

R. Joe Simmons, Director

**Nancy M. Welch, MD, MHA, MBA,
Board of Commissioners, Chair**



Contributors:

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Kirby Foley, Operations Director

R. Joe Simmons, Director

Jason Pevear, GIS Analyst

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Janet Haley, Human Resources and Risk Manager

Chesapeake Mosquito Control Commission

Annual Report 2014

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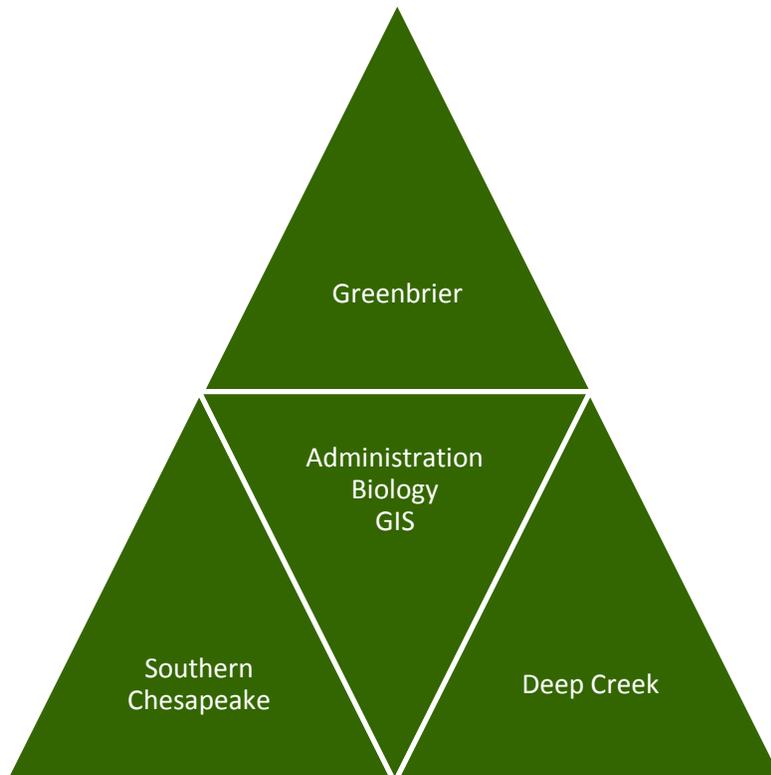
INTRODUCTION

The purpose of the Chesapeake Mosquito Control Commission is to conduct mosquito control activities in the City, as managed by a director who is appointed by a board of commissioners.

The Chesapeake Mosquito Control Board of Commissioners consists of six volunteer members who are residents appointed by the Chesapeake City Council; the seventh is a designee of the Virginia State Health Commissioner and serves as Commission Chair.

The goal of the Chesapeake Mosquito Control Commission is to reduce and control the mosquito populations using the safest and most effective means available. The ecologically based, integrated mosquito management (IMM) approach utilized relies heavily on natural mortality factors, using control tactics which disrupt the environment as little as possible. Adulticides are used during periods of mosquito-borne disease transmission or when source reduction and larval control have failed, or are not feasible. All control activities and decisions are based on surveillance.

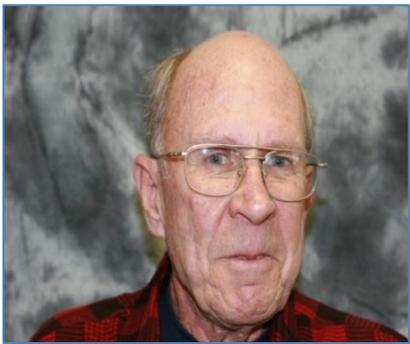
The Commission is made up of three service districts: Deep Creek, Greenbrier and Southern Chesapeake.



