

Garfield County Annual Report

2013

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GARFIELD COUNTY COOPERATIVE MOSQUITO CONTROL PROGRAM

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GARFIELD COUNTY COOPERATIVE MOSQUITO CONTROL PROGRAM MISSION STATEMENT

Garfield County completed its 10th year of cost effective Integrated Mosquito Management operations in 2013. Many communities across Colorado recognize the need to control mosquito annoyance and the risk of mosquito-borne disease associated with flood irrigation practices, urban development, and snow-melt runoff. Integrated mosquito management operations that utilize environmentally-sensitive controls and new technologies can greatly enhance the outdoor experience without negatively impacting the environment.

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 Garfield County Mosquito Control Program is to suppress populations of larval mosquitoes in aquatic habitats. Colorado Mosquito Control (CMC) technicians utilize bacterial larvacides that reduce mosquito populations without harming non-target organisms. Additionally, monitoring of adult mosquito populations is an essential component of an Integrated Mosquito Management (IMM) program. Surveillance trapping can provide data used to assess West Nile Virus Infection Rates, as well as the need for adult mosquito control measures. Data driven response with mosquito adulticide ULV technology can greatly reduce the threat of disease transmission and annoyance associated with mosquitoes, while also reducing the necessity for large amounts of products to be applied.

CMC OBJECTIVES

With over 10 years of experience monitoring West Nile Virus in Colorado, it is clear that limiting exposure to mosquito bites is the best way to reduce the risk of disease. A well-developed mosquito management operation is only part of the picture, and CMC also emphasizes the need for personal action and protection through our educational outreach programs. *Culex Tarsalis*, the 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 education outreach and data driven management in an effort to minimize West Nile Virus risk and reduce mosquito annoyance in the communities where we operate and also live.

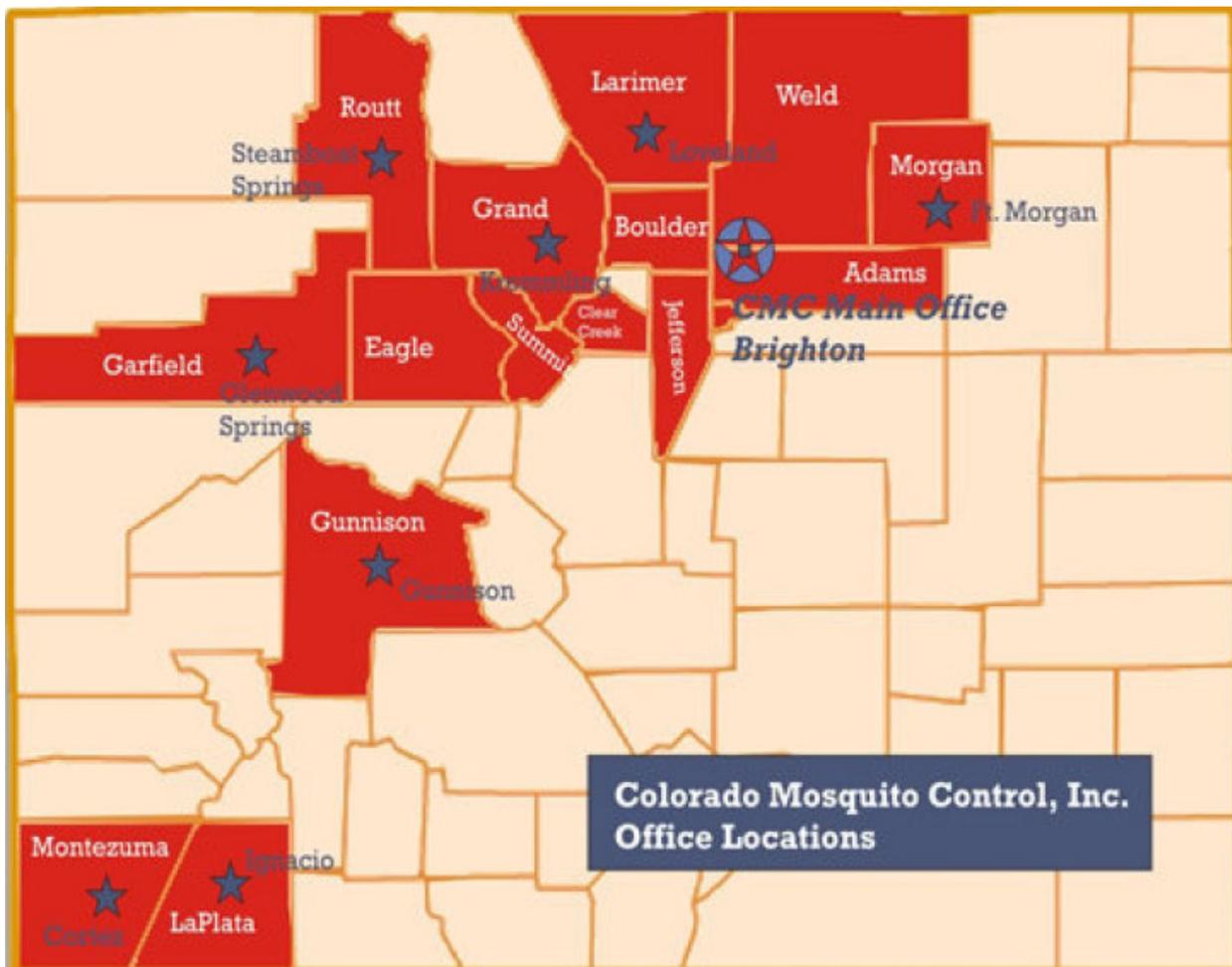
Colorado Mosquito Control, Inc.

Colorado Mosquito Control, Inc. (CMC) 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 was established in 1986, is the largest private company specializing in mosquito control in Colorado, and is the only company in Colorado offering complete IPM mosquito control services.

Cooperating Entities

CMC currently has programs across the state of Colorado including: Homeowners Associations, Incorporated Cities and Towns, Mosquito Control Districts, Counties, Indian Reservations, and others. Geographically, CMC reaches from the Ute Mountain Ute Reservation in the southwest corner of the state to Fort Morgan in northeastern Colorado. CMC has programs in several mountain areas including Aspen, the Gunnison Valley, the Roaring Fork Valley, the I-70 corridor through Garfield County and parts of the upper Colorado River valley.

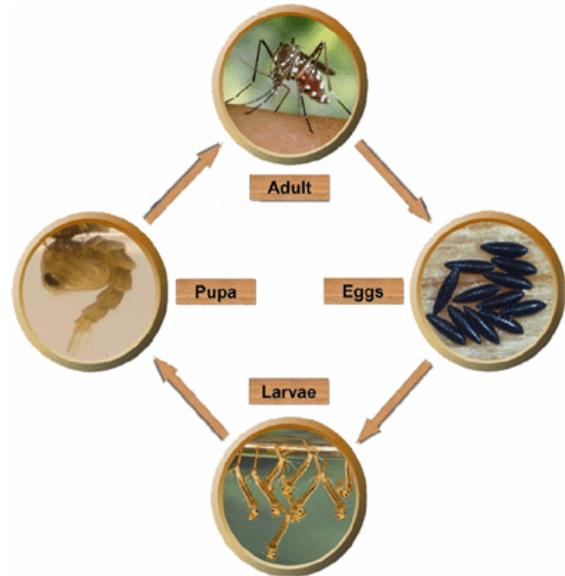
Since the inception of Garfield County Mosquito Control Program, efficacy of the established program has been improved with the inclusion of areas adjacent to or surrounded by previously participating areas. CMC has continued to provide top quality mosquito control programs in several Western Slope and Mountain accounts for the past 10 years and for front-range communities for over 16 years. In addition, CMC has rapidly expanded to provide service to other municipalities as new mosquito control programs were initiated. CMC will maintain its commitment to provide top quality service, in an effort to minimize the threat of West Nile Virus to citizens and to reduce mosquito annoyance in Garfield County and surrounding areas.



2013 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; 2013 was typical in that respect.

The 2013 mosquito season started with a cooler than average April and a few late spring snowstorms. In early May things started to warm up and mosquito larval activity picked up. By June the mosquito season was in full swing with above average temperatures and below average snowmelt runoff. July and August continued the trend of higher than average temperature and relatively few significant precipitation events. (See Chart “2013 Garfield County Climate Data”). Area snow pack levels were below average but snowmelt was still enough to fill many larval mosquito breeding sites. Colorado River water levels were low but not as low as 2012 when near record low water levels were recorded.



The majority of the mosquitoes encountered during the 2013 summer were of the genus (*Aedes/Ochlerotatus*). They are associated with newly applied floodwater via rain or areas of irrigation. Older standing stagnant water will often produce mosquitoes of the genus (*Culex*). These are also common in most areas of the county and are often a vector for West Nile Virus. Mosquito population trends are almost always dependent on either heavy rains (over 0.5in) or the agricultural flooding of fields for irrigation. With a below average snow pack in 2013 snowmelt runoff was a less of a factor in early season mosquito production but seasonal rains in July and early August in addition to irrigation caused a larval resurgence that produced a second spike in mosquito population levels peaking in early August.

In the months of July and August there were a handful of significant rain events triggering many areas to produce larvae that hadn't produced early in the season which resulting in increased mosquito larval production and subsequent larval treatments. However, the water did not last long as there were above average temperatures both July and August. Anticipating and understanding snowmelt runoff, and significant rainfall events and the resulting effect it will have on mosquito populations is one of CMC's primary objectives to tailor the perfect program for Garfield County.

Below average precipitation and cooler temperatures in late August resulted in a decrease of all mosquito populations. The season came to a close on September 16th as daytime temperatures dipped into the 60's and 70's with night time temperatures dropping into the mid to low 40s throughout the control area.

