

A dramatic landscape photograph featuring a bright lightning bolt striking a field. The sky is filled with dark, heavy clouds, and the lightning bolt is a prominent white streak descending from the upper right towards the center. The foreground shows a green field with some trees in the distance.

# 2011 Annual Report Garfield County Cooperative Mosquito Control Program Garfield County

October 2011

## Colorado Mosquito Control, Inc.

695 North 7th Ave. Brighton, CO 80601

(303) 558-8730 FAX (303) 558-8734

Email: [info@comosquitocontrol.com](mailto:info@comosquitocontrol.com)

Website: [www.comosquitocontrol.com](http://www.comosquitocontrol.com)

## On the Cover:

### *The Perfect Storm (or not)*

*On the northern Front Range the 2011 mosquito season will long be remembered as the year the monsoon rains came early, often and heavy. While monsoon rains generally come to Colorado in mid to late August; 2011 saw 10 straight days of monsoonal rains in mid-July, followed closely by numerous days in the high 90's, the perfect storm for high mosquito populations.*

*Other parts of Colorado saw dramatically different weather patterns. The mountain valleys experienced flooding from record snow-pack levels while Pueblo and the south had drought conditions. A year to be remembered for many reasons.*

**GARFIELD COUNTY COOPERATIVE  
MOSQUITO CONTROL PROGRAM  
UNINCORPORATED GARFIELD COUNTY  
ANNUAL REPORT 2011**

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# ***THE GARFIELD COUNTY COOPERATIVE MOSQUITO CONTROL PROGRAM MISSION STATEMENT***

The Garfield County Mosquito Management Program completed its 8th year of cost effective Integrated Mosquito Management operations in 2011. 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 Cooperative Mosquito Control Program is to suppress populations of larval mosquitoes in aquatic habitats. 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 performed in the Garfield County Cooperative provides 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 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***

With 9 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.

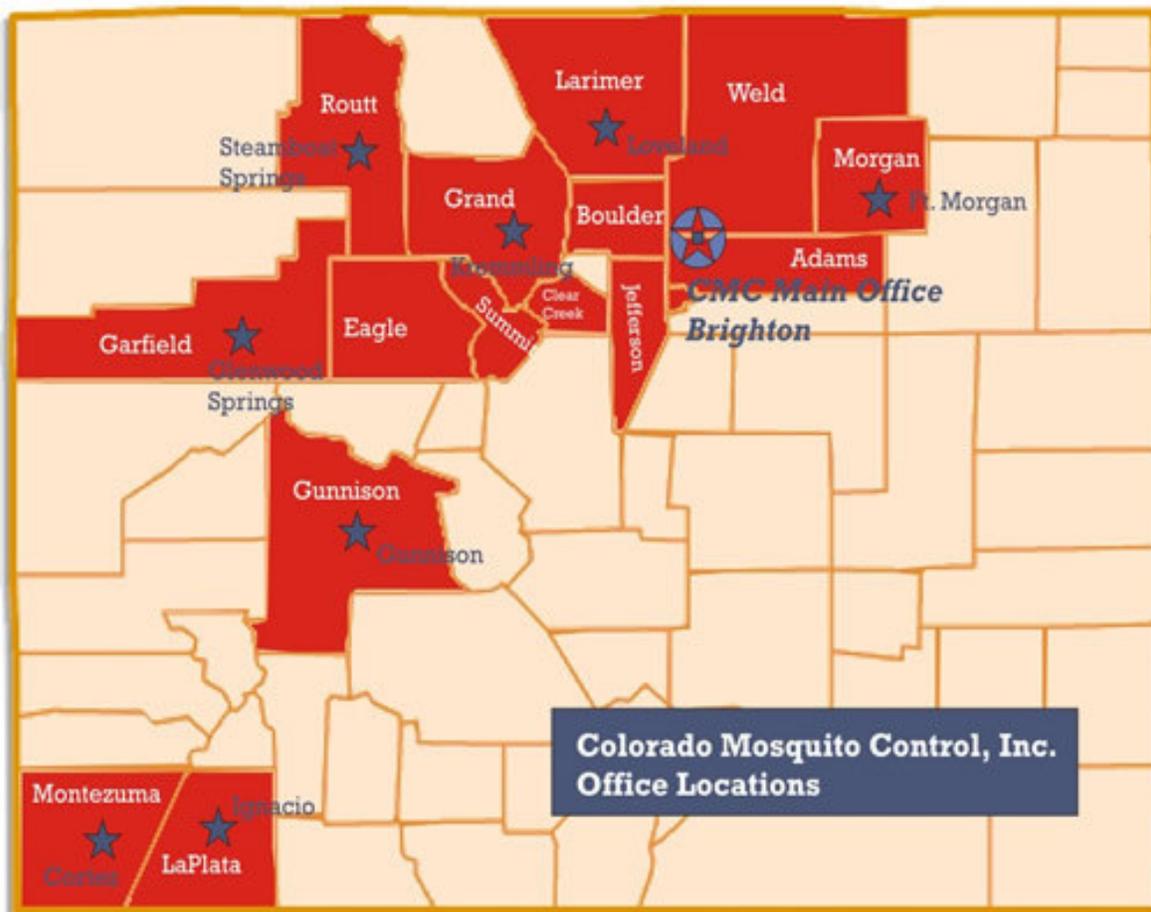
### **Colorado Mosquito Control, Inc.**

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 the Gunnison Valley, the I-70 corridor through Garfield County and parts of the upper Colorado River valley.

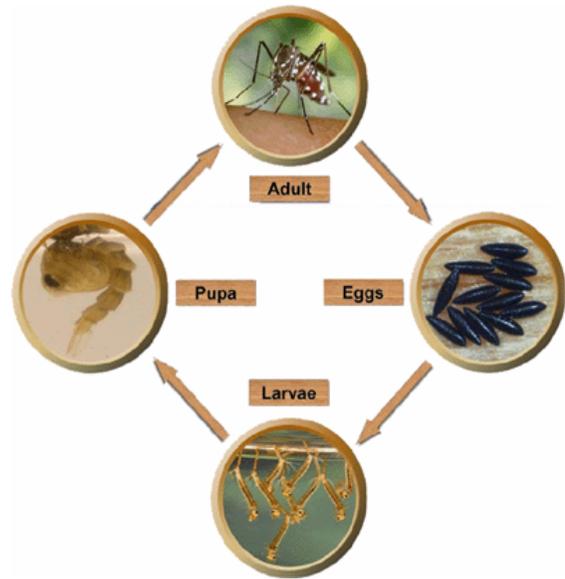
Seven municipalities throughout Garfield County again participated in an extensive cooperative mosquito control effort during 2011. Since the inception of Garfield County Cooperative Mosquito Control Program, efficacy of the established program has been improved with the inclusion of areas adjacent to 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 8 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.



## 2011 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; 2011 was typical in that respect.

The 2011 mosquito season can best be described as a “Roller Coaster Ride,” with dramatic snowmelt run-off throughout June and July to the exceptional heat of August. (See Chart “2011 Garfield County Climate Data”). River levels reached all-time record highs, flooding the banks of the Colorado River in numerous locations in Garfield County in late June and the first week of July. Fortunately, the river receded rapidly and larval sites dried up with the 21 days of 90+ degree weather in August.



The vast majority of the mosquitoes (*Aedes/Ochlerotatus*) with which we must contend are associated with newly applied floodwater via rain or irrigation or older standing stagnant water (*Culex*). Thus, mosquito population trends are almost always dependent on either heavy rains (over 0.5in) or the agricultural flooding of fields for irrigation. However, in 2011 snowmelt run-off throughout the month of June and into early July contributed more to mosquito populations than any other factor. With record runoff and river levels, many rivers and streams flooded their banks creating many new larval sites throughout Garfield County and the Colorado River corridor. This season followed the norm for mosquito trends in populations with June and July seeing prominently (*Aedes/Ochlerotatus*) species. While late July into August *Culex* species became more populous as standing stagnant pools became more prominent with warmer temperatures.

In the month of July there were a few significant rain events triggering large hatches of floodwater *Aedes/Ochlerotatus* species. In addition, flood irrigation played a key role throughout July and August resulting in several recognizable and localized broods of floodwater mosquitoes and post irrigation standing water *Culex* mosquitoes. Understanding and recognizing patterns of agricultural irrigation is still one of CMC's primary goals.

Below average precipitation in August resulted in a decrease of floodwater mosquito populations. The warm weather was ideal for *Culex* mosquito production and was evident in trap counts throughout Garfield County. The *Culex* mosquitoes are the primary vectors of West Nile Virus in Colorado. Adult *Culex* mosquitoes peaked in the last week of July into the first week of August with a steep decline as September began. The season came to a close on September 13<sup>th</sup> as daytime temperatures dipped into the 60's and 70's with night time temperatures dropping into the mid to low 40s throughout Garfield County.