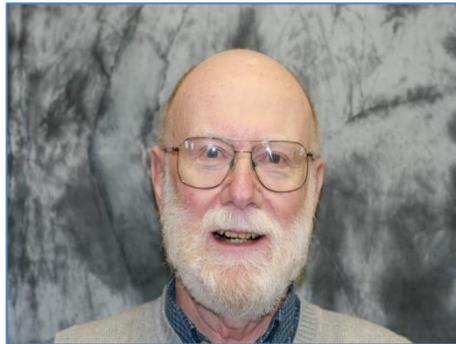
Board of Commissioners



Nancy Welch, MD, Chairperson



Joe Davis



William Hoddinott



Robert Mann, Vice Chairperson



James Sawyer



Cullen Darling



Janie Tompkins

Commission Staff



R. Joe Simmons, Director

Administration	Biology	Mechanics
Kirby Foley, Operations Director	Lisa Wagenbrenner, Biologist II	John Tyndell, Mechanic II
Amy Pippin, Fiscal & Office Administrator	Connie Gregg, Biology Technician	Michale Powell, Mechanic
Janet Haley, HR & Risk Manager	Sadye Steele, Seasonal Biology Technician	Randon Snyder, Mechanical Technician (Part-time)
Jason Pevear, GIS Analyst	Ryan Everton, Seasonal Biology Technician	
Deborah Vines, Office Specialist	Marina Vallad, Seasonal Biology Technician	
Tammy White, Office Support Specialist		
Roger Burnham, Custodian		

Deep Creek District	Greenbrier District	Southern District
Allen Peoples, District Supervisor	Robert Whitaker, District Supervisor	Leroy Bohn, District Supervisor
Patricia Scott, Field Supervisor	Steve Lemnios, Field Supervisor	Zollie Russell, Field Supervisor
Charles Darden, Applicator III	Mark Leary, Applicator III	Chris Gautier, Senior Applicator
Ronald Wells, Senior Applicator	Scott Stevens, Senior Applicator	Darin Brown, Senior Applicator
Martell White, Senior Applicator	Tameka Smith, Senior Applicator	Jerry George, Senior Applicator
Joseph Cato, Senior Applicator	Robyn Klaus, Field Tech I, (Part-Time)	Ronald Johnson, Senior Applicator
Shamsiddeen Ali, Applicator III	John Cole, Applicator III	Richard Jones, Senior Applicator
Kyle Lawrence, Field Tech I, (Part-Time)	Gary Harmon, Applicator II	Brandon Hupman, Applicator II
James Linkenhoker, Field Tech II, (Part-time)	Jack Akers Jr., Field Technician II	Patrick Solomon, Applicator III
Ed Lewis, Field Tech II, (part-time)		Fred Whitaker, Applicator II
		Ed Blakeman, Applicator I (Part-Time)

A "Bit" of History in Chesapeake, Virginia

The Chesapeake Mosquito Control Commission came into existence in 2003 through the consolidation of the five individual mosquito control commissions: Deep Creek, Great Bridge, South Norfolk, Washington Borough and Western Branch. The Norfolk County Board of Supervisors started three Commissions: the Deep Creek Commission was formed in 1948; the Washington Borough Commission in 1952; and the Western Branch Commission became official in January 1955.

Norfolk County became the City of Chesapeake in 1963 and in the 1960s, the Chesapeake City Council formed the Great Bridge and the South Norfolk Mosquito Control Commissions.

Mosquito Biology

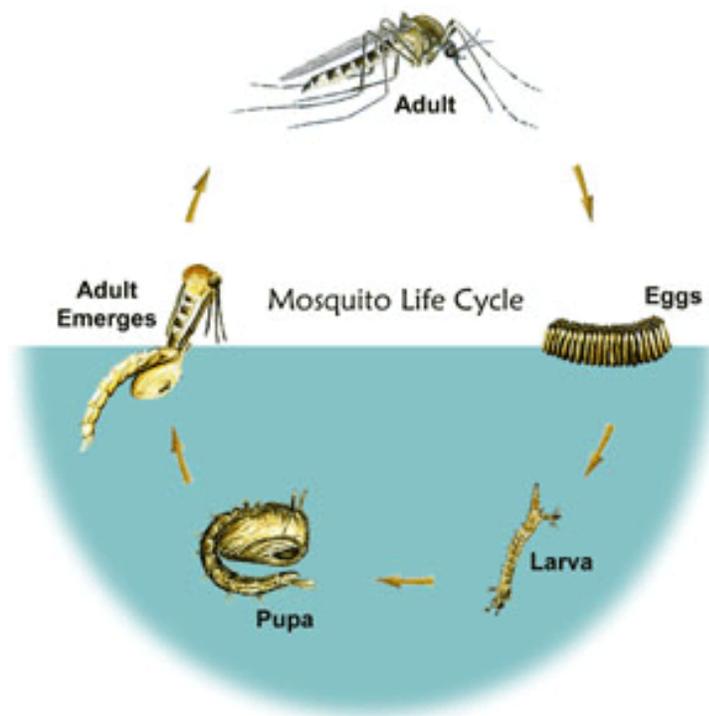
Mosquitoes are a part of the aquatic and the terrestrial food chains and are not just pests but also vectors of human and animal diseases.