2013 Field Activities

Field activities began March 13th for the 2013 season. The earliest activity of the season involved updating and revising all GIS maps throughout the fall and winter. In addition, new site identification and mapping were the priority in areas that had not previously been included in larval control operations. Mapping larval sites is an ongoing process; every year citizen reports of standing water, new construction and site destruction result in many new sites being added or removed from the existing larval inspection routes.

Hiring of seasonal technicians began in April, and continued into late May. As the CMC service area continues to grow, hiring an adequate number of top quality field technicians has become a challenge. For the Garfield County office, nearly 20 applicants were interviewed with 8 full-time technicians being hired; two of which were returning technicians from last year.

CMC's Annual Field Technician Classroom Training Day took place on Monday, May 20th with over 75 new and returning field technicians in attendance. Field training by CMC management and veteran employees lasted throughout May, with a few late hires being trained during early June. By the end of May, CMC was fully staffed and had full daytime and evening shift crews fully trained and in the field. During the early June to early September time period, field mosquito control operations were in full swing. The final day for larval inspections and control was Tuesday, September 17th.

Mosquito trapping was planned through September 6th; however cool temperatures and an overall decrease in adult populations effectively eliminated the final week of trapping and associated adult spraying operations. Before the end of August, mosquito annoyance calls declined to zero.



WEST NILE VIRUS

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 now the Western States. WNV activity has been documented in all US states except Alaska and Hawaii.

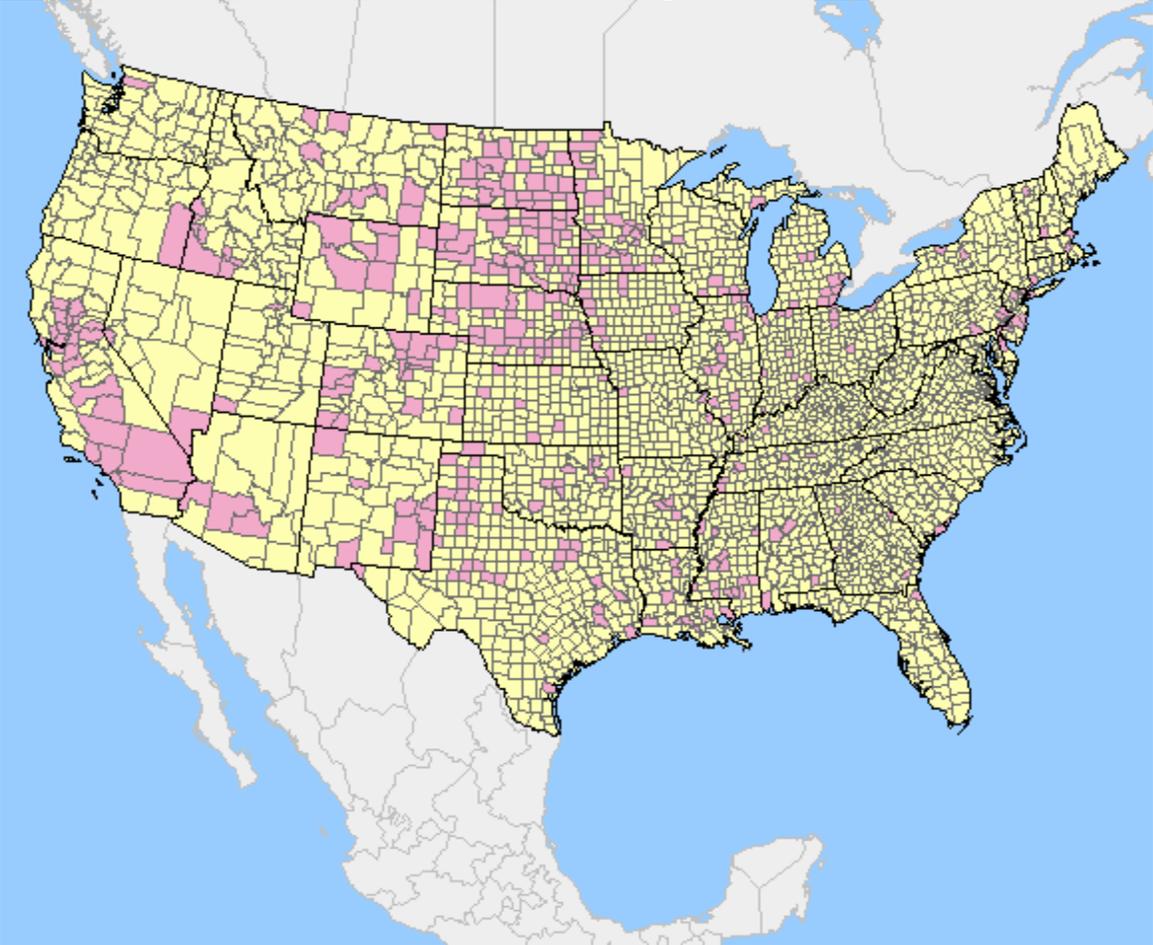
Colorado first saw activity of the virus late in the summer of 2002. In 2003 Colorado was the hardest hit state compiling 2,947 human cases and 63 deaths most of which occurred along the Front Range. By 2004 the majority of the cases shifted to the Western Slope and the state totaled 291 cases with 4 deaths (Mesa County).

West Nile Virus 2013

Cases of WNV have been seen throughout a large portion of the country in 2013. States with the most reported WNV cases in 2013 include: Colorado, California, South Dakota, Minnesota, and North Dakota. At the time of this report Colorado has the highest number of human West Nile cases in the nation followed closely by California. As of September 24th there were a total of 1,134 cases in the United States this year compared to 2636 last year.

In Colorado in 2004 and 2005 WNV activity was spread throughout the state with no particular clustering in any one region. This year there was little WNV activity through the end of June, however cases exploded in mid July through late August with 197 confirmed human cases and three deaths. Similar to previous seasons there was a clustering of WNV activity along the Front Range, as well as in Delta, Montrose and Mesa Counties on the Western Slope of Colorado. There were 4 West Nile positive mosquito pools from the Colorado Mosquito Control surveillance network in Garfield County. The positive pools were detected in Rifle, Battlement Mesa, and Parachute (See Appendix for maps). There have been no positive human or animal cases reported in Garfield or Pitkin Counties at the time of this report. As of September 25 there have been 215 confirmed human cases (most of which were observed in adults between 35 and 70yrs old) and tree deaths, one each in Weld County, Adams County, and Larimer County.

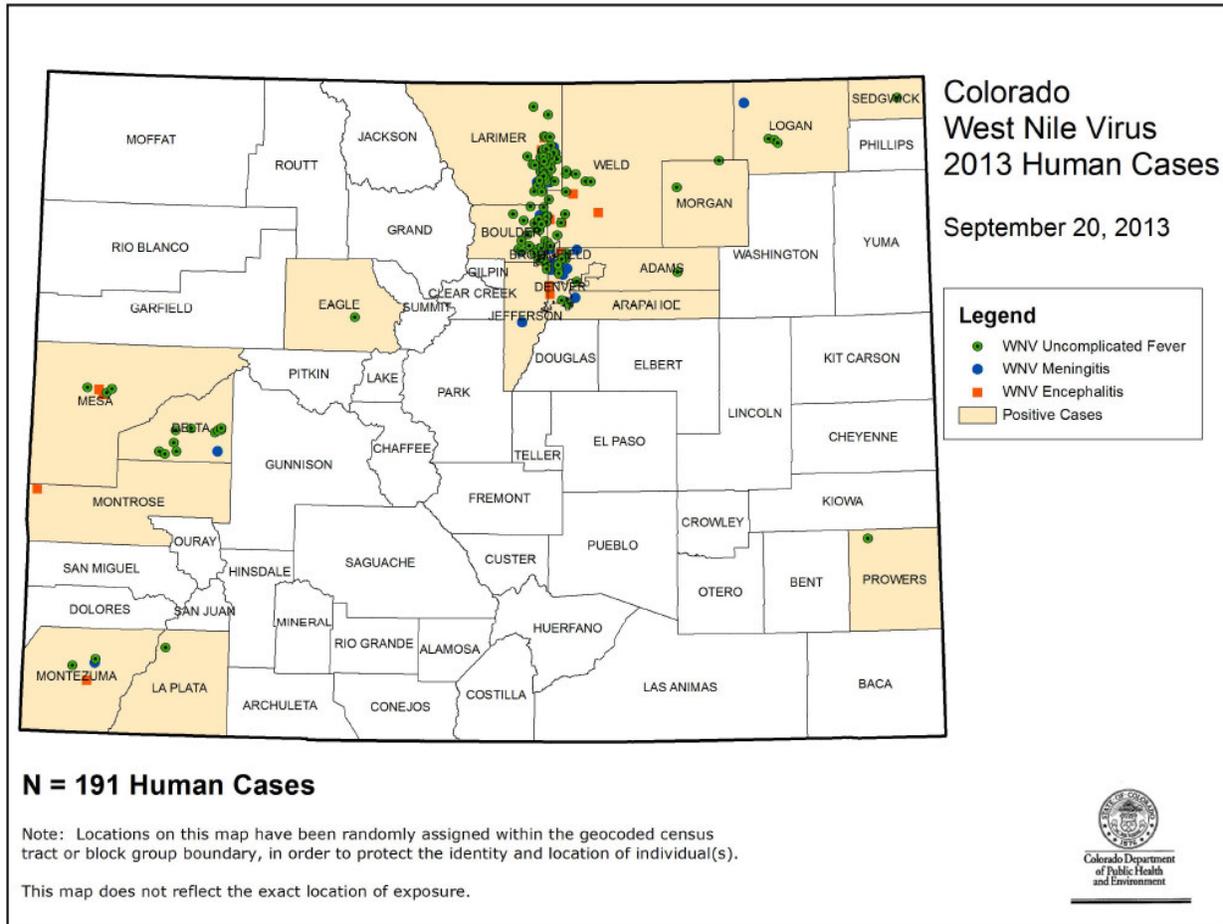
COUNTIES WITH HUMAN WEST NILE VIRUS (WNV) CASES REPORTED TO ARBONET, BY STATE, UNITED STATES, 2013 (AS OF SEPTEMBER 24, 2013)