## 2011 Field Activities

Field activities began in late March for the 2011 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 result in many new sites being added to the existing larval inspection routes.

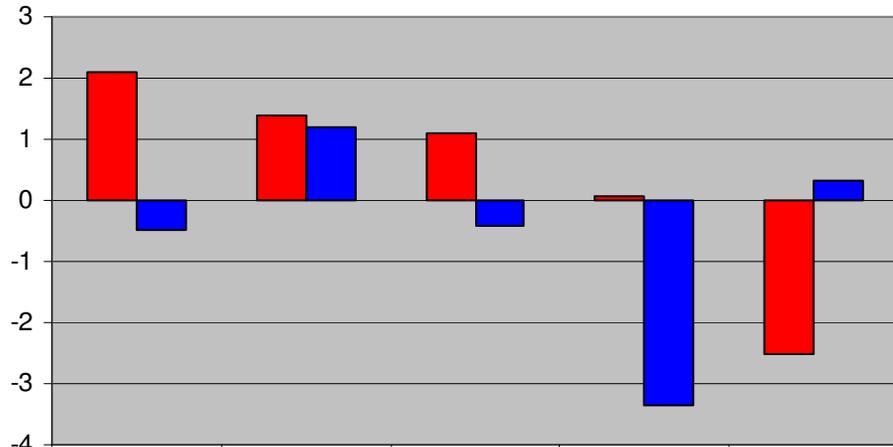
Hiring of seasonal technicians began in March, and continued into late May. As the CMC service area continues to grow, hiring an adequate number of top quality field technicians has become a challenge. For the Garfield County office, nearly 20 applicants were interviewed with 8 full-time technicians being hired; fortunately, 5 of which were returning technicians from last year.

CMC's Annual Field Technician Classroom Training Day took place on Monday, May 23rd 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 Monday, September 12th.

Mosquito trapping was planned through September 9th, however windy, cold and wet weather conditions effectively eliminated the final week of mosquito trapping and associated adult spraying operations. Although small populations of adult mosquitoes remained through the end of September, mosquito annoyance calls declined to zero during the last weeks of the month.

## 2011 Garfield County Area Climate Data

### Departures From Normal



	August	July	June	May	April
■ Temperatures (degrees F)	2.1	1.4	1.1	0.05	-2.5
■ Precipitation (inches)	-0.47	1.18	-0.42	-3.35	0.32

# WEST NILE VIRUS 2011

## *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.

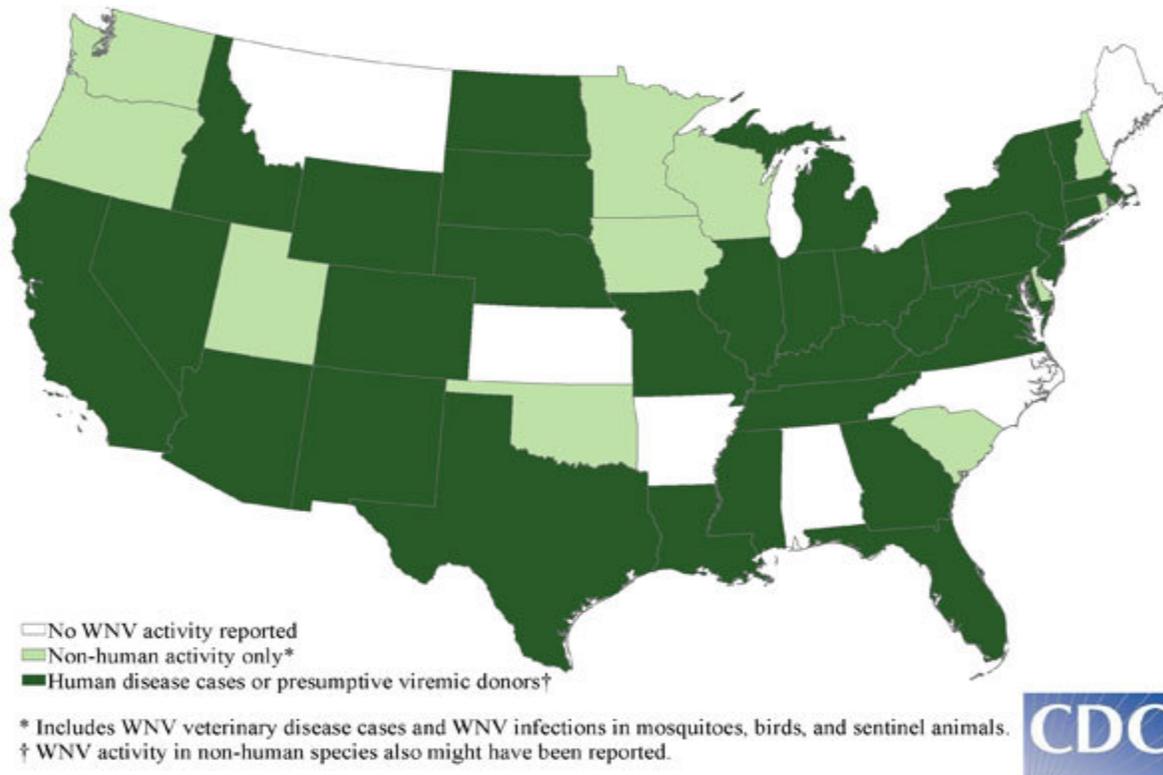
Colorado first saw activity of the virus late in the summer of 2002. In 2003 Colorado was the hardest hit state compiling 2,947 human cases and 63 deaths most of which occurred along the Front Range. By 2004 the majority of the cases shifted to the Western Slope and the state totaled 291 cases with 4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

## *Colorado Perspective*

Cases of WNV have been seen throughout a large portion of the country. States with the most reported WNV cases thus far in 2011 include: Arizona, California, Mississippi and Florida.

In Colorado in 2004 and 2005 WNV activity was spread throughout the state with no particular clustering in any one region. This year there has not been nearly the number of cases as in 2010, partly due to the weather conditions and larval production patterns. Also of significance is the lack of a healthy avian population to propagate and infect vector mosquitoes. However; similar to last year there has been a clustering of positive WNV cases along the Northern Front Range. There have been no positive human or animal cases reported in Garfield County thus far in 2011. As of September 14 there have been 5 confirmed human cases (most of which were observed in adults between 35 and 70yrs old) and zero deaths in the state.

## WEST NILE VIRUS (WNV) ACTIVITY REPORTED TO ARBONET, BY STATE, UNITED STATES, 2011 (AS OF SEPTEMBER 13, 2011)



Source: <http://www.cdc.gov/ncidod/dvbid/westnile/Mapsactivity/surv&control11MapsAnybyState.htm>

Human West Nile Virus Infections: Colorado, 2011

Updated September 8, 2011

	New cases	Clinical diagnosis			Total cases	Total deaths
		Fever	Meningitis	Encephalitis		
<b>County of Residence</b>	1	.	1	.	1	.
<b>Archuleta</b>						
<b>Boulder</b>	.	1	.	1	2	.
<b>Denver</b>	.	1	.	.	1	.
<b>Larimer</b>	.	1	.	.	1	.
<b>COLORADO</b>	1	3	1	1	5	.

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 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 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. *Gambusia* 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.

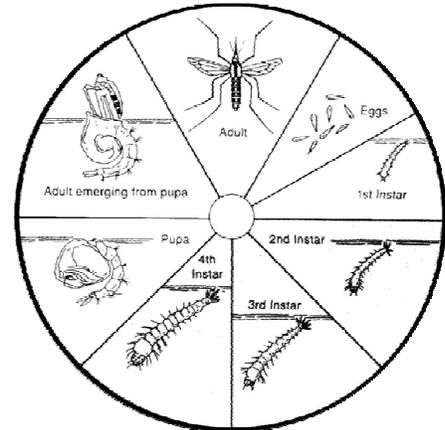
CMC's favored method of larval mosquito control is through bacterial bio-rational products. The main product used by CMC is a variety of bacteria (*Bacillus thuringiensis var. israeliensis*). *Bti* as it is known has become the cornerstone of mosquito control programs throughout the world. The benefits 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 larvacides 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 the first week of April and continued though the second week of September. Sporadic rain events, record snowmelt run-off and irrigation practices contributed to a record number of “wet” sites in June and July. As a result many more acres were treated throughout June and July. Despite increased production and treatment during June and July, August brought relief with very warm and dry weather. During the 2011 season, there were 3,483 site inspections with 86% (2,981) of them wet. Of the 2,981 wet sites 28% (847) of them required treatment totaling 360.6 acres treated in Unincorporated Garfield County.



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 all 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 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 2011, Colorado Mosquito Control monitored a statewide network of more than 270 weekly trap sites, collecting nearly 910,000 adult mosquitoes that 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 35 of those were identified from samples processed during the 2011 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 2011 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. The infection rates of West Nile Virus in *Culex* mosquitoes in 2011 was comparable to the unprecedented high rates in 2003 season, the only real difference between 2011 and 2003 seems to be in the actual overall number of *Culex* mosquitoes at the end of the season, not in the percentage of mosquitoes that were infected with the virus.