A mosquito undergoes a complete metamorphosis by passing through four successive stages in its development: egg, larva, pupa and adult. Complete development can take as little as five days but normally takes ten to fourteen days, depending on the species and environmental conditions. With the exception of the adult, all stages require water to complete development.

After breeding, the adult female requires a blood meal for the development of viable eggs. The male mosquitoes feed on plant nectar and do not take blood meals. The adult female of some species lays her eggs in masses or “rafts” on the surface of the water. The other scenario involves mosquitoes that lay eggs on moist soil or other substrates in areas that will later be flooded with water. After two days these eggs are ready to hatch but, if not flooded, can withstand drying for months. Heavy rains and flooding can produce extremely huge mosquito populations in short periods of time.

The adult female of *Anopheles* and some *Culex* pass the winter in hibernation in protected places, whereas others over-winter in the egg or larval stage.

The flight habits of mosquitoes vary greatly with the different species. Some stay near their aquatic habitats, while others may wander from a half, one, five, up to fifty miles.



IMPORTANCE OF MOSQUITO CONTROL

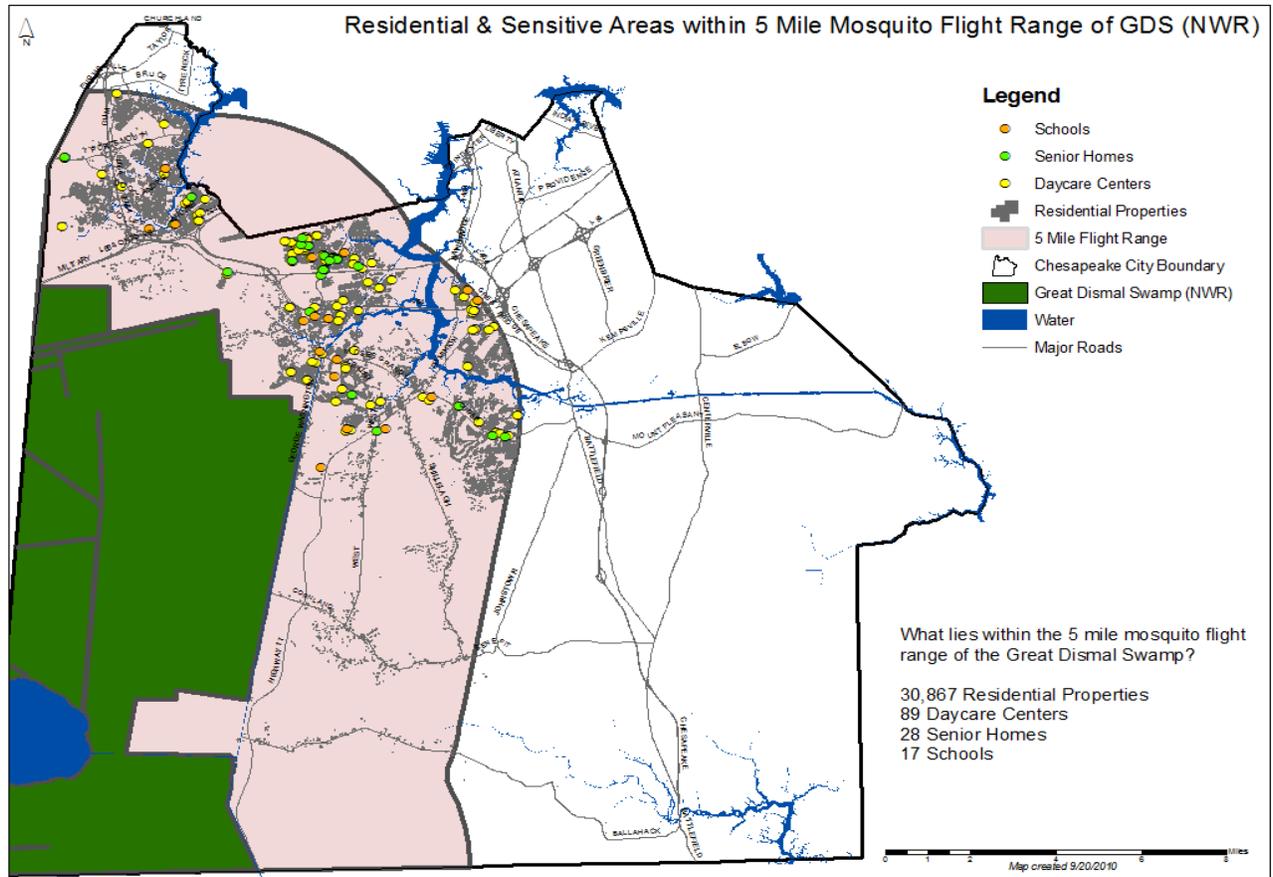
There are two main reasons why mosquito management is important: many mosquitoes can transmit pathogens to man and animals and mosquitoes can be a major annoyance.