Source: http://diseasemaps.usgs.gov/wnv_us_human.html

Human West Nile Virus Infections: Colorado 2013

Updated September 20, 2013



Human West Nile Virus Infections: Colorado, September 25, 2013

	New cases	Clinical diagnosis			Total cases	Total deaths
		Fever	Meningitis	Encephalitis		
County of Residence						
Adams	.	7	7	4	18	1
Arapahoe	.	.	2	.	2	.
Boulder	.	29	5	2	36	.
Broomfield	.	3	1	1	5	.
Delta	.	12	1	.	13	.
Denver	.	4	.	3	7	.
Douglas	.	1	.	.	1	.
Eagle	.	1	.	.	1	.
Jefferson	.	2	1	.	3	.
La Plata	.	1	.	.	1	.
Larimer	4	65	11	5	81	1
Logan	.	4	1	.	5	.
Mesa	.	3	.	2	5	.
Montezuma	.	2	1	1	4	.
Montrose	.	.	.	1	1	.
Morgan	.	6	.	.	6	.
Prowers	.	3	.	.	3	.
Pueblo	.	.	.	1	1	.
Sedgwick	.	1	.	.	1	.
Weld	3	16	.	5	21	1
COLORADO	7	160	30	25	215	3

Counties not listed have no verified human cases of WNV

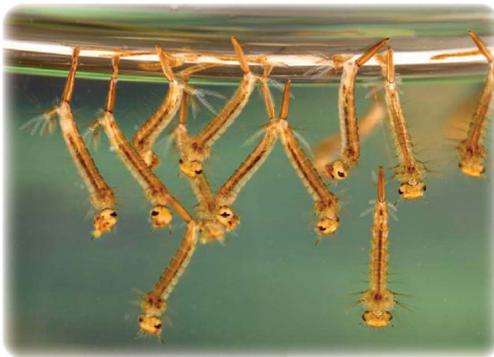
LARVAL MOSQUITO CONTROL

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 tolerable levels. 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 for reducing larval populations, some options may have greater consequences than benefits. 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 assessed. Permanent ecological damage may occur if extensive habitat change has taken place. True biological controls may also have non-target effects that outweigh the benefits of their control capacity. The biological control agent, if not carefully selected and evaluated may cause an imbalance in the natural ecological community, as well as threaten population levels of other organisms.



This was the case with the introduced mosquito fish (*Gambusia affinis*), an introduced species, while an effective predator on mosquito larvae it may have much larger dangers to native fish of Colorado waters. The *Gambusia* fish are very aggressive eaters and rapidly reproduce and often out-compete their native counterparts. For these reasons the Colorado Division of Wildlife (CDOW) has placed restrictions on the stocking and use of *Gambusia*. However, CMC has made fathead minnows (*Pimephales promelas*), a native Colorado species, available to the public to stock in irrigation and retention ponds. In general however, predatory fish and other biological controls such as birds and bats do not provide sufficient control of mosquito populations to be used as the sole mechanism. Other measures need to be used to gain adequate larval mosquito reductions.

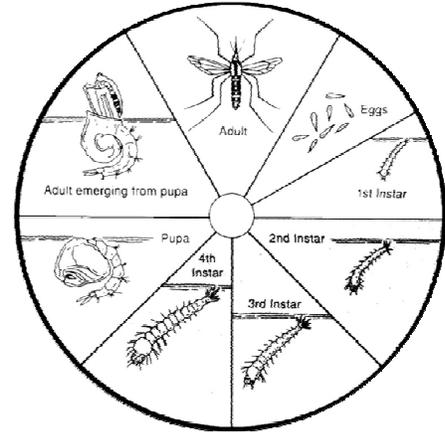


CMC's favored method of larval mosquito control is through bacterial bio-rational products. The main product used by CMC is a variety of bacteria (*Bacillus thuringiensis var. israeliensis*). *Bti* as it is known has become the cornerstone of mosquito control programs throughout the world. The benefits 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. A broad label allows for the use of the product in the majority of the habitats throughout the service area. Another bacterial product closely related to *Bti* is *Bacillus sphaericus* (*Bs*). 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 regulator (methoprene), a mineral oil 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.

All of the fore mentioned methods and products represent the essential ingredients of Integrated Pest Management. Mosquitoes are very well adapted and can be found in many different habitat types from a cattail marsh to a cup littered on the side of the road. A variety of tools must be used to prevent resistance and ensure the best method will be available for any given situation.



Larval control began in early April and continued through the second week of September. Steady production was seen throughout the summer with significant increases in larval production/treatment coinciding with minor precipitation events and local irrigation practices. During the 2013 season, there were 5,761 site inspections with 81.44% (4,692) of them wet. Of the 4,692 wet sites 50.85% (2,403) of them required treatment totaling 665.4 acres treated throughout Garfield County.



Colorado Mosquito Control, Inc.

Larval Data - Summary

by REPORT DATE: 4/10/2013 to 9/15/2013

by ACCOUNT: BM, CD, GF, GW, NC, PR, RF, SI

	Total Site Inspections	Wet Sites	% Wet	Sites Treated	Percentage Breeding*	Acres Treated	Total Kill (Millions)
Battlement Mesa	121	98	80.99%	46	46.94%	30.1	44.3
Carbondale, Town of	708	591	83.47%	201	33.67%	23.0	57.3
Garfield County Unincorporated	2,964	2,495	84.18%	1,326	52.75%	370.1	1,585.0
Glenwood Springs, City of	82	62	75.61%	23	37.1%	0.5	1.0
New Castle, Town of	587	475	80.92%	233	48.84%	45.8	129.9
Parachute, Town of	225	198	88.0%	145	73.23%	104.1	180.8
Rifle, Town of	921	663	71.99%	358	53.39%	63.7	238.3
Silt, Town of	153	110	71.9%	71	64.55%	28.1	50.9
	5,761	4,692	81.44%	2,403	50.85%	665.4	2,287.7

CMC constantly strives to improve its operations. Most recently CMC has implemented several high tech solutions to what historically has been a particularly low tech operation. CMC's "CMMS" (Computerized Mosquito Management System) utilizes historical data to analyze and identify areas and sites of particular importance. Additionally, a sample of larvae from sites found to be breeding is collected and brought back to the lab for identification purposes. This allows for a specific knowledge of each site especially in the event of a disease outbreak where a particular species has been found to be the vector. Targeted inspections then allow for resources to be allocated efficiently.

CMC SURVEILLANCE LABORATORY

Information on mosquito abundance and species identity is critical in the operation of a successful mosquito management program. Over the past few years identifying, packaging and sending *Culex* mosquito pool samples to the CDPHE or CSU labs for West Nile Virus testing has also become critically important in the battle against WNV and other mosquito-borne diseases. The Colorado Mosquito Control Surveillance Laboratory, managed by Dr. Michael “Doc” Weissmann, has become the largest single source of adult and larval mosquito surveillance data in the state of Colorado. Specifically, CMC has 4 stereo zoom binocular microscopes, 94 CDC dry-ice baited Light Traps, 21 Reiter Gravid Traps and all associated equipment and hardware.

The CDC light trap 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 2013, Colorado Mosquito Control Inc., monitored a statewide network of CO₂ baited light traps in which all adult mosquitoes were 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, and over 30 of those were identified from samples processed during the 2013 season from across the state.



Additionally, the CMC Surveillance Laboratory conducts an intensive larval identification program with over 8,000 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. Additionally, a majority of the *Culex* specimens collected in the CMC traps during the 2013 season were sent to the CO State Health Department laboratory or one of the regional county laboratories to be tested for West Nile Virus and other mosquito-borne diseases.

CDC Surveillance Light Trap Data Comparison

In 2013, an average of 11 surveillance light trap locations monitored adult mosquito populations within Garfield County weekly. Weather permitting, CDC battery-operated “light traps” were set in each location to provide adult mosquito population data for seasonal comparisons. Surveillance trapping began June 1st and was concluded on August 31st.

In 2013, 141 surveillance light traps were set within Garfield County, which collected 14,382 total mosquitoes. The average number of mosquitoes collected per trap per night was 102 and the average number of *Culex* mosquitoes collected per trap per night was 45. The percent composition of mosquitoes collected in 2013 is as follows: 52.1% (7,498) *Aedes/Oc. Spp*, 44.3% (6,364) *Culex*, 2.4% (338) *Culiseta* and 1.3% (182) *Anopheles*. Please refer to the CDC Light Trap Details for species composition and seasonal trends by individual surveillance trap location.