## CDC Surveillance Light Trap Data Comparison

In 2011, an average of 2 surveillance light trap locations monitored adult mosquito populations within Unincorporated Garfield County weekly. Weather permitting, CDC battery-operated “light traps” were set weekly in each location to provide adult mosquito population data for seasonal comparisons. Surveillance trapping began June 1<sup>st</sup> and trapping was concluded on August 31<sup>st</sup>.

In 2011, 32 surveillance light traps were set within Unincorporated Garfield County, which collected 13860 total mosquitoes. The average number of mosquitoes collected per trap per night was 433 and the average number of *Culex* mosquitoes collected per trap per night was 63. The percent composition of mosquitoes collected in 2011 is as follows: 83.4(11553) *Aedes/Oc. Spp*, 14.5% (2015) *Culex*, 1.9% (265) *Culiseta*. Please refer to the CDC Light Trap Details for species composition and seasonal trends by individual surveillance trap location.

## 2011 ADULT CONTROL

The Goal of Colorado Mosquito Control, Inc. is to provide all residents of the Garfield County Cooperative with the best options for safe, effective, modern mosquito management. The primary emphasis of the Garfield County Cooperative Mosquito Management 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.

The Garfield County Cooperative 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, 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.

This season CMC used the product Evoluer 4-4 for ULV adult mosquito control. Its active ingredient permethrin is highly effective against mosquitoes and has proven that this is the right choice for the adulticide portion of the Integrated Mosquito Management Program.

As we look towards the 2012 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 2011. 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

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 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.

### LINKS FROM WEBSITE

CMC was one of the first mosquito control organizations anywhere to publish adult mosquito control spray schedules on the web. Adult mosquito spray schedules are posted daily by 3PM.

CMC has led the industry with dissemination of data via our online dashboard using Digital Interactive Reporting. No other mosquito control company anywhere has DIGITAL INTERACTIVE REPORTING. These CMC exclusive technologies allows our customers to quickly and easily analyze thousands of data points, simply create and instantly view charts and graphs that can visually compare years of data and show trends not easily detected from traditional data analysis.

CMC also established client website pages that contain program information and goals, product information larval control areas and annual reports in easily accessible and downloadable PDF formats.

## **PUBLIC OUTREACH & DATA DISSEMINATION**

For 25 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 Cooperative Mosquito 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.

### **“PREVENTION & PROTECTION” PRESENTATIONS**

CMC staff provides informative presentations about personal protection, repellents, West Nile Virus activity and ways to reduce mosquitoes by dumping/ draining standing water. Examples of groups that have benefited from these presentations include employees in the Parks & Recreation Department, Utility Workers, “at risk” employees exposed to mosquito bites from outdoor work, and senior populations within communities.

**FLOATER TRAP PLACEMENT** for annoyance reports at resident homes in locations away from standard trapping sites.

**FLYER POSTING NEAR LAKES/ RESERVOIRS** with reminders to dump standing water from paddle boats, canoes & kayaks that can breed mosquitoes after sitting stagnant over winter and after rainfall.

### **MUNICIPAL CLIENT ON-LINE SURVEYS**

In the fall of 2008 CMC implemented its first on-line customer service survey utilizing Survey Monkey. The results from the survey were very encouraging. The feedback was analyzed by CMC management and resulted in several new service improvements.

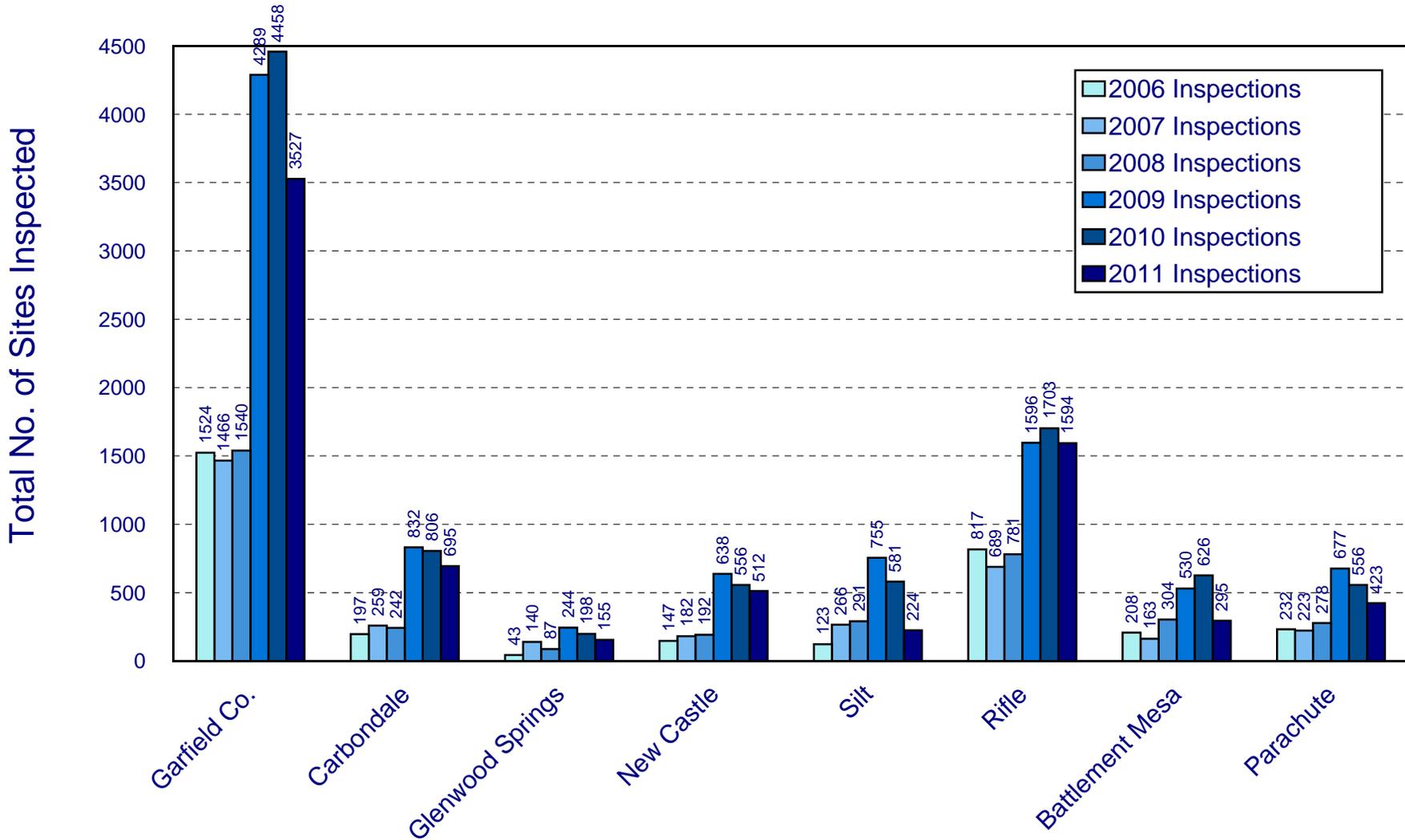
## SUMMARY

The 2011 Garfield County Cooperative Mosquito Control Program once again provided challenges and successes. Fortunately the threat of West Nile Virus Disease and transmission was significantly reduced when compared to previous years. In fact, there were no human or animal cases confirmed in Garfield County during the 2011 season. We have learned a lot since the inception of the Garfield County Cooperative Mosquito Control program, and have made some great improvements; in both the mosquito-borne disease realm and also on the nuisance side. Work will always continue in the arena of public education, notification and dissemination of information about personal protection and the mosquito control program itself. CMC's website continues to be successful based on the number of "hits," favorable e-mails and requests for more information received from program residents.

Colorado Mosquito Control, Inc. continues to effectively serve the residents of Unincorporated Garfield County and the Garfield County Cooperative Mosquito Control Program using Integrated Mosquito Management technology to reduce mosquito nuisance and the related potential for disease transmission including West Nile Virus. CMC continued to promote a responsible IPM approach to mosquito management, fully utilizing all available biological control techniques while minimizing the use of chemical pesticides. CMC has been able to develop both a cost-effective and efficient program in Unincorporated Garfield County over the past seasons and looks forward to continued service in 2012 and beyond. We also know that there is always room for improvement and have high expectations for program improvements and new successes in future years.