Mosquito-borne diseases are among the world's leading causes of illness and death. The World Health Organization estimates that each year more than 300 million clinical cases are attributable to mosquito-borne illnesses. Malaria, dengue, encephalitis, yellow fever, filariasis and heartworm are mosquito-borne diseases yielding devastating effects throughout the world. Most of these diseases have been endemic and/or caused epidemics in the United States in the past. Today, only the arboviral encephalitides occur annually and dengue occurs periodically in the United States. The major types of viral encephalitis in the U.S. include St. Louis, LaCrosse, Eastern Equine, Western Equine and West Nile virus. These viruses are normally infections of birds or small mammals. During these infections, the level of the virus may increase in these infected animals facilitating transmission to humans by mosquitoes. Human cases of encephalitis may be mild to very severe illnesses and a few cases can be fatal. Dengue is a viral disease transmitted from person to person by mosquitoes. Most infections will cause mild illness but some can be severe and even cause death. Dengue is endemic in the Caribbean, Central and South America. Recently, dengue has occurred with increasing frequency in Texas and Florida. Other pathogens transmitted by mosquitoes include a protozoan parasite, which causes Malaria and *Dirofilaria immitis*. *Dirofilaria immitis* is a parasitic roundworm and that causes dog heartworm.

Mosquito-borne diseases also affect both wild and domestic animals. Unvaccinated horses and emus are highly susceptible to Eastern Equine Encephalitis. Death rates may reach 90% once encephalitis is contracted. Horses, a few small mammals and some birds are very susceptible to West Nile virus. Dog heartworm kills many domestic dogs each year. It is both preventable and treatable, although treatment is expensive and not always successful. The best option for dog owners is prevention.

The presence of mosquitoes can cause reductions in workforce efficiency and depreciation of real estate values. Mosquitoes can also interfere with outdoor activities and recreation.

The Chesapeake Mosquito Control Commission practices integrated mosquito management principals by employing the following techniques: public education, source reduction, surveillance, biological controls, larviciding and adulticiding. The proper philosophy of mosquito control is based on the fact that the greatest impact on mosquito populations will occur when they are concentrated, immobile and accessible. This emphasis focuses on habitat management and controlling the immature stages before the mosquitoes emerge as adults. This practice reduces the need for adulticiding applications.