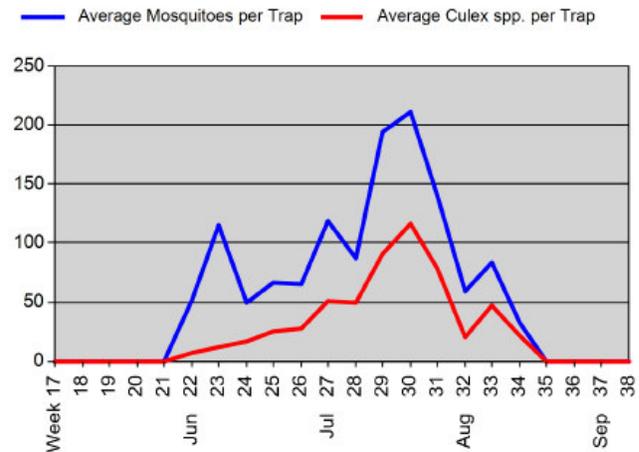
2013 Garfield Light Trap Composite Data

Total number of trap/nights set:	141
Total number of mosquitoes collected:	14,382
Average mosquitoes per trap/night:	102
Average Culex per trap/night:	45

Species collected and abundance:

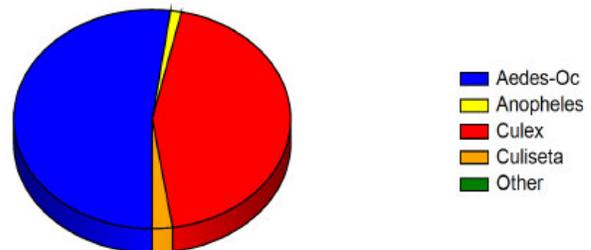
<i>Aedes (Oc.) dorsalis</i>	412	2.9 %
<i>Aedes (Oc.) fitchii</i>	10	0.1 %
<i>Aedes (Oc.) inaequalis</i>	146	1.0 %
<i>Aedes (Oc.) melanimon</i>	737	5.1 %
<i>Aedes (Oc.) nigromaculis</i>	10	0.1 %
<i>Aedes (Oc.) spencerii idahoensis</i>	7	0.0 %
<i>Aedes cinereus</i>	217	1.5 %
<i>Aedes vexans</i>	5953	41.4 %
<i>Aedes/Ochlerotatus spp</i>	6	0.0 %
<i>Anopheles hermsi</i>	182	1.3 %
<i>Culex erythrothorax</i>	139	1.0 %
<i>Culex pipiens</i>	14	0.1 %
<i>Culex salinarius</i>	1018	7.1 %
<i>Culex tarsalis</i>	5193	36.1 %
<i>Culiseta incidens</i>	23	0.2 %
<i>Culiseta inornata</i>	315	2.2 %

Seasonality



Genus proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	7,498	52.1 %
<i>Anopheles</i>	182	1.3 %
<i>Culex</i>	6,364	44.3 %
<i>Culiseta</i>	338	2.4 %
Other	0	0.0 %



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2013 ADULT CONTROL

The goal of Colorado Mosquito Control, Inc. is to provide all residents of the Garfield County with the best options for safe, effective, modern mosquito management. The primary emphasis of the program is to control mosquitoes in the larval stage, using safe biological control products. This environmentally focused program maintains adulticiding applications as a final resort when mosquito populations surpass nuisance or risk thresholds. Mosquito surveillance trapping results are used to make data-driven decisions regarding areas that need to be sprayed for adult mosquito control. Adult mosquito control spraying is targeted to specific sectors determined by this trap data, thereby reducing the area sprayed and the frequency of spraying in each sector.

Garfield County Mosquito Control Program uses all available data from CDC light traps, gravid traps, Mosquito Hotline annoyance calls and field technician reports to focus adult mosquito control efforts to 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 many 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 larval habitat sources of the trapped adults and continued larval control measures.

Colorado Mosquito Control, Inc. uses state of the art technology, calibrated application timing and least-toxic products to minimize non-target insect activity (for example, damage to day-flying pollinators like bees) is greatly reduced. Using this application technique, the overall goal of minimal environmental impact and effective adult control is achieved in the targeted area.

The product Evoluer 4-4 was used during Ultra Low Volume (ULV) adulticide applications beginning in June, and ending the last week of August. Its active ingredient permethrin is highly effective against mosquitoes and has proven to be the right choice for the adulticide portion of the Integrated Mosquito Management Program.

As we look towards the 2014 season, we will continue to evaluate treatment areas and new control products coming to the market. As always we will listen to the goals and needs of our customers so as to continue to provide an effective program that minimizes environmental impacts.

Our adult mosquito spray “notification and shutoff” program was again in place and updated throughout 2013. This service allows residents to request a notification of when adult mosquito control treatments will take place in their area, “shutting off” the sprayer in the vicinity of their address, or both. This service provides residents with up to date information on when and where adult mosquito spraying will take place.

TECHNOLOGY

Colorado Mosquito Control, Inc. 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 the State of 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 the dissemination of operational data to the citizens we serve, minimizing the resource and time required by the city and its employees for answering or fielding public inquiries.



Colorado Mosquito Control, Inc.
Environmental Solutions to Nature's little problems
Protecting Colorado from Annoyance and Disease Since 1986

Home Page

Colorado Mosquito Control, Inc. is a large-scale mosquito control contractor and consultant established in 1986. CMC specializes in full service Integrated Mosquito Management programs designed to control nuisance and disease vector mosquitoes while protecting our Colorado environment. CMC employs multiple wildlife Biologists, a PhD Entomologist, 10 state certified "Qualified Supervisors", and over 100 Entomology, Biology and Public Health technicians to serve over 80 county, municipal, commercial and residential HOA clients throughout the State of Colorado.

Large-scale Mosquito Control Program Services include;

- Survey & Digital Mapping Featuring ArcGIS@ (Geographic Information System)
- Comprehensive "Computer Targeted" Wetland Site Inspection
- Adult Mosquito Population Surveillance
- Aerial and Ground-based Biological Larval Mosquito Control
- Aerial and Ground-based ULV Adult Mosquito Control
- Full Taxonomic Identification & Laboratory Services
- Computer-based Record Keeping and Database Services
- Public Health Emergency Large Scale Control Applications

Small-scale Mosquito Control Services include;

- Residential Homeowner Maintenance Contracts
- Special Event Adult Mosquito Control Applications
 - Fairs, Concerts & Special Events
 - Corporate Events
 - Backyard Weddings, Parties & Barbeques
- Adult & Larval Mosquito Spot-treatments

Professional Consulting Services (available World-wide)

PUBLIC OUTREACH & DATA DISSEMINATION

For 26 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 we offer. We have clearly demonstrated this commitment by proactively incorporating numerous innovative programs, activities and services into the Garfield County HOA Control Program.

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 mapped in ArcView GIS and updated annually. Call & Shutoff forms are available online and may be submitted via the CMC website or by mail.

FLOATER TRAP PLACEMENT

For annoyance reports at resident homes in locations away from standard trapping sites, to determine adult populations and whether threshold levels are met for ULV Adulticide applications.

MONTHLY & ANNUAL REPORTS

Detailed monthly reports are distributed to each municipality participating in the mosquito control program, and a comprehensive annual report detailing the season and with suggestions for program improvements for future years.



SUMMARY

We have learned a lot since the inception of Garfield County program, and have made some great improvements; with both nuisance control and mosquito borne disease information. Work will always continue in the arena of public education, notification and dissemination of information about personal protection and the mosquito control program itself. The Colorado Mosquito Control, Inc. website continues to be successful based on the number of “hits,” favorable e-mails and requests for more information received from program residents.

The 2013 season could be described as a middle of the road season. It was certainly much more challenging than the 2012 season but the production levels were much lower than what was seen in 2011. The irrigated fields found throughout the county with stagnant water standing most of the summer were the most productive and challenging this season. At this point it is difficult to determine what challenges and obstacles will present themselves in the coming seasons. With that in mind we here at Colorado Mosquito Control will continue to improve and stay adaptive to whatever conditions the future holds.

Colorado Mosquito Control, Inc. continues to effectively serve the residents of Garfield County using Integrated Mosquito Management technology to reduce mosquito nuisance and the related potential for disease transmission including West Nile Virus. CMC continues to promote a responsible IPM approach to mosquito management, fully utilizing all available biological control techniques while minimizing the use of chemical pesticides and maintaining a cost effective but highly efficient program.

Colorado Mosquito Control would like to thank all of the residents of the Garfield County as well as our contacts within the local municipalities and their elected officials for their support and business over the past ten years. We will look forward to working with Garfield County in the future.

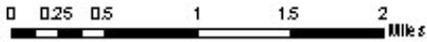
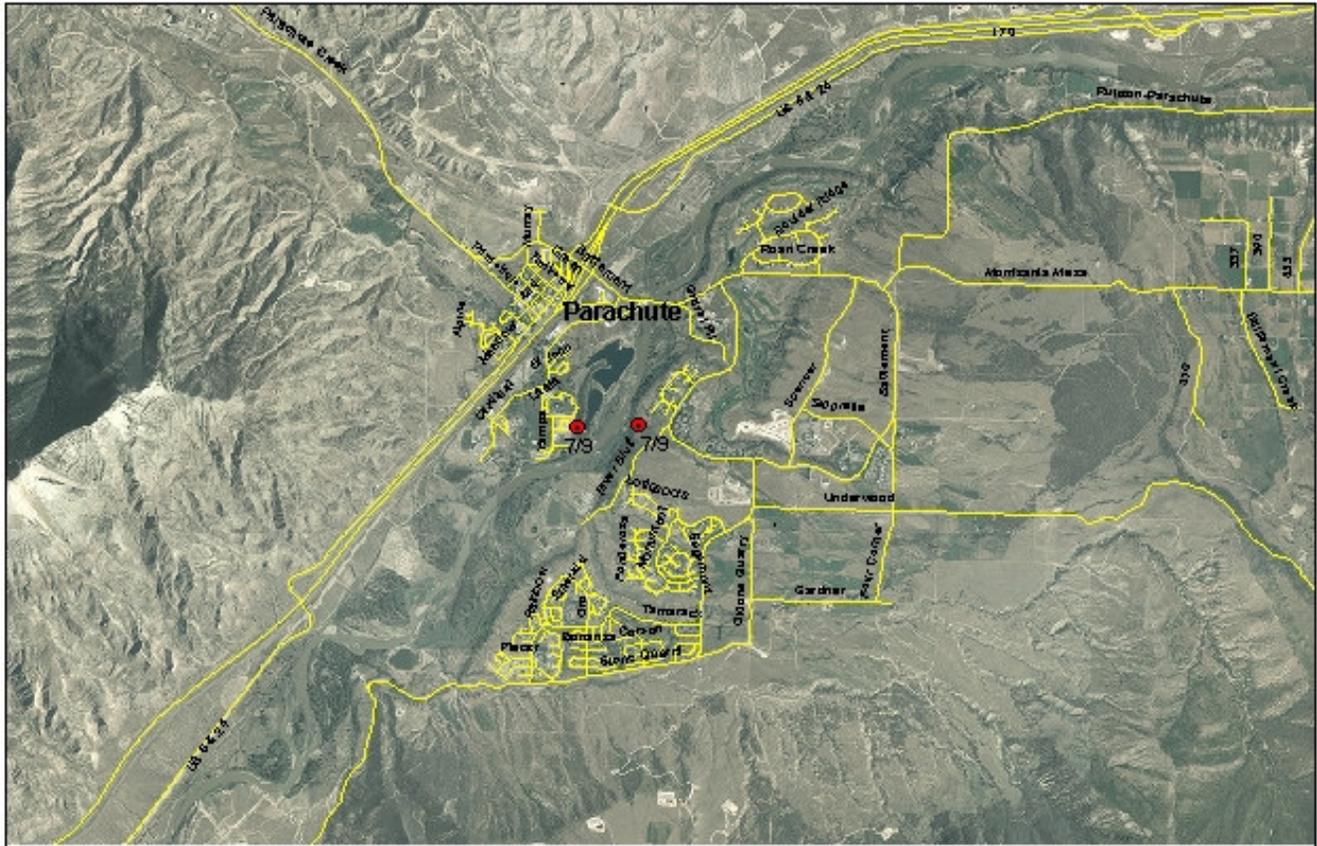
Appendix

