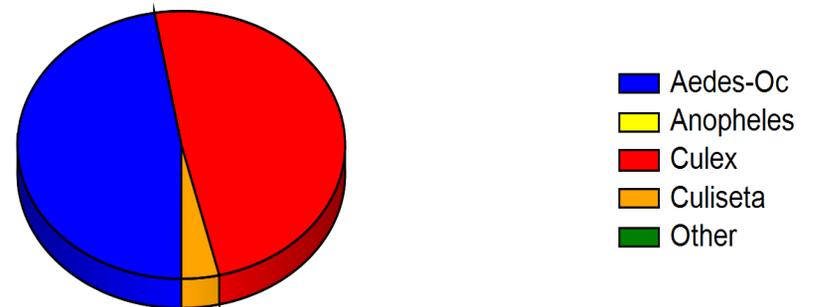
## Species collected and abundance:

<i>Aedes vexans</i>	153	47.4 %
<i>Culex pipiens</i>	29	9.0 %
<i>Culex salinarius</i>	17	5.3 %
<i>Culex tarsalis</i>	112	34.7 %
<i>Culiseta inornata</i>	12	3.7 %



## Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	153	47.4 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	158	48.9 %
<i>Culiseta</i>	12	3.7 %
Other	0	0.0 %



# PA-01: Parker Cottonwood Open Space

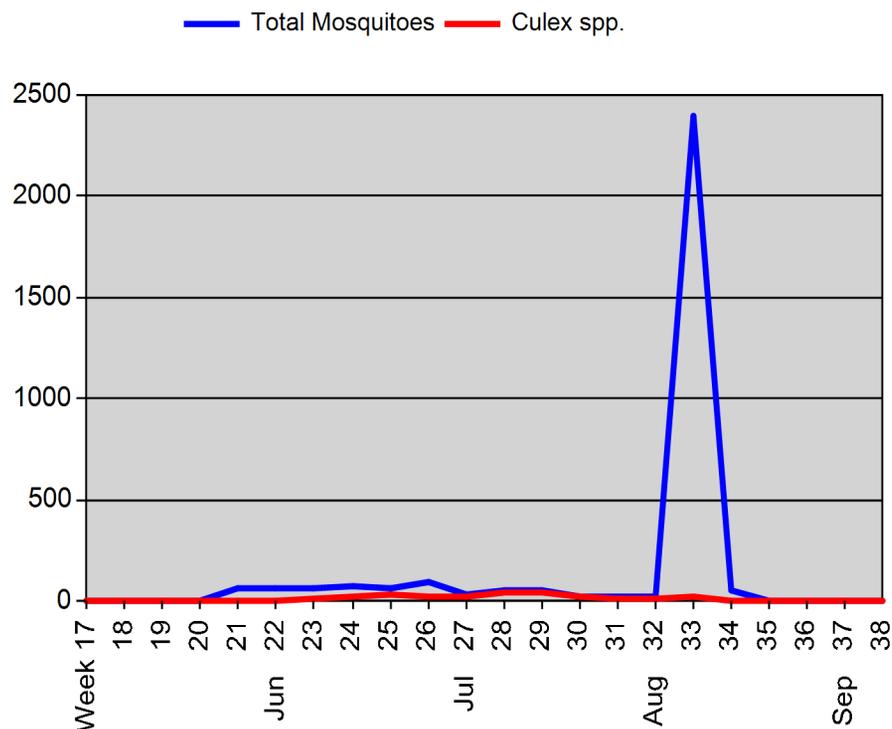
**Season:** 2015  
**Trap Type:** Light/CO2  
**Location:** Cottonwood Drive at Cherry Creek  
**GPS:** N39° 33.390', W104° 47.220'

**Total number of trap/nights set:** 13  
**Total number of mosquitoes collected:** 2,992  
**Average mosquitoes per trap/night:** 230  
**Average Culex per trap/night:** 19