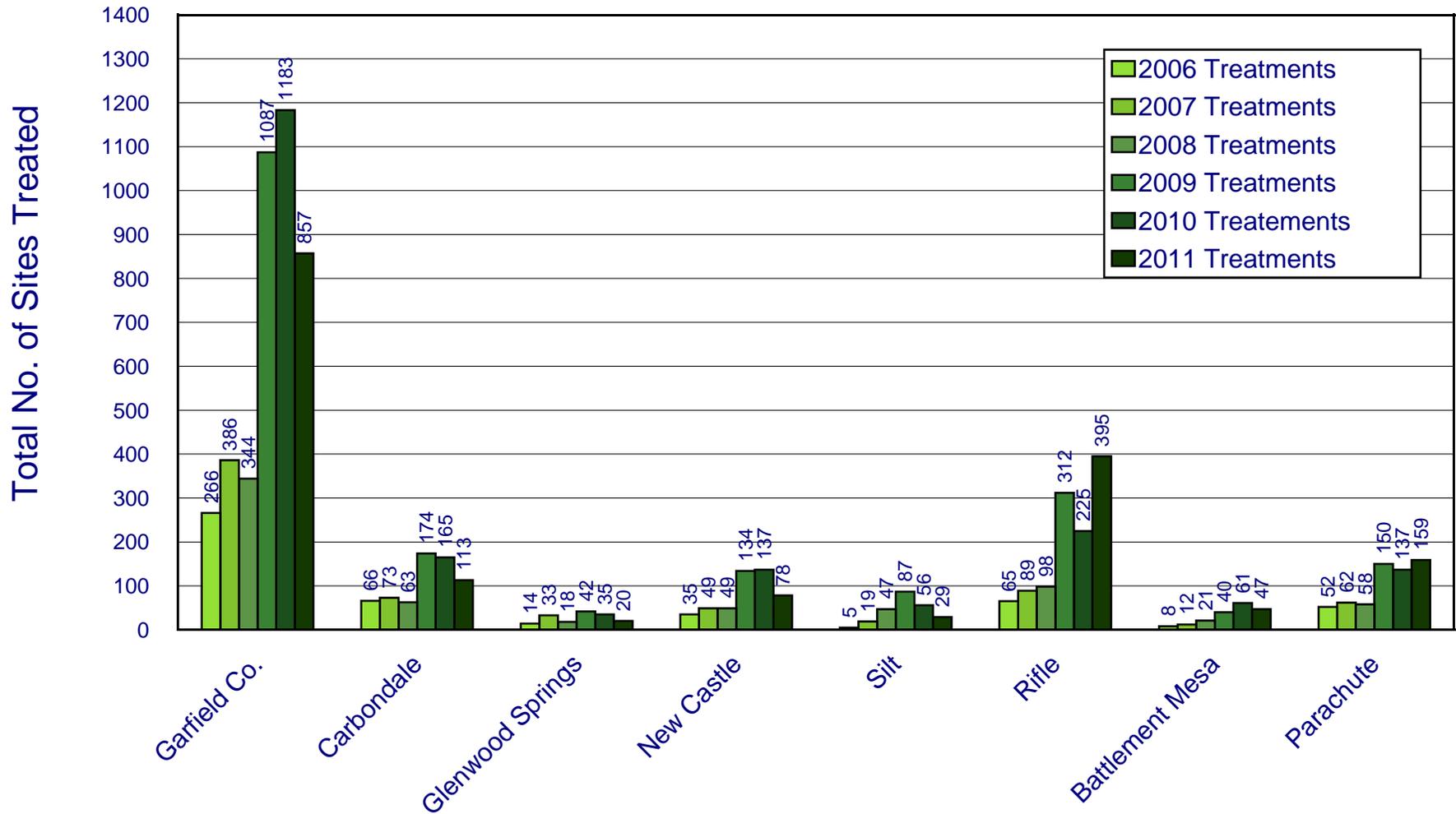
# Larval Site Inspections by Service Area

'06 - '11 Garfield County Mosquito Control Program



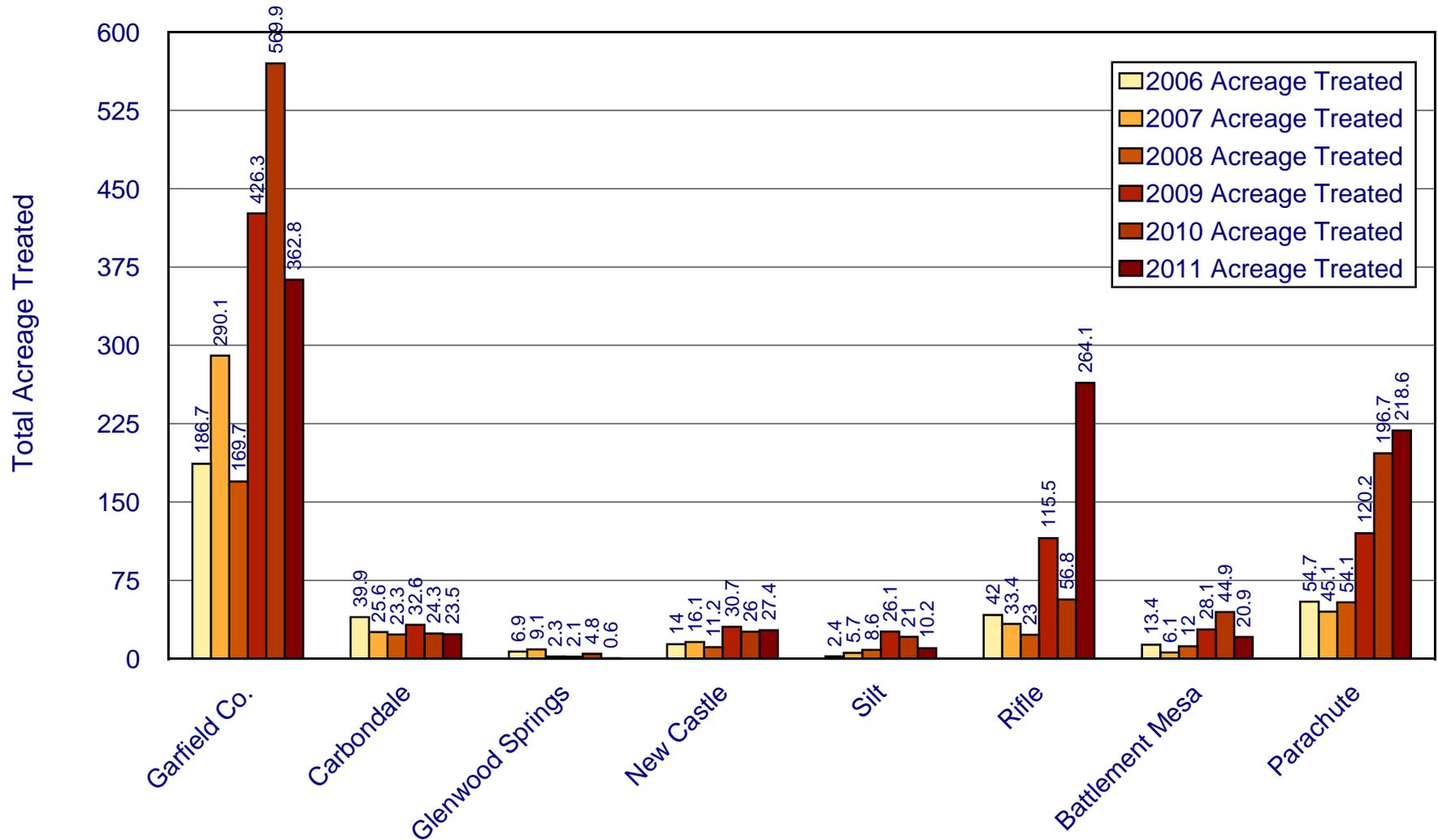
# Larval Site Treatments by Service Area