Map of the City pinpointing sensitive areas such as schools, daycares and senior living, within a five-mile buffer zone of the Great Dismal Swamp.

Integrated Mosquito Management Techniques



Education

Extensive efforts are made to inform and educate the public about potential diseases related to mosquitoes and methods of mosquito control. Education is very important in controlling mosquito populations. A well-informed and alert resident can be as effective as a weekly property inspection by mosquito control personnel.

Public service announcements and ads are placed in news publications and on the radio. Some informative interviews with Commission personnel are conducted by news departments of local television stations.

Lisa Wagenbrenner and Connie Gregg spearhead the educational program and made presentations to 16 elementary schools with third grade classes, conducting presentations to 2,260 students. A Career day was conducted at one elementary school involving 175 students. The Biology Department also attended two science fairs and one 4-H group reaching another 143 students and parents.

Presentations are made to schools, clubs, or civic groups and are routinely made at state and regional mosquito control organizational conferences. Commission personnel are available for public speaking. The biology personnel assist with the annual state recertification classes each year, and are also very active in local, state and regional training.



Lisa Wagenbrenner, Biologist

Engaging students in mosquito control operations during a school career day



Connie Gregg, Biology Technician

Source Reduction

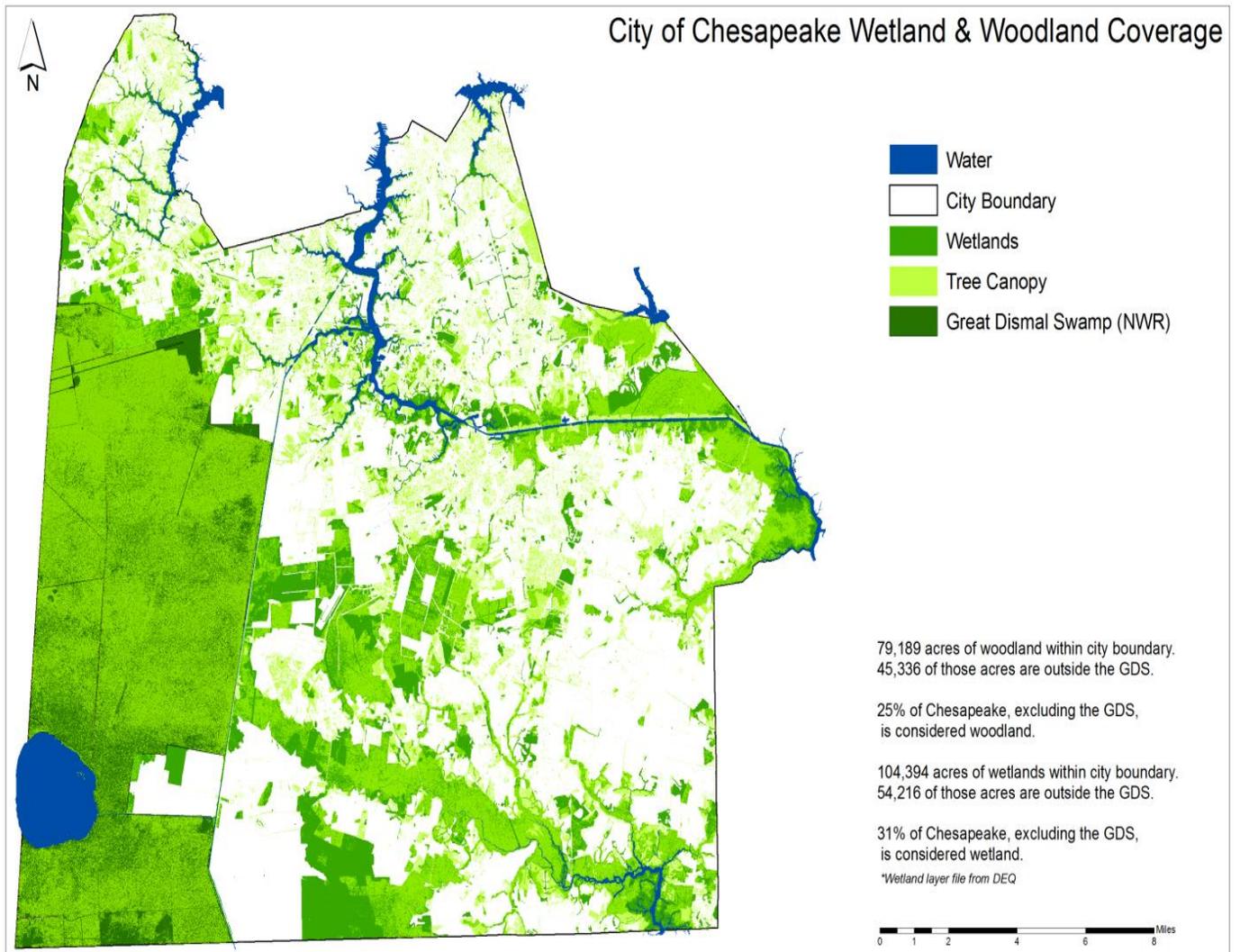
Effective mosquito control must include efforts to eliminate or reduce sources of mosquito breeding by eliminating, emptying or treating artificial containers that can become mosquito habitats. Mosquitoes reproduce in impounded and standing water; therefore, maintenance of drainage ditches is one of the Commission's primary concerns.