## Species collected and abundance:

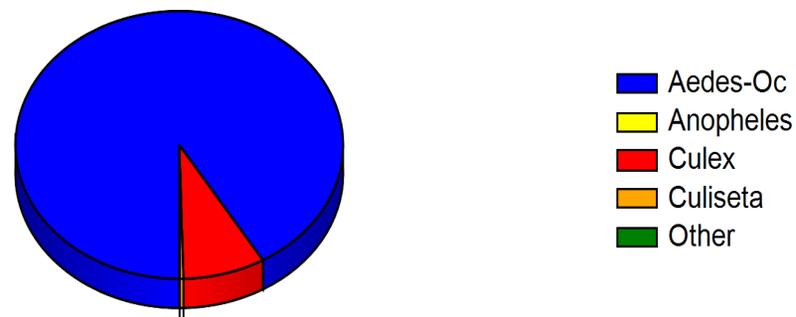
<i>Aedes (Oc.) dorsalis</i>	3	0.1 %
<i>Aedes (Oc.) hendersoni</i>	9	0.3 %
<i>Aedes (Oc.) increpitus</i>	34	1.1 %
<i>Aedes (Oc.) trivittatus</i>	524	17.5 %
<i>Aedes vexans</i>	2167	72.4 %
<i>Culex pipiens</i>	14	0.5 %
<i>Culex salinarius</i>	66	2.2 %
<i>Culex tarsalis</i>	163	5.4 %
<i>Culiseta inornata</i>	11	0.4 %
<i>Psorophora signipennis</i>	1	0.0 %

## Seasonality



## Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	2,737	91.5 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	243	8.1 %
<i>Culiseta</i>	11	0.4 %
Other	1	0.0 %



# PA-02: Parker Sulphur Gulch

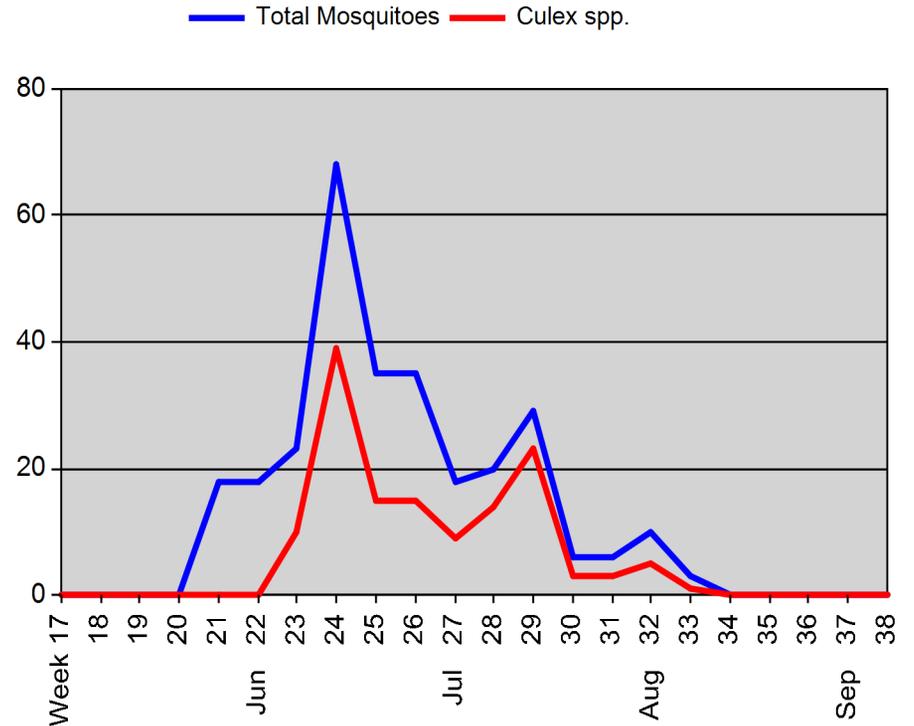
**Season:** 2015  
**Trap Type:** Light/CO2  
**Location:** Sulphur Gulch at Riva Ridge Park  
**GPS:** N39° 30.970', W104° 44.280'