'06 - '11 Garfield County Mosquito Control Program



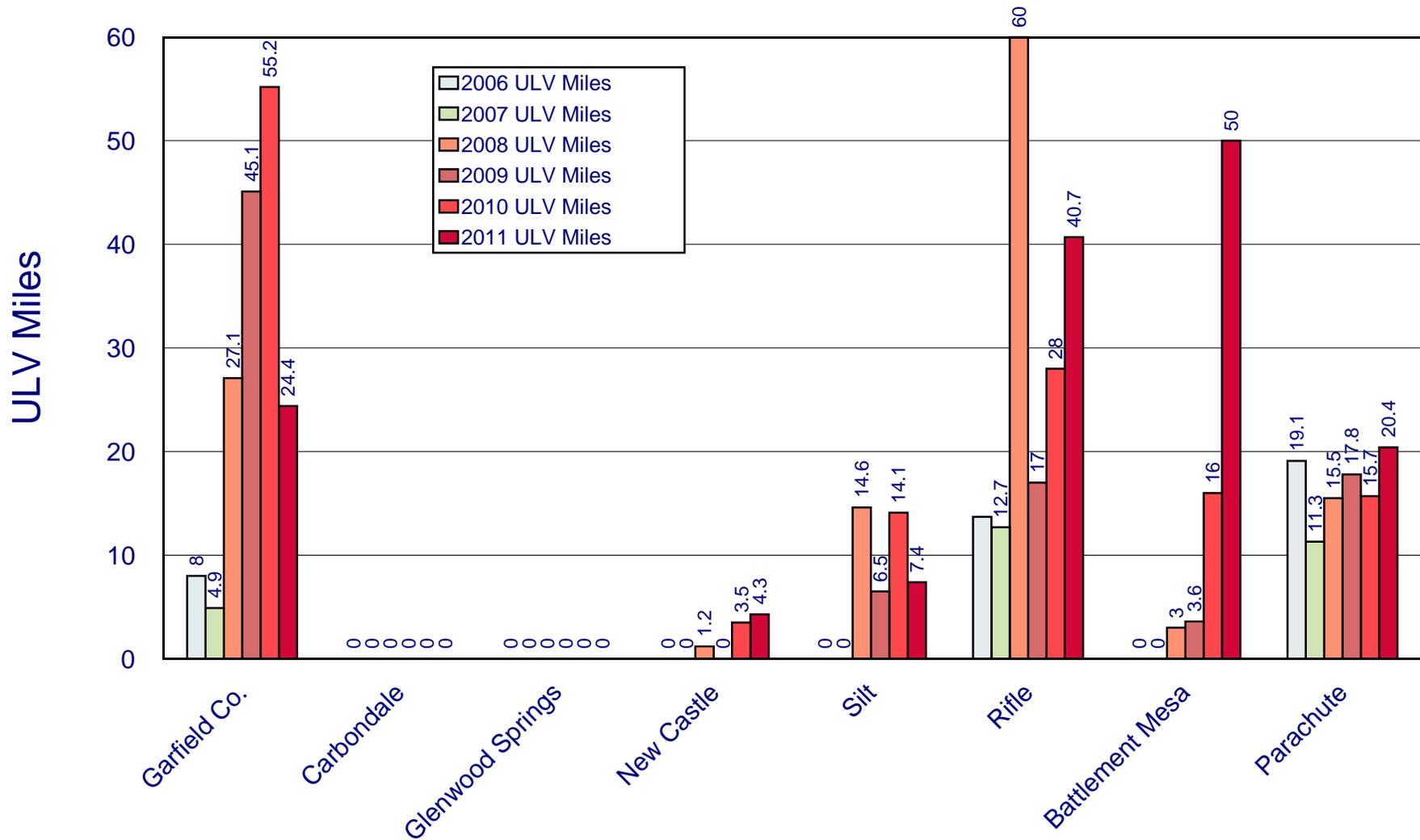
# Larval Acreage Treated by Service Area

## '06 - '11 Garfield County Mosquito Control Program



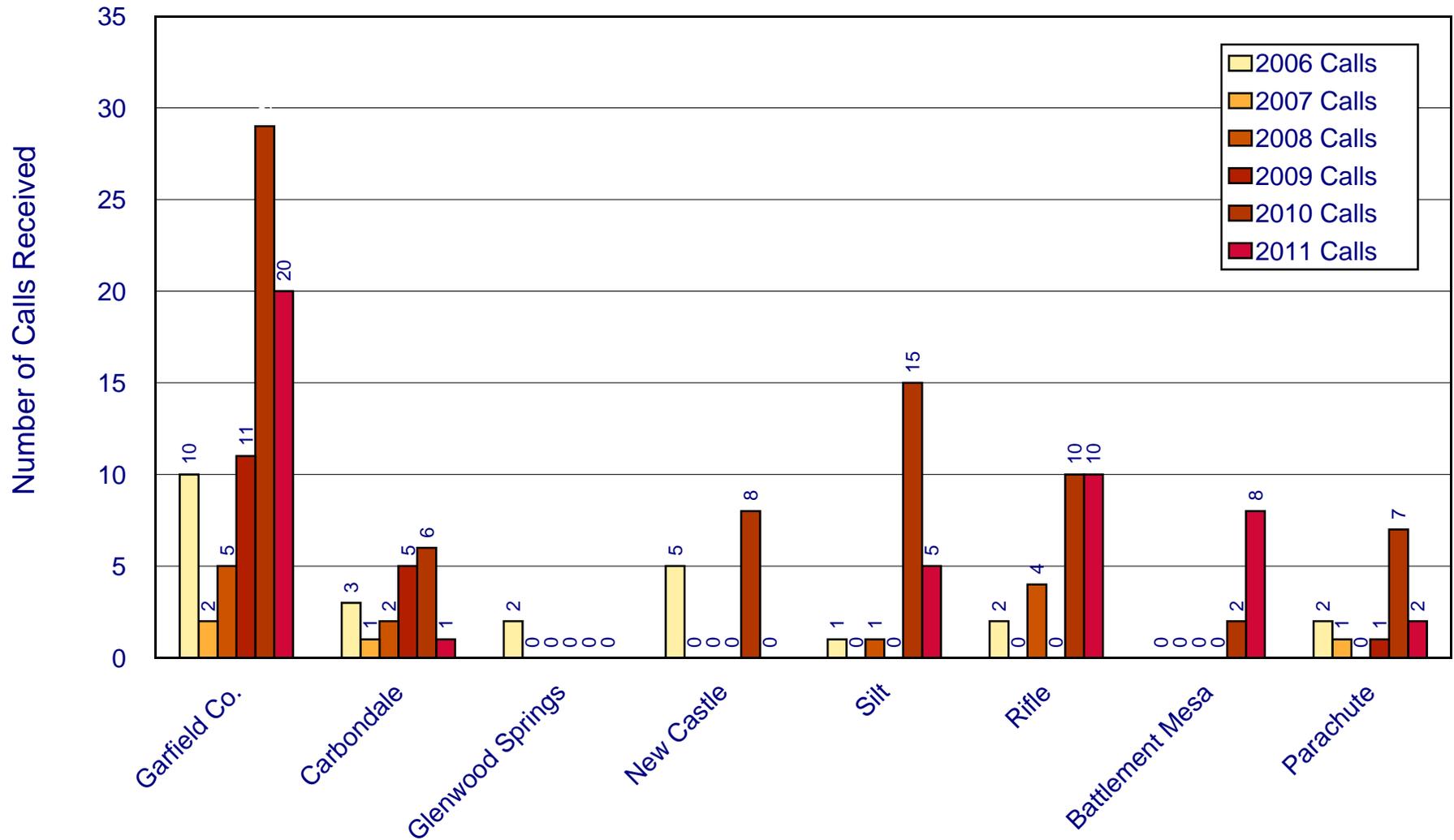
# ULV Adulicide Comparison By Service Area

## '06 - '11 Garfield County Mosquito Control Program



# MosquitoLine Calls by Service Area

'06 - '11 Garfield County Mosquito Control Program



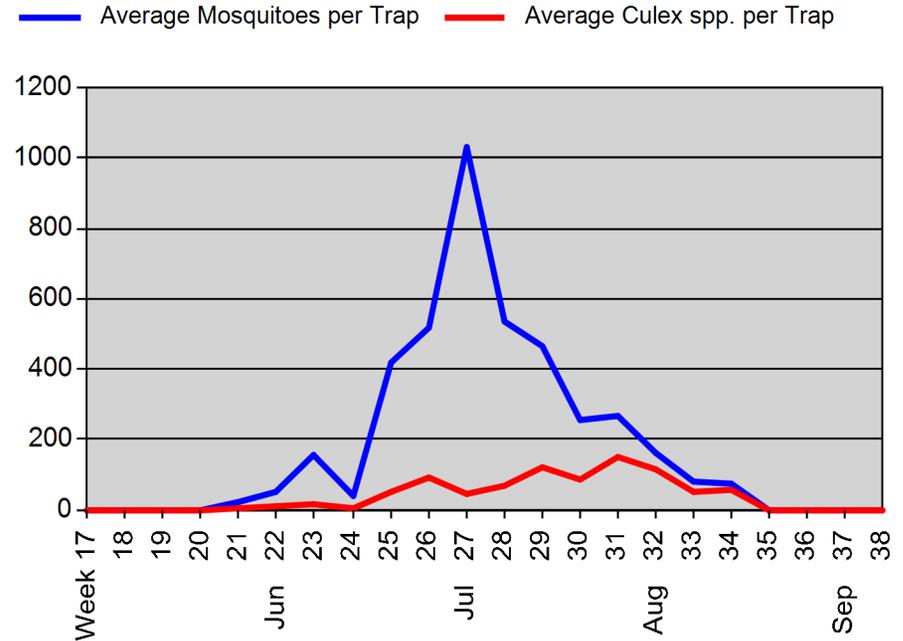
# 2011 Garfield Cci blmTrap Composite Data

**Total number of trap/nights set:** 156  
**Total number of mosquitoes collected:** 49,770  
**Average mosquitoes per trap/night:** 319  
**Average Culex per trap/night:** 64