Source Reduction Activities Completed in 2014

	Deep Creek	Greenbrier	Southern	Citywide Totals
Weed-Eater	4.8 Acres	15.4 Acres	19.8 Acres	39.25 Acres
Bush-Hog	.02 Acres	17.4 Acres	0	17.4 Acres
Cleaning	13.3 Miles	9.8 Miles	16.4 Miles	39.6 Miles
Refuse Removal	5.1 Tons	18.4 Tons	22.5 Tons	45.27 Tons
Workforce Hours				10,204

Ditching Operations





The City of Chesapeake is unique because it has over 104,000 acres of wetlands within its boundary and 25% of the City, excluding the Great Dismal Swamp, is considered woodland.

Surveillance

Although surveillance is a primary concern of the Biology Department, it is conducted by a combined effort of the larviciding crews, field supervisors and the biology staff.

During breeding season, surveillance programs are conducted so that control activities can be concentrated in those areas with the most serious problems. Surveillance is also done to determine if any virus activity is present in the mosquito populations and in the Sentinel chickens.

The surveillance techniques used are: larval dipping surveys, trapping for adult mosquitoes, testing of mosquitoes, testing Sentinel chicken serum, and service requests from the public.

CDC, Gravid, and BG-Sentinel Traps

The Biology Department uses Centers for Disease Control (CDC) light traps, BG-Sentinel and Gravid Traps to survey the adult mosquito populations in Chesapeake.

CDC light trap is the primary method used to capture adult mosquitoes. The traps are set for over-night collection of mosquitoes and at least 40 of these traps are set each week throughout the City. CDC Light Traps utilize a battery powered light source to attract mosquitoes and are baited with CO₂ gas emitted from pressurized tanks as an additional attractant.

The BG-Sentinel is designed to use a special lure that contains lactic acid, ammonia and fatty acids like the human skin. Carbon dioxide is also used as an attractant with the lure. The BG trap is more effective in capturing the *Ae. albopictus* (Asian Tiger) mosquito. This species is our number one summertime nuisance mosquito and can generate numerous service calls.

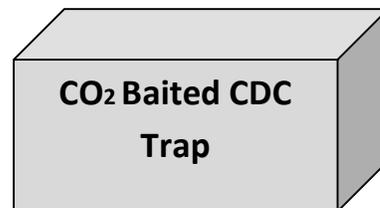
The presence of CO₂ gas widens the array of mosquitoes that are attracted and allows these traps to be effectively set to collect mosquitoes that are active during both daylight and evening hours.

BG and CDC traps complement each other and can be set in combination to determine which species are involved in a problem area.