2013 Garfield County Climate Data



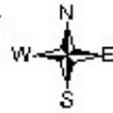
■ Precipitation (inches)	0.5	-0.48	-1.02	-0.36	-1.07
■ Temperatures (degrees F)	-3.7	0.4	3.2	3	1.1

Garfield County West Nile Positive Mosquitoes July 9th 2013

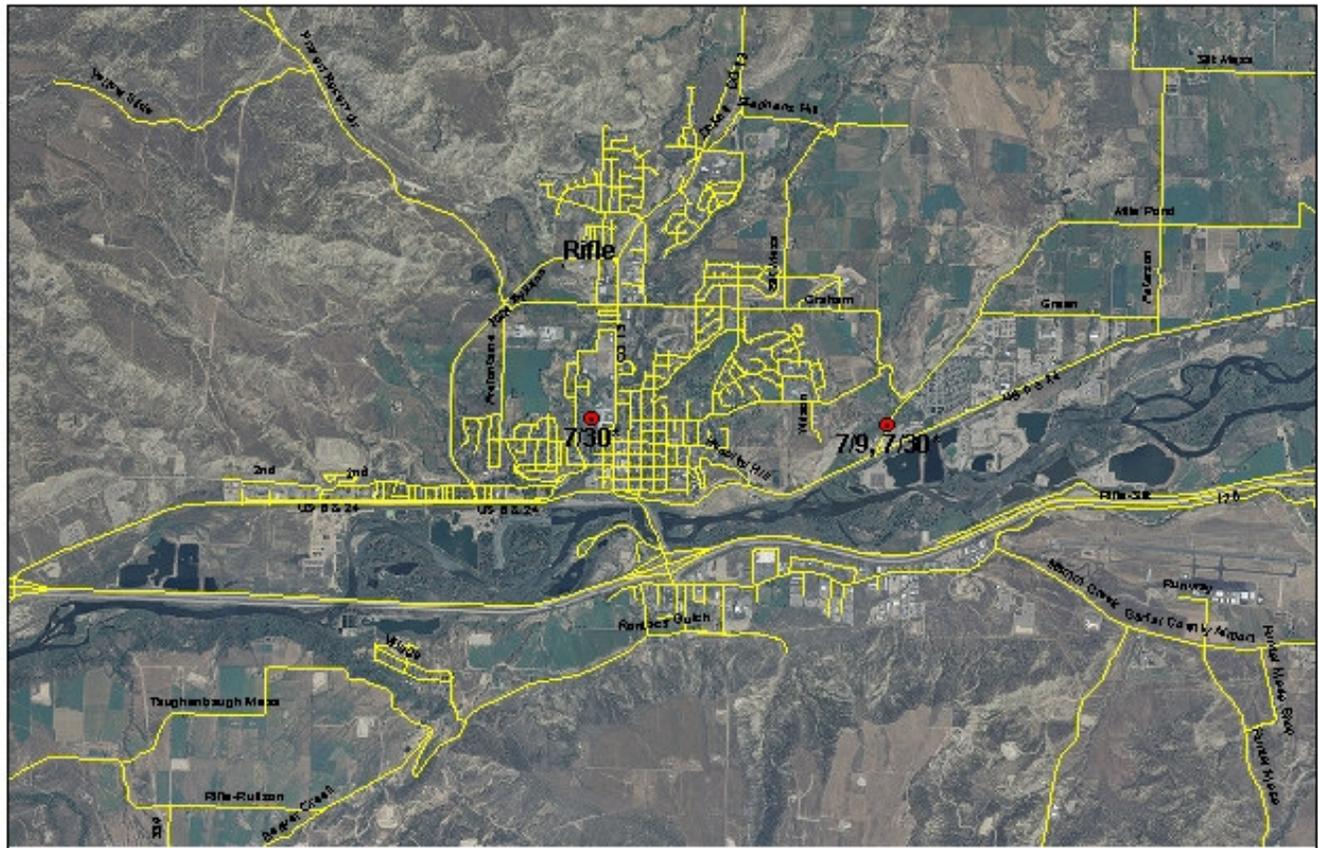


West Nile Positive Mosquito Pool Samples

Colorado Mosquito Control, Inc.
635 N. 7th Ave.
Brighton, CO 80601
303-558-8730



Garfield County West Nile Positive Mosquitoes July 9th and *July 30th 2013

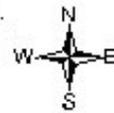


0 0.25 0.5 1 1.5 2 Miles

West Nile Positive Mosquito Pool Samples

*7/30 Sample was split approximate location only

Colorado Mosquito Control, Inc.
635 N. 7th Ave.
Brighton, CO 80601
303-558-8730



CDC Individual Light Trap Data

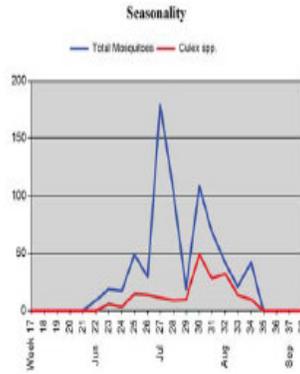
NC-03: New Castle Elk Creek Elem. School

Season: 2013
 Trap Type: Light/CO2
 Location: in town between Hwy. 6 and Elk Creek school lot
 GPS: N39° 34.290', W107° 32.500'

Total number of trap/nights set: 13
 Total number of mosquitoes collected: 707
 Average mosquitoes per trap/night: 54
 Average Culex per trap/night: 16

Species collected and abundance:

<i>Aedes (Gc) triseriatus</i>	65	9.2%
<i>Aedes (Gc) melanotarsus</i>	4	0.6%
<i>Aedes (Gc) japonicus albopictus</i>	1	0.1%
<i>Aedes albopictus</i>	1	0.1%
<i>Aedes vexans</i>	410	58.0%
<i>Anopheles hernesi</i>	1	0.1%
<i>Culex pipiens</i>	1	0.1%
<i>Culex salinarius</i>	139	19.7%
<i>Culex tarsalis</i>	62	8.8%
<i>Culiseta inchoata</i>	16	2.3%
<i>Culiseta inornata</i>	7	1.0%



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Culiseta</i>	481	68.0%
<i>Anopheles</i>	1	0.1%
<i>Culex</i>	202	28.6%
<i>Culiseta</i>	23	3.3%
Other	0	0.0%



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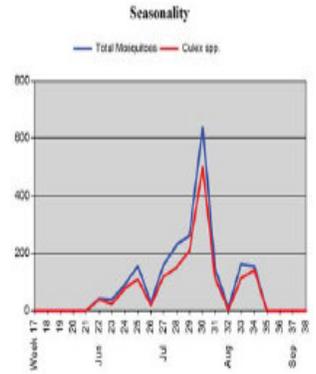
PR-01: Parachute - Cottonwood Park

Season: 2013
 Trap Type: Light/CO2
 Location: west of Cottonwood Park next to fishing ponds
 GPS: N39° 26.600', W108° 2.890'

Total number of trap/nights set: 13
 Total number of mosquitoes collected: 2,128
 Average mosquitoes per trap/night: 164
 Average Culex per trap/night: 125

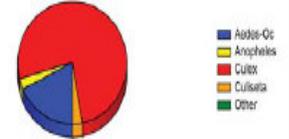
Species collected and abundance:

<i>Aedes (Gc) dorsalis</i>	15	0.7%
<i>Aedes (Gc) melanotarsus</i>	25	1.2%
<i>Aedes (Gc) nigropictus</i>	2	0.1%
<i>Aedes vexans</i>	342	16.1%
<i>Anopheles hernesi</i>	59	2.8%
<i>Culex erythrotarsus</i>	139	6.5%
<i>Culex pipiens</i>	1	0.0%
<i>Culex salinarius</i>	437	20.5%
<i>Culex tarsalis</i>	1044	49.1%
<i>Culiseta inornata</i>	64	3.0%



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Culiseta</i>	384	18.0%
<i>Anopheles</i>	59	2.8%
<i>Culex</i>	1,621	76.2%
<i>Culiseta</i>	64	3.0%
Other	0	0.0%



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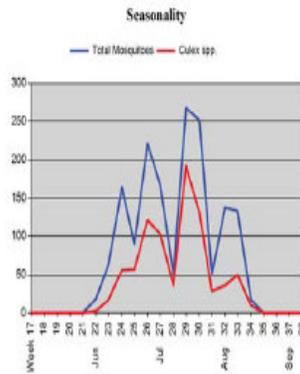
RF-01: Rifle Lyons Park Rest Area

Season: 2013
 Trap Type: Light/CO2
 Location: next to marsh south of Lyons Park Rest Area
 GPS: N39° 31.515', W107° 47.140'