## Species collected and abundance:

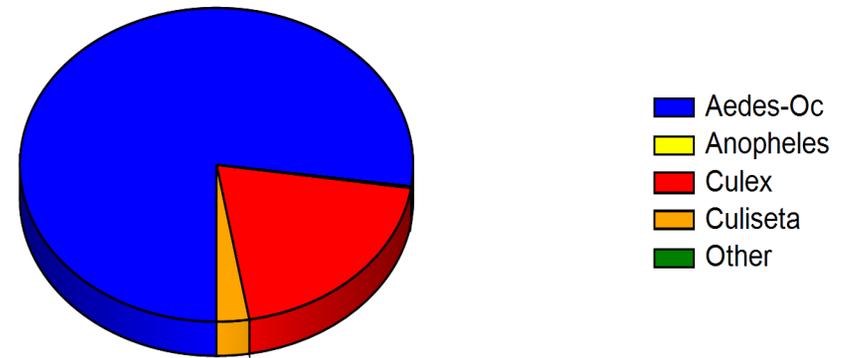
<i>Aedes (Oc.) dorsalis</i>	4252	6.3 %
<i>Aedes (Oc.) increpitus</i>	573	0 %
<i>Aedes (Oc.) melanimon</i>	532	80 %
<i>Aedes (Oc.) spencerii idahoensis</i>	; 3	0.4 %
<i>Aedes cinereus</i>	"4; ;	0.8 %
<i>Aedes vexans</i>	546; 4	67.5%
<i>Aedes/Ochlerotatus qyj gt'urr 0</i>	6;	0.3 %
<i>Anopheles hermsi</i>	'9;	0.2 %
<i>Culex erythrothorax</i>	439;	60 %
<i>Culex pipiens</i>	"3; 2	0.6 %"
<i>Culex salinarius</i>	3498	40 %
<i>Culex tarsalis</i>	8522	340%
<i>Culiseta alaskaensis</i>	3	0.2 %
<i>Culiseta incidens</i>	55	20%
<i>Culiseta inornata</i>	14; 5	40 %

## Seasonality



## Genus proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	38,462	77.3 %
<i>Anopheles</i>	78	0.2 %
<i>Culex</i>	9,946	20.0 %
<i>Culiseta</i>	1,327	2.7 %
Other	0	0.0 %



### BM-09: Willow Creek

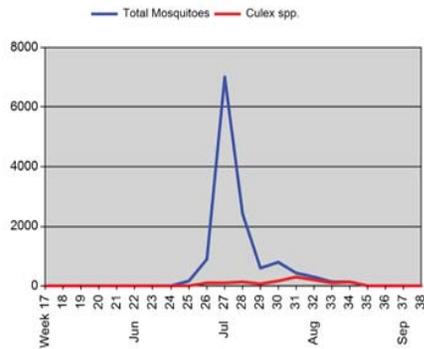
Season: 2011  
 Trap Type: Light/CO2  
 Location: Battlement Mesa - Willow Creek Subdivision  
 GPS: N39° 26.625', W108° 2.525'

Total number of trap/nights set: 14  
 Total number of mosquitoes collected: 12,842  
 Average mosquitoes per trap/night: 917  
 Average Culex per trap/night: 89

#### Species collected and abundance:

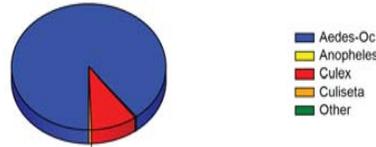
<i>Aedes (Oc.) dorsalis</i>	48	0.4%
<i>Aedes (Oc.) incriptus</i>	46	0.4%
<i>Aedes (Oc.) melanimon</i>	929	7.2%
<i>Aedes (Oc.) nigromaculis</i>	1	0.0%
<i>Aedes (Oc.) spencerii idahoensis</i>	34	0.3%
<i>Aedes (Oc.) trivittatus</i>	4	0.0%
<i>Aedes vexans</i>	10424	81.2%
<i>Anopheles hermsi</i>	41	0.3%
<i>Culex pipiens</i>	1	0.0%
<i>Culex salinarius</i>	7	0.1%
<i>Culex tarsalis</i>	1236	9.6%
<i>Culiseta incidens</i>	1	0.0%
<i>Culiseta inornata</i>	70	0.5%

#### Seasonality



#### Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	11,486	89.4%
<i>Anopheles</i>	41	0.3%
<i>Culex</i>	1,244	9.7%
<i>Culiseta</i>	71	0.6%
Other	0	0.0%



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### CD-02: East Carbondale Saint Finbar

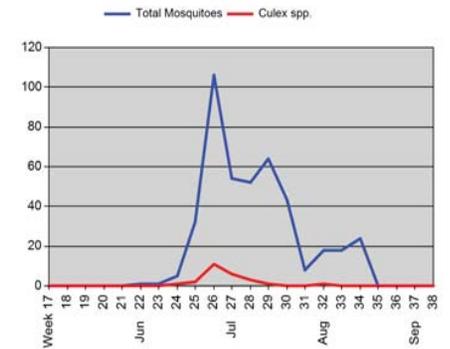
Season: 2011  
 Trap Type: Light/CO2  
 Location: In Saint Finbar neighborhood nr. Equestrian Ctr.  
 GPS: N39° 24.100', W107° 9.330'

Total number of trap/nights set: 14  
 Total number of mosquitoes collected: 426  
 Average mosquitoes per trap/night: 30  
 Average Culex per trap/night: 2

#### Species collected and abundance:

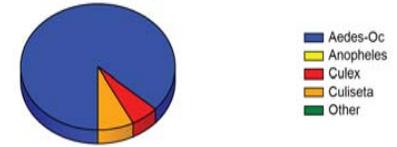
<i>Aedes (Oc.) c. canadensis</i>	6	1.4%
<i>Aedes (Oc.) communis</i>	20	4.7%
<i>Aedes (Oc.) dorsalis</i>	83	19.5%
<i>Aedes (Oc.) incriptus</i>	9	2.1%
<i>Aedes (Oc.) melanimon</i>	2	0.5%
<i>Aedes (Oc.) spencerii idahoensis</i>	12	2.8%
<i>Aedes (Oc.) trivittatus</i>	2	0.5%
<i>Aedes cinereus</i>	142	33.8%
<i>Aedes vexans</i>	93	21.8%
<i>Culex tarsalis</i>	25	5.9%
<i>Culiseta alaskaensis</i>	1	0.2%
<i>Culiseta incidens</i>	1	0.2%
<i>Culiseta inornata</i>	30	7.0%

#### Seasonality



#### Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	369	86.6%
<i>Anopheles</i>	0	0.0%
<i>Culex</i>	25	5.9%
<i>Culiseta</i>	32	7.5%
Other	0	0.0%



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### CD-11: Carbondale CRMS

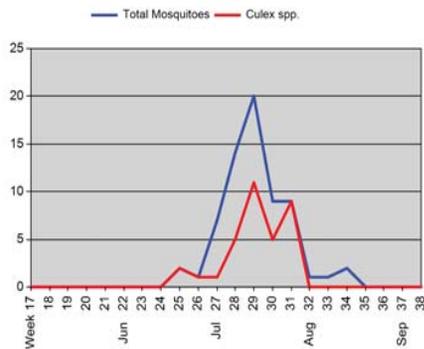
Season: 2011  
 Trap Type: Light/CO2  
 Location: Colorado Rocky Mountain School  
 GPS: N39° 24.480', W107° 13.645'

Total number of trap/nights set: 12  
 Total number of mosquitoes collected: 65  
 Average mosquitoes per trap/night: 5  
 Average Culex per trap/night: 3

#### Species collected and abundance:

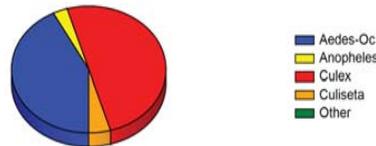
<i>Aedes (Oc.) dorsalis</i>	3	4.6%
<i>Aedes (Oc.) incriptus</i>	2	3.1%
<i>Aedes (Oc.) melanimon</i>	1	1.5%
<i>Aedes (Oc.) spencerii idahoensis</i>	1	1.5%
<i>Aedes vexans</i>	20	30.8%
<i>Anopheles hermsi</i>	2	3.1%
<i>Culex tarsalis</i>	33	50.8%
<i>Culiseta inornata</i>	3	4.6%

#### Seasonality



#### Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	28	43.1%
<i>Anopheles</i>	2	3.1%
<i>Culex</i>	33	50.8%
<i>Culiseta</i>	3	4.6%
Other	0	0.0%



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### GF-08: County Road 320

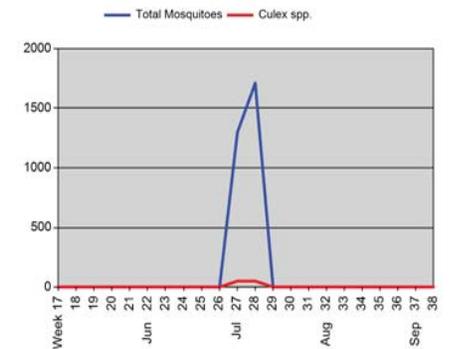
Season: 2011  
 Trap Type: Light/CO2  
 Location: Temporary floater trap south of Rifle  
 GPS: N39° 31.475', W107° 46.845'