**Total number of trap/nights set:** 11  
**Total number of mosquitoes collected:** 236  
**Average mosquitoes per trap/night:** 21  
**Average Culex per trap/night:** 11

## Species collected and abundance:

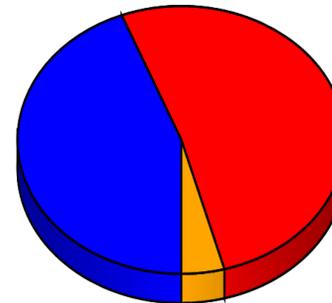
<i>Aedes (Oc.) dorsalis</i>	1	0.4 %
<i>Aedes (Oc.) trivittatus</i>	28	11.9 %
<i>Aedes vexans</i>	75	31.8 %
<i>Culex pipiens</i>	4	1.7 %
<i>Culex salinarius</i>	4	1.7 %
<i>Culex tarsalis</i>	114	48.3 %
<i>Culiseta inornata</i>	10	4.2 %

## Seasonality



## Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	104	44.1 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	122	51.7 %
<i>Culiseta</i>	10	4.2 %
Other	0	0.0 %



■ Aedes-Oc  
■ Anopheles  
■ Culex  
■ Culiseta  
■ Other



**Colorado Mosquito Control**

# Larvicide Data Summary

by REPORT DATE: 4/5/2015 to 11/5/2015

by ACCOUNT: AC

	Total Site Inspections	No. Wet Sites	Percentage Wet Sites	No Sites Treated	Percentage Breeding*	Total Acres Treated
Arapahoe County	168	135	80 %	24	18 %	7.6

\* (Sites Treated/Wet Sites)



# Visit Analysis - Summary

by REPORT DATE: 4/5/2015 to 11/5/2015

by ACCOUNT: AC

Site ID	Visits	Wet Sites	Dips w/ Larvae	Acres	Vectobac	Vectolex	Altosid	Oil		
AC 0001	12	12	100.0 %	5	41.7 %	1.6	11.5	0.0	0.0	0.0
AC 0001	3	3	100.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0002	3	3	100.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0002	12	12	100.0 %	4	33.3 %	0.3	2.4	0.0	0.0	0.0
AC 0003	3	3	100.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0003	11	11	100.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0004	4	4	100.0 %	1	25.0 %	0.1	0.0	0.0	0.0	0.1
AC 0004	10	10	100.0 %	1	10.0 %	0.1	0.0	0.0	0.0	0.0
AC 0005	3	3	100.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0005	12	12	100.0 %	5	41.7 %	1.6	15.0	0.0	0.0	0.0
AC 0006	4	4	100.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0006	9	9	100.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0007	3	0	0.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0007	10	0	0.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0008	3	0	0.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0008	10	0	0.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0009	3	3	100.0 %	1	33.3 %	1.0	5.5	0.0	0.0	0.0
AC 0009	11	10	90.9 %	2	18.2 %	0.6	4.3	0.0	0.0	0.0
AC 0010	1	1	100.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0010	5	4	80.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0012	4	3	75.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0014	4	1	25.0 %	1	25.0 %	0.2	2.0	0.0	0.0	0.0
AC 0015	3	3	100.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0015	10	9	90.0 %	0	0.0 %	0.0	0.0	0.0	0.0	0.0
AC 0016	3	3	100.0 %	1	33.3 %	1.2	10.0	0.0	0.0	0.0
AC 0016	12	12	100.0 %	3	25.0 %	1.1	10.0	0.0	0.0	0.0
<b>168</b>	<b>135</b>	<b>80.4 %</b>	<b>24</b>	<b>14.3 %</b>	<b>7.6</b>	<b>60.7</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.1</b>



**COLORADO MOSQUITO CONTROL**  
*Protecting Colorado From Annoyance & Disease Since  
1986*