Total number of trap/nights set: 13
 Total number of mosquitoes collected: 1,632
 Average mosquitoes per trap/night: 126
 Average Culex per trap/night: 65

Species collected and abundance:

<i>Aedes (Gc) dorsalis</i>	74	4.5%
<i>Aedes (Gc) triseriatus</i>	1	0.1%
<i>Aedes (Gc) melanotarsus</i>	67	4.1%
<i>Aedes albopictus</i>	3	0.2%
<i>Aedes vexans</i>	610	37.4%
<i>Anopheles hernesi</i>	3	0.2%
<i>Culex salinarius</i>	80	4.9%
<i>Culex tarsalis</i>	766	47.1%
<i>Culex territans</i>	16	1.0%
<i>Culiseta inornata</i>	32	2.0%



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Culiseta</i>	755	46.3%
<i>Anopheles</i>	3	0.2%
<i>Culex</i>	842	51.6%
<i>Culiseta</i>	32	2.0%
Other	0	0.0%



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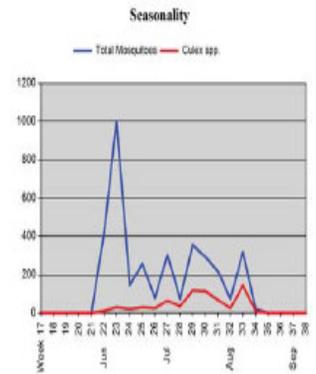
RF-15: Rifle - Mile Pond Road

Season: 2013
 Trap Type: Light/CO2
 Location: pull-off 0.2 miles NE of Amtrak Storage Facility
 GPS: N39° 32.140', W107° 45.345'

Total number of trap/nights set: 13
 Total number of mosquitoes collected: 3,556
 Average mosquitoes per trap/night: 274
 Average Culex per trap/night: 53

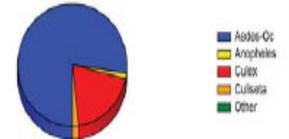
Species collected and abundance:

<i>Aedes (Gc) dorsalis</i>	11	0.3%
<i>Aedes (Gc) triseriatus</i>	2	0.1%
<i>Aedes (Gc) melanotarsus</i>	61	1.7%
<i>Aedes (Gc) albopictus</i>	1	0.0%
<i>Aedes albopictus</i>	3	0.1%
<i>Aedes vexans</i>	2668	75.0%
<i>Anopheles hernesi</i>	48	1.3%
<i>Culex salinarius</i>	115	3.2%
<i>Culex tarsalis</i>	579	16.3%
<i>Culiseta inornata</i>	68	1.9%



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Culiseta</i>	2,746	77.2%
<i>Anopheles</i>	48	1.4%
<i>Culex</i>	694	19.5%
<i>Culiseta</i>	68	1.9%
Other	0	0.0%



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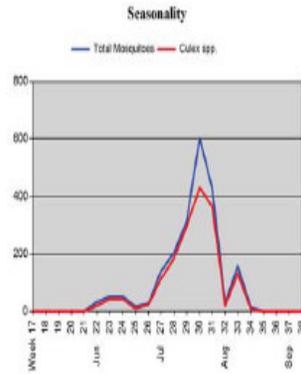
BM-09: Willow Creek

Season: 2013
 Trap Type: LightCO2
 Location: Battlement Mesa - Willow Creek
 GCS: N39° 26.625', W108° 2.525'

Total number of trap nights set: 12
 Total number of mosquitoes collected: 2,017
 Average mosquitoes per trap night: 168
 Average Culex per trap night: 137

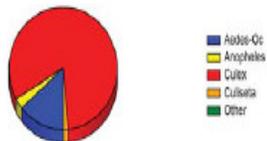
Species collected and abundance:

<i>Aedes (Oc.) albopictus</i>	7	0.3%
<i>Aedes (Oc.) triseriatus</i>	13	0.6%
<i>Aedes (Oc.) melanonotus</i>	69	3.4%
<i>Aedes (Oc.) nigropictus</i>	2	0.1%
<i>Aedes vexans</i>	109	9.4%
<i>Anopheles hernesi</i>	58	2.9%
<i>Culex albivittatus</i>	13	0.6%
<i>Culex tarsalis</i>	1635	81.1%
<i>Culiseta inornata</i>	31	1.5%



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Culiseta</i>	280	13.9%
<i>Anopheles</i>	58	2.9%
<i>Culex</i>	1,648	81.7%
<i>Culiseta</i>	31	1.5%
Other	0	0.0%



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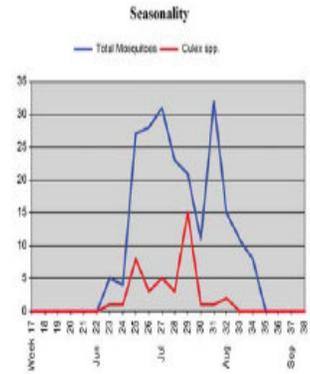
CD-02: East Carbondale Saint Finbar

Season: 2013
 Trap Type: LightCO2
 Location: In Saint Finbar neighborhood nr. Equiptown Cr.
 GCS: N39° 24.100', W107° 9.330'

Total number of trap nights set: 13
 Total number of mosquitoes collected: 216
 Average mosquitoes per trap night: 17
 Average Culex per trap night: 3

Species collected and abundance:

<i>Aedes (Oc.) albopictus</i>	23	10.6%
<i>Aedes (Oc.) fitchii</i>	1	0.5%
<i>Aedes (Oc.) triseriatus</i>	2	0.9%
<i>Aedes (Oc.) melanonotus</i>	4	1.9%
<i>Aedes (Oc.) speenckii albopictus</i>	6	2.8%
<i>Aedes cinereus</i>	32	14.8%
<i>Aedes vexans</i>	96	44.4%
<i>Aedes/Culiseta</i> spp.	4	1.9%
<i>Culex tarsalis</i>	38	17.6%
<i>Culiseta inornata</i>	10	4.6%



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Culiseta</i>	168	77.8%
<i>Anopheles</i>	0	0.0%
<i>Culex</i>	38	17.6%
<i>Culiseta</i>	10	4.6%
Other	0	0.0%



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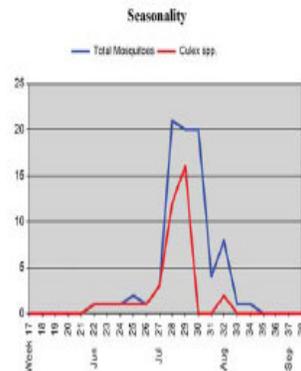
CD-11: Carbondale CRMS

Season: 2013
 Trap Type: LightCO2
 Location: Colorado Rocky Mountain School
 GCS: N39° 24.480', W107° 13.645'

Total number of trap nights set: 13
 Total number of mosquitoes collected: 63
 Average mosquitoes per trap night: 5
 Average Culex per trap night: 3

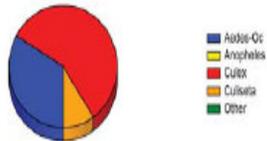
Species collected and abundance:

<i>Aedes (Oc.) albopictus</i>	2	3.2%
<i>Aedes (Oc.) triseriatus</i>	5	7.9%
<i>Aedes cinereus</i>	6	9.5%
<i>Aedes vexans</i>	8	12.7%
<i>Culex tarsalis</i>	36	57.1%
<i>Culiseta inornata</i>	3	4.8%
<i>Culiseta inornata</i>	3	4.8%



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Culiseta</i>	21	33.3%
<i>Anopheles</i>	0	0.0%
<i>Culex</i>	36	57.1%
<i>Culiseta</i>	6	9.5%
Other	0	0.0%



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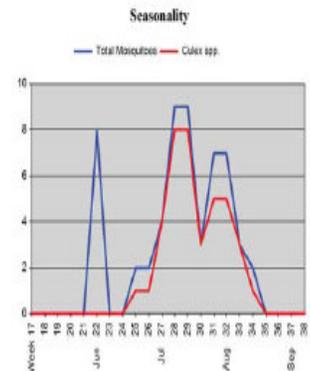
GW-09: Glenwood Springs Cemetery

Season: 2013
 Trap Type: LightCO2
 Location: Cemetery Road east of 12th St
 GCS: N39° 32.415', W107° 19.115'

Total number of trap nights set: 11
 Total number of mosquitoes collected: 38
 Average mosquitoes per trap night: 3
 Average Culex per trap night: 2

Species collected and abundance:

<i>Aedes (Oc.) fitchii</i>	9	23.7%
<i>Aedes vexans</i>	1	2.6%
<i>Anopheles hernesi</i>	1	2.6%
<i>Culex pipiens</i>	3	7.9%
<i>Culex albivittatus</i>	9	23.7%
<i>Culex tarsalis</i>	13	34.3%
<i>Culiseta inornata</i>	2	5.3%



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Culiseta</i>	10	26.3%
<i>Anopheles</i>	1	2.6%
<i>Culex</i>	25	65.8%
<i>Culiseta</i>	2	5.3%
Other	0	0.0%



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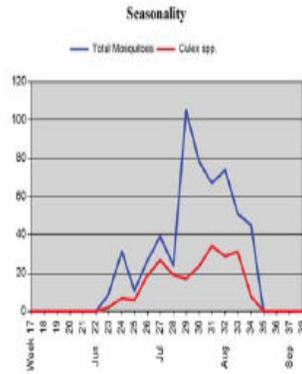
RF-16: Rifle - Middle School

Season: 2013
 Trap Type: Light/CO2
 Location: NW of Rifle Middle School
 GPS: N39° 32.060', W107° 47.125'

Total number of trap nights set: 13
 Total number of mosquitoes collected: 561
 Average mosquitoes per trap night: 43
 Average Culex per trap night: 17

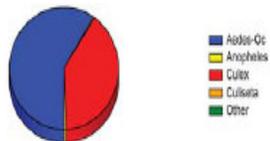
Species collected and abundance:

<i>Aedes (Oc) dorsalis</i>	19	3.4%
<i>Aedes (Oc) melanotus</i>	9	1.6%
<i>Aedes (Oc) nigroparvulus</i>	1	0.2%
<i>Aedes vexans</i>	303	54.0%
<i>Anopheles hernesi</i>	2	0.4%
<i>Culex pipiens</i>	8	1.4%
<i>Culex subvarius</i>	48	8.6%
<i>Culex tarsalis</i>	167	29.8%
<i>Culiseta inornata</i>	4	0.7%



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Culiseta</i>	332	59.2%
<i>Anopheles</i>	2	0.4%
<i>Culex</i>	223	39.8%
<i>Culiseta</i>	4	0.7%
Other	0	0.0%



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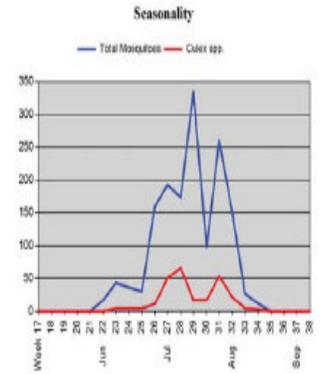
SI-09: Silt Kum & Go

Season: 2013
 Trap Type: Light/CO2
 Location: SE of Kum & Go Store, 905 Main Street
 GPS: N39° 32.765', W107° 39.145'

Total number of trap nights set: 12
 Total number of mosquitoes collected: 1,507
 Average mosquitoes per trap night: 126
 Average Culex per trap night: 21

Species collected and abundance:

<i>Aedes (Oc) dorsalis</i>	98	6.5%
<i>Aedes (Oc) incipitator</i>	53	3.5%
<i>Aedes (Oc) melanotus</i>	132	8.8%
<i>Aedes (Oc) nigroparvulus</i>	1	0.1%
<i>Aedes vexans</i>	171	11.3%
<i>Anopheles hernesi</i>	9	0.6%
<i>Culex subvarius</i>	18	1.2%
<i>Culex tarsalis</i>	238	15.8%
<i>Culiseta inornata</i>	83	5.5%



Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Culiseta</i>	1,159	76.9%
<i>Anopheles</i>	9	0.6%
<i>Culex</i>	256	17.0%
<i>Culiseta</i>	83	5.5%
Other	0	0.0%



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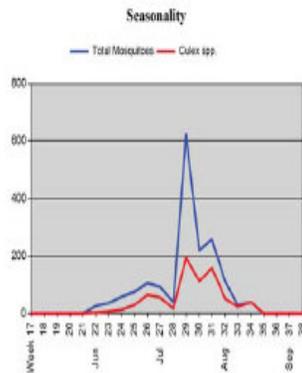
SI-10: Silt Coal Ridge High School

Season: 2013
 Trap Type: Light/CO2
 Location: near retention pool SE of Coal Ridge H.S.
 GPS: N39° 33.040', W107° 36.415'

Total number of trap nights set: 13
 Total number of mosquitoes collected: 1,725
 Average mosquitoes per trap night: 133
 Average Culex per trap night: 59

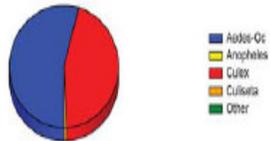
Species collected and abundance:

<i>Aedes (Oc) dorsalis</i>	163	9.4%
<i>Aedes (Oc) incipitator</i>	1	0.1%
<i>Aedes (Oc) melanotus</i>	366	21.2%
<i>Aedes (Oc) nigroparvulus</i>	4	0.2%
<i>Aedes (Oc) vittatus</i>	1	0.1%
<i>Aedes vexans</i>	402	23.3%
<i>Anopheles hernesi</i>	1	0.1%
<i>Culex subvarius</i>	158	9.2%
<i>Culex tarsalis</i>	614	35.6%
<i>Culiseta inornata</i>	2	0.1%
<i>Culiseta inornata</i>	12	0.7%



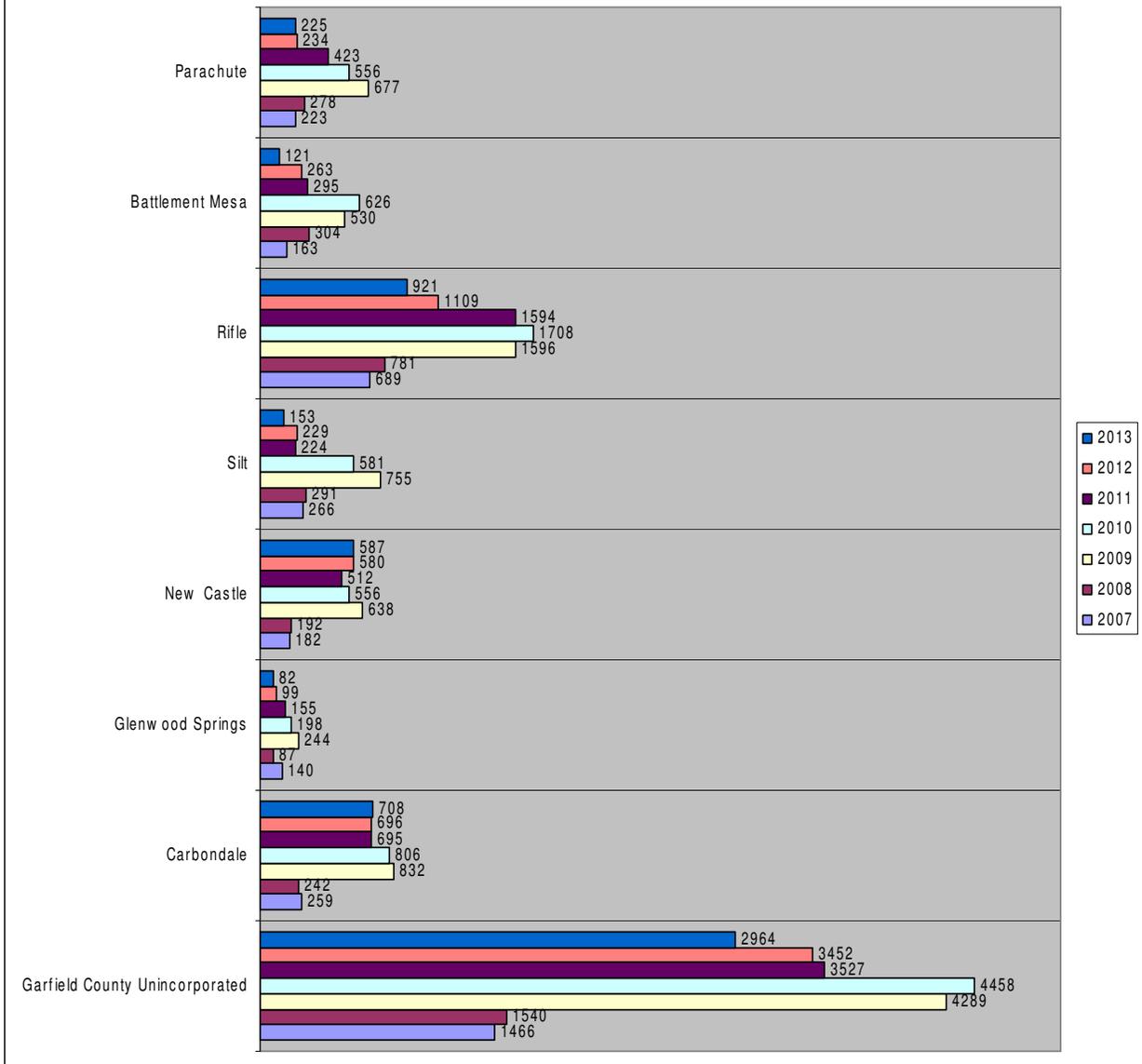
Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Culiseta</i>	938	54.4%
<i>Anopheles</i>	1	0.1%
<i>Culex</i>	772	44.8%
<i>Culiseta</i>	14	0.8%
Other	0	0.0%