Total number of trap/nights set: 4  
 Total number of mosquitoes collected: 3,009  
 Average mosquitoes per trap/night: 752  
 Average Culex per trap/night: 26

#### Species collected and abundance:

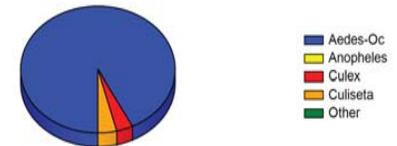
<i>Aedes (Oc.) dorsalis</i>	584	19.4%
<i>Aedes (Oc.) incriptus</i>	45	1.5%
<i>Aedes (Oc.) melanimon</i>	51	1.7%
<i>Aedes (Oc.) spencerii idahoensis</i>	2	0.1%
<i>Aedes vexans</i>	2105	70.0%
<i>Culex salinarius</i>	9	0.3%
<i>Culex tarsalis</i>	95	3.2%
<i>Culiseta inornata</i>	118	3.9%

#### Seasonality



#### Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	2,787	92.6%
<i>Anopheles</i>	0	0.0%
<i>Culex</i>	104	3.5%
<i>Culiseta</i>	118	3.9%
Other	0	0.0%



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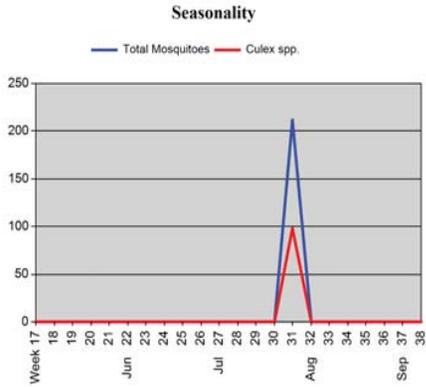
### GF-09: County Road 335

Season: 2011  
 Trap Type: Light/CO2  
 Location: Temporary floater trap SE of Silt  
 GPS: N39° 32.050', W107° 36.770'

Total number of trap/nights set: 1  
 Total number of mosquitoes collected: 212  
 Average mosquitoes per trap/night: 212  
 Average Culex per trap/night: 98

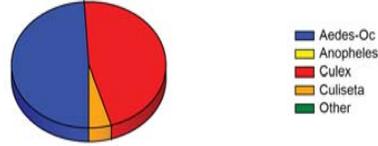
#### Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	58	27.4 %
<i>Aedes (Oc.) melaninon</i>	28	13.2 %
<i>Aedes (Oc.) nigromaculis</i>	1	0.5 %
<i>Aedes vexans</i>	17	8.0 %
<i>Culex tarsalis</i>	98	46.2 %
<i>Culiseta inornata</i>	10	4.7 %



#### Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	104	49.1 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	98	46.2 %
<i>Culiseta</i>	10	4.7 %
Other	0	0.0 %



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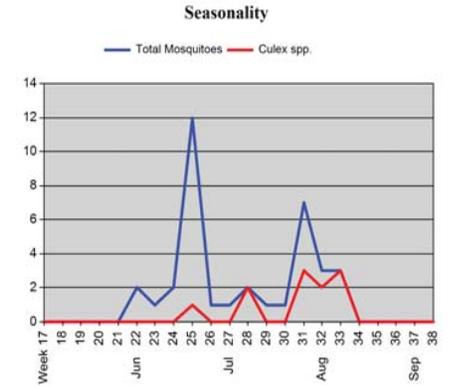
### GW-09: Glenwood Springs Cemetery

Season: 2011  
 Trap Type: Light/CO2  
 Location: Cemetery Road east of 12th St.  
 GPS: N39° 32.415', W107° 19.115'

Total number of trap/nights set: 14  
 Total number of mosquitoes collected: 34  
 Average mosquitoes per trap/night: 2  
 Average Culex per trap/night: 1

#### Species collected and abundance:

<i>Aedes (Oc.) spencerii idahoensis</i>	10	29.4 %
<i>Aedes vexans</i>	3	8.8 %
<i>Culex salinarius</i>	1	2.9 %
<i>Culex tarsalis</i>	10	29.4 %
<i>Culiseta incidens</i>	10	29.4 %



#### Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	13	38.2 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	11	32.4 %
<i>Culiseta</i>	10	29.4 %
Other	0	0.0 %



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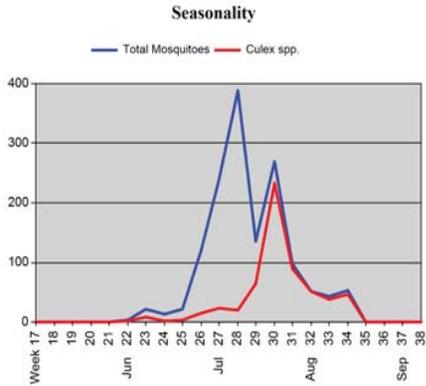
### NC-03: New Castle Elk Creek Elem. School

Season: 2011  
 Trap Type: Light/CO2  
 Location: in trees between Hwy. 6 and Elk Creek school lot  
 GPS: N39° 34.290', W107° 32.500'

Total number of trap/nights set: 14  
 Total number of mosquitoes collected: 1,458  
 Average mosquitoes per trap/night: 104  
 Average Culex per trap/night: 43

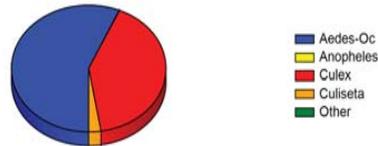
#### Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	1	0.1 %
<i>Aedes (Oc.) fitchii</i>	1	0.1 %
<i>Aedes (Oc.) incrinpitus</i>	56	3.8 %
<i>Aedes (Oc.) melaninon</i>	3	0.2 %
<i>Aedes (Oc.) spencerii idahoensis</i>	2	0.1 %
<i>Aedes (Oc.) trivitanus</i>	5	0.3 %
<i>Aedes cinereus</i>	14	1.0 %
<i>Aedes vexans</i>	741	50.8 %
<i>Anopheles hermsi</i>	1	0.1 %
<i>Culex salinarius</i>	551	37.8 %
<i>Culex tarsalis</i>	46	3.2 %
<i>Culiseta incidens</i>	21	1.4 %
<i>Culiseta inornata</i>	16	1.1 %



#### Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	823	56.4 %
<i>Anopheles</i>	1	0.1 %
<i>Culex</i>	597	40.9 %
<i>Culiseta</i>	37	2.5 %
Other	0	0.0 %



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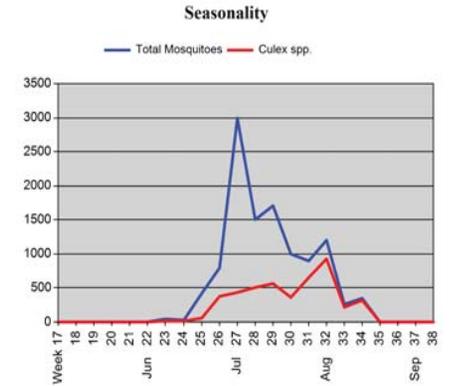
### PR-01: Parachute - Cottonwood Park

Season: 2011  
 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: 11,179  
 Average mosquitoes per trap/night: 860  
 Average Culex per trap/night: 340

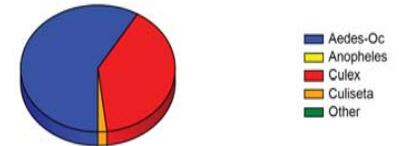
#### Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	89	0.8 %
<i>Aedes (Oc.) melaninon</i>	283	2.5 %
<i>Aedes (Oc.) nigromaculis</i>	1	0.0 %
<i>Aedes (Oc.) spencerii idahoensis</i>	28	0.3 %
<i>Aedes vexans</i>	6144	55.0 %
<i>Anopheles hermsi</i>	1	0.0 %
<i>Culex erythrothorax</i>	2179	19.5 %
<i>Culex pipiens</i>	180	1.6 %
<i>Culex salinarius</i>	318	2.8 %
<i>Culex tarsalis</i>	1748	15.6 %
<i>Culiseta inornata</i>	208	1.9 %



#### Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	6,545	58.5 %
<i>Anopheles</i>	1	0.0 %
<i>Culex</i>	4,425	39.6 %
<i>Culiseta</i>	208	1.9 %
Other	0	0.0 %



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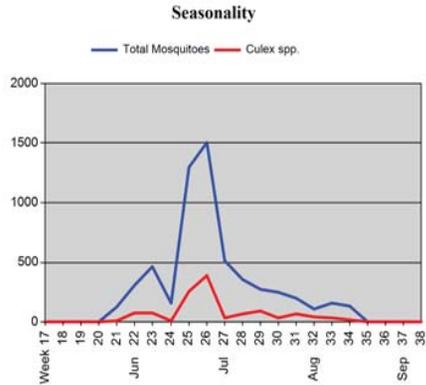
### RF-01: Rifle Lyons Park Rest Area

Season: 2011  
 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: 16  
 Total number of mosquitoes collected: 5,828  
 Average mosquitoes per trap/night: 364  
 Average Culex per trap/night: 74

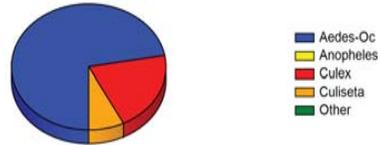
#### Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	735	12.6 %
<i>Aedes (Oc.) incripitus</i>	2	0.0 %
<i>Aedes (Oc.) melaninon</i>	295	5.1 %
<i>Aedes (Oc.) trivittatus</i>	4	0.1 %
<i>Aedes cinereus</i>	35	0.6 %
<i>Aedes vexans</i>	3133	53.8 %
<i>Culex pipiens</i>	3	0.1 %
<i>Culex salinarius</i>	79	1.4 %
<i>Culex tarsalis</i>	1110	19.0 %
<i>Culiseta inornata</i>	432	7.4 %



#### Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	4,204	72.1 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	1,192	20.5 %
<i>Culiseta</i>	432	7.4 %
Other	0	0.0 %



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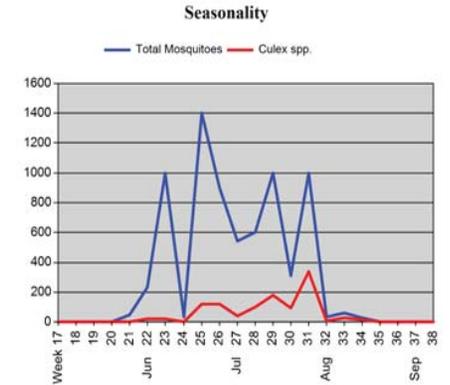
### RF-15: Rifle - Mile Pond Road

Season: 2011  
 Trap Type: Light/CO2  
 Location: pulloff 0.2 miles NE of Ardvark Storage Facility  
 GPS: N39° 32.140', W107° 45.345'

Total number of trap/nights set: 14  
 Total number of mosquitoes collected: 7,183  
 Average mosquitoes per trap/night: 513  
 Average Culex per trap/night: 77

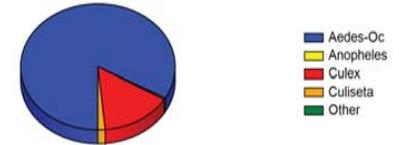
#### Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	208	2.9 %
<i>Aedes (Oc.) incripitus</i>	7	0.1 %
<i>Aedes (Oc.) melaninon</i>	284	4.0 %
<i>Aedes cinereus</i>	2	0.0 %
<i>Aedes vexans</i>	5473	76.2 %
<i>Anopheles hermsi</i>	27	0.4 %
<i>Culex salinarius</i>	56	0.8 %
<i>Culex tarsalis</i>	1018	14.2 %
<i>Culiseta inornata</i>	108	1.5 %



#### Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	5,974	83.2 %
<i>Anopheles</i>	27	0.4 %
<i>Culex</i>	1,074	15.0 %
<i>Culiseta</i>	108	1.5 %
Other	0	0.0 %



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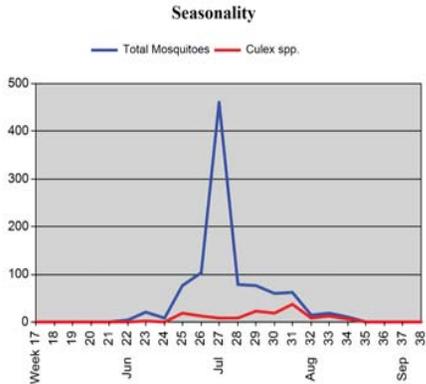
### RF-16: Rifle - Middle School

Season: 2011  
 Trap Type: Light/CO2  
 Location: NW of Rifle Middle School  
 GPS: N39° 32.140', W107° 47.150'

Total number of trap/nights set: 14  
 Total number of mosquitoes collected: 995  
 Average mosquitoes per trap/night: 71  
 Average Culex per trap/night: 11

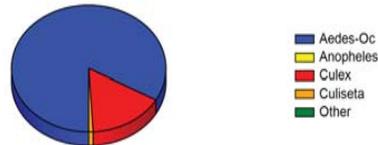
#### Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	19	1.9 %
<i>Aedes (Oc.) hendersoni</i>	2	0.2 %
<i>Aedes (Oc.) melaninon</i>	52	5.2 %
<i>Aedes (Oc.) nigromaculis</i>	1	0.1 %
<i>Aedes cinereus</i>	1	0.1 %
<i>Aedes vexans</i>	753	75.7 %
<i>Culex pipiens</i>	4	0.4 %
<i>Culex salinarius</i>	18	1.8 %
<i>Culex tarsalis</i>	136	13.7 %
<i>Culiseta inornata</i>	9	0.9 %



#### Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	828	83.2 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	158	15.9 %
<i>Culiseta</i>	9	0.9 %
Other	0	0.0 %



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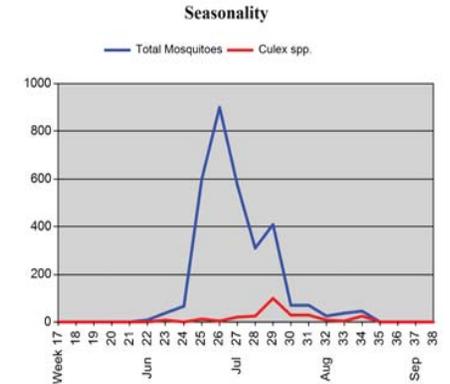
### SI-09: Silt Kum & Go

Season: 2011  
 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: 13  
 Total number of mosquitoes collected: 3,083  
 Average mosquitoes per trap/night: 237  
 Average Culex per trap/night: 19

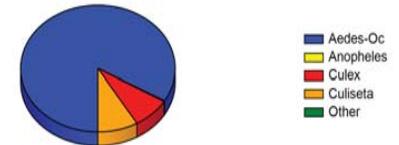
#### Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	91	3.0 %
<i>Aedes (Oc.) fitchii</i>	1	0.0 %
<i>Aedes (Oc.) incripitus</i>	75	2.4 %
<i>Aedes (Oc.) melaninon</i>	774	25.1 %
<i>Aedes (Oc.) spencerii idahoensis</i>	2	0.1 %
<i>Aedes cinereus</i>	103	3.3 %
<i>Aedes vexans</i>	1526	49.5 %
<i>Anopheles hermsi</i>	6	0.2 %
<i>Culex pipiens</i>	2	0.1 %
<i>Culex salinarius</i>	21	0.7 %
<i>Culex tarsalis</i>	222	7.2 %
<i>Culiseta inornata</i>	260	8.4 %



#### Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	2,575	83.5 %
<i>Anopheles</i>	6	0.2 %
<i>Culex</i>	245	7.9 %
<i>Culiseta</i>	260	8.4 %
Other	0	0.0 %



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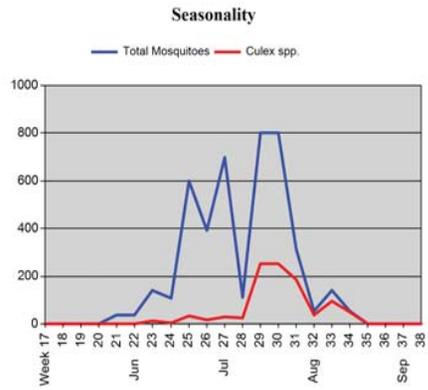
## SI-10: Silt Coal Ridge High School

**Season:** 2011  
**Trap Type:** Light/CO2  
**Location:** near retention pond 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:** 3,456  
**Average mosquitoes per trap/night:** 266  
**Average Culex per trap/night:** 57

### Species collected and abundance:

<i>Aedes (Oc.) dorsalis</i>	111	3.2 %
<i>Aedes (Oc.) inreptus</i>	109	3.2 %
<i>Aedes (Oc.) melanimon</i>	406	11.7 %
<i>Aedes cinereus</i>	2	0.1 %
<i>Aedes vexans</i>	2060	59.6 %
<i>Culex salinarius</i>	216	6.3 %
<i>Culex tarsalis</i>	523	15.1 %
<i>Culiseta inornata</i>	29	0.8 %



### Genus Proportions:

Genus	Number	Percent of Total
<i>Aedes/Ochlerotatus</i>	2,725	78.8 %
<i>Anopheles</i>	0	0.0 %
<i>Culex</i>	739	21.4 %
<i>Culiseta</i>	29	0.8 %
Other	0	0.0 %