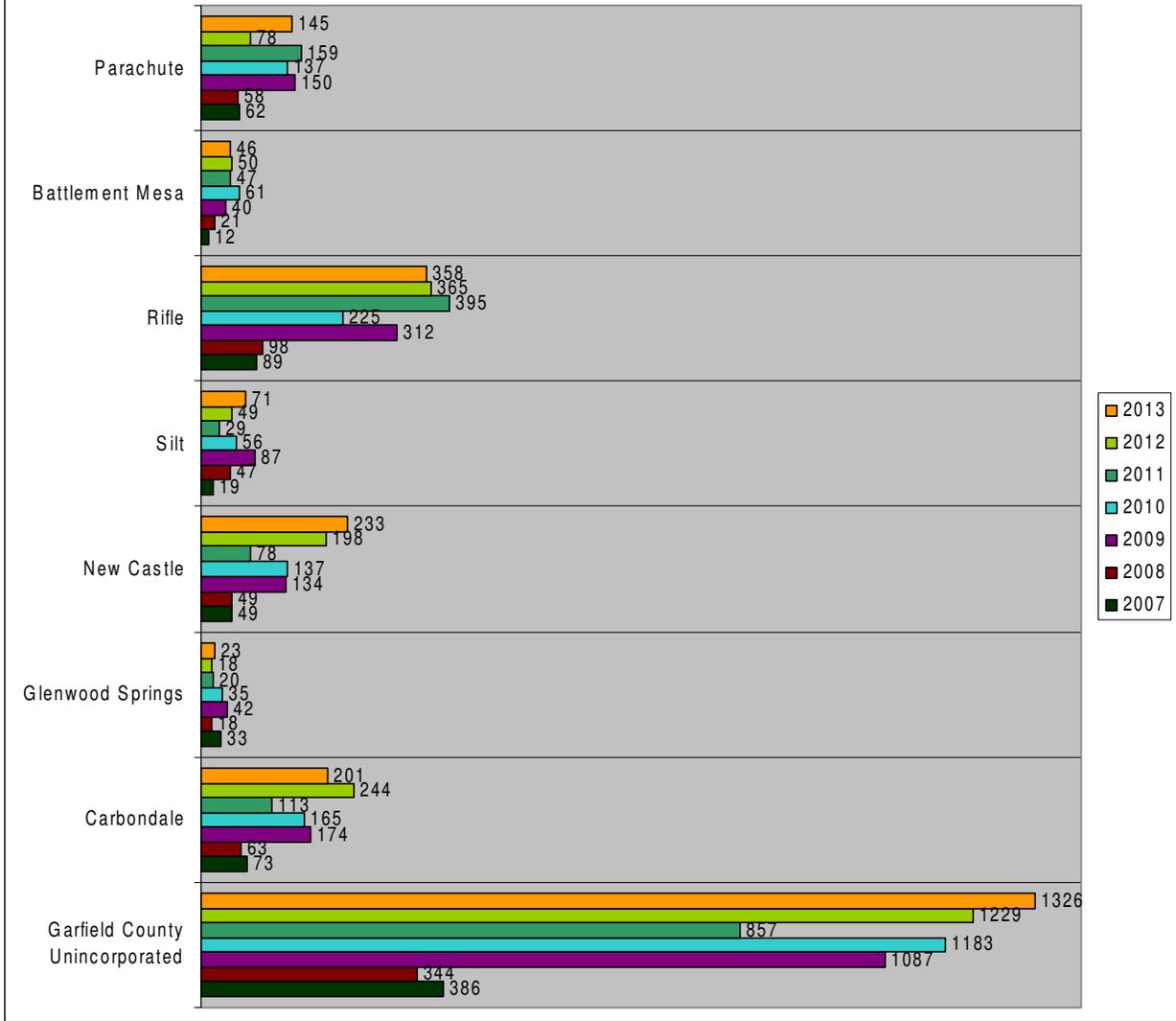


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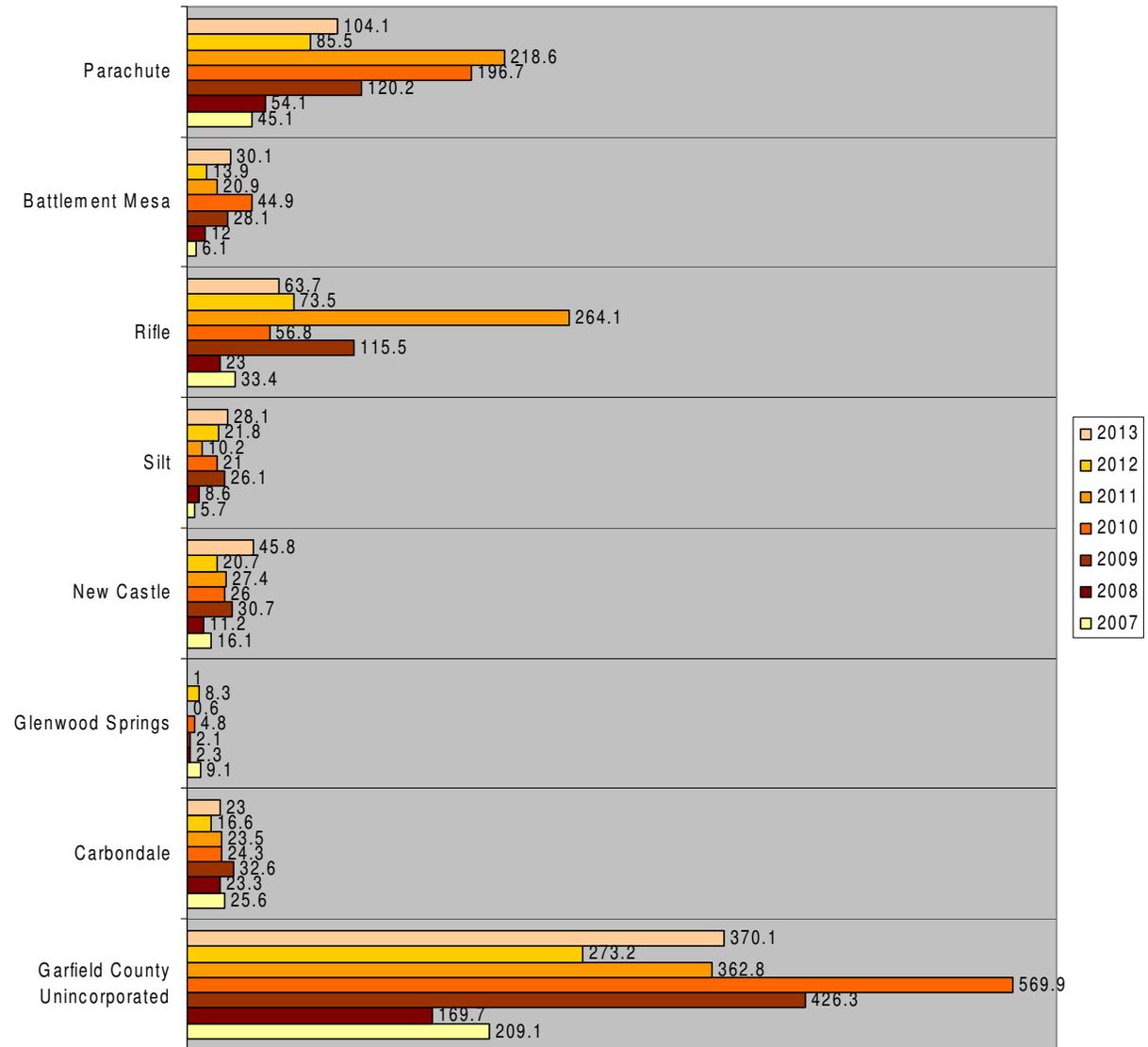
Garfield County Site Inspections by Year (2007-2013)



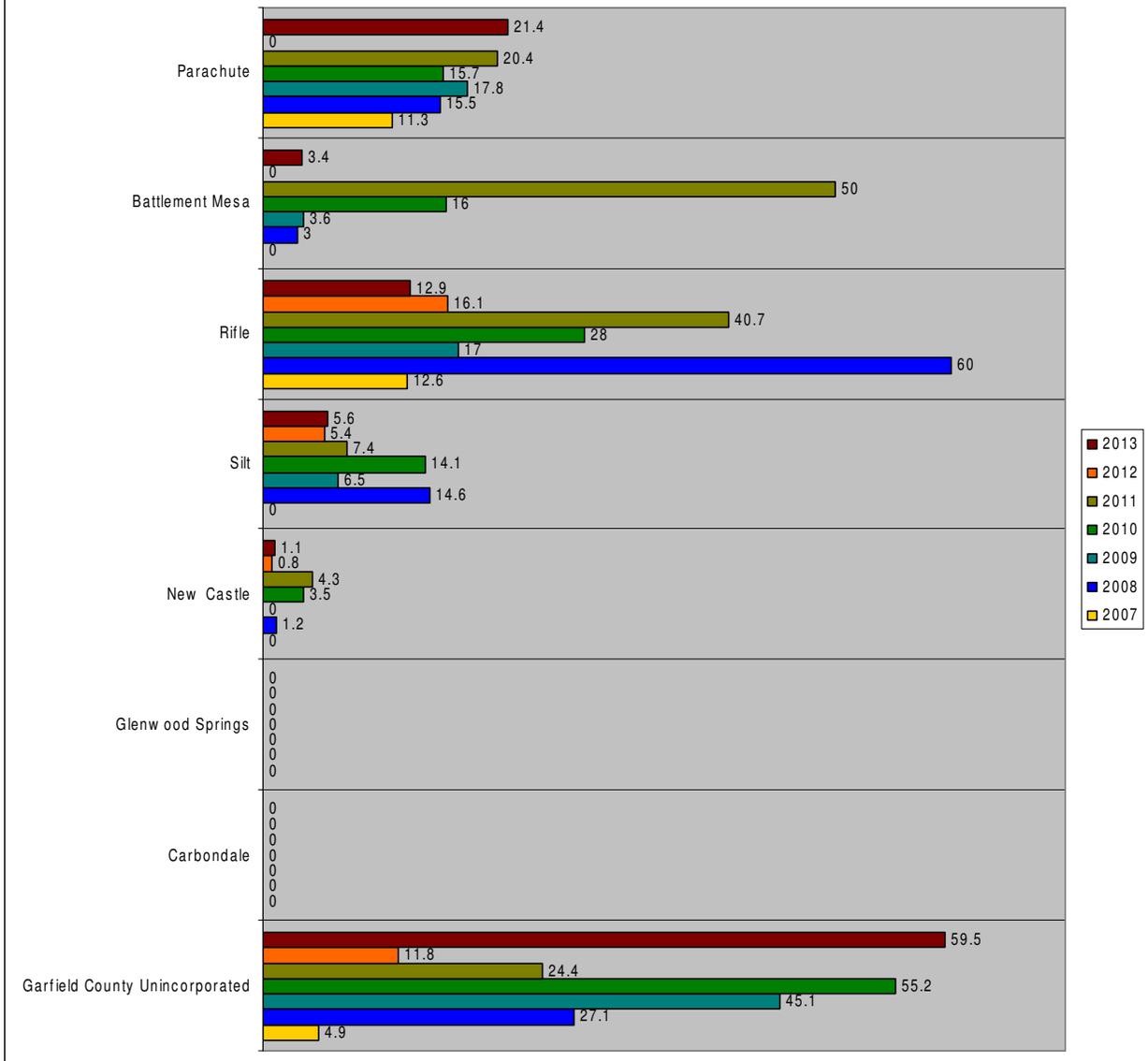
Garfield County Site Treatments (2007-2013)



Garfield County Total Acres Treated (2007-2013)



Garfield County Total ULV Truck Miles (2007-2013)



Garfield County Mosquito Line Calls (2007-2013)