The Gravid Trap is used to attract and capture female adult mosquitoes seeking water to lay their eggs. The attractant used is an infusion of hay, grass clippings, chicken feces, yeast and water that has been allowed to ferment. The primary target species are *Culex pipiens/restuans*. Typical habitat includes stagnant pools of ground water, artificial containers, catch basins and sewage seepage. Therefore, gravid traps are set in urban areas with high population densities where these habitats are found.

The mosquitoes are collected alive in the CDC, BG-Sentinel and Gravid traps by containing them in a net. Collecting the mosquitoes alive is necessary for viral detection. After paralyzing with a special chemical, the mosquitoes are separated by species and counted. Prominent disease carrying species are pooled for testing.

Examples of the Traps used for Adult Mosquito Capture





BIOLOGICAL REVIEW



The Biology Department started the year by completing the 2013 Annual Report, refurbishing and/or replacing equipment and preparing for the season. The third grade Mosquito Control Educational Program was conducted January through March at 16 Chesapeake Public schools.

Larval surveys were conducted during late March into early April to determine a timeline for an aerial larvicide application. The aerial contractor applied liquid *Bti* and liquid Altosid larvicides. Biology and operational staff worked 80 hours, and achieved excellent results.

An **average setting of 40 traps** was accomplished each week during the season, including CDC, Gravid, and BG-Sentinel traps in the three operational districts.

A new trapping schedule was implemented adding additional sites on a 3 week rotation. This allowed for better coverage of the City. Gravid traps were increased and lead to the finding of a record number of WNV positive *Cx. pipiens*. The biology personnel set 1087 baited traps capturing 220,408 mosquitoes that were identified to species and counted.

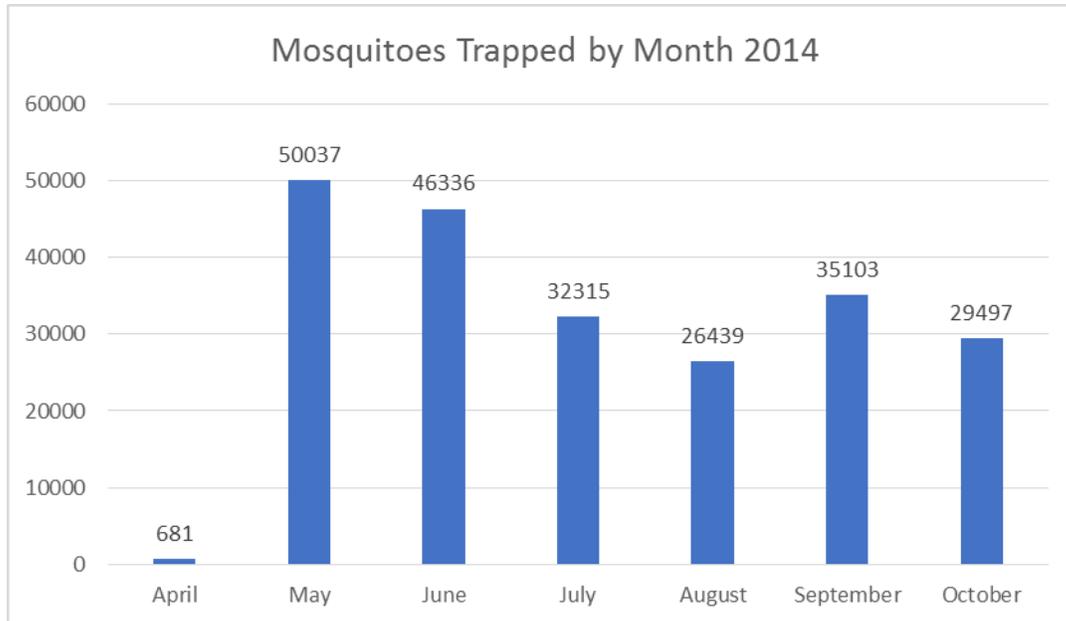
The Commission is a member of the Tidewater Regional Arboviral Surveillance Team (TRAST), a cooperative effort of the regional mosquito control agencies. TRAST is also in agreement with the Virginia Department of General Services, Division of Consolidated Laboratory Services (DCLS), in Richmond for the sentinel chicken testing from June until October.

The 2014 season was a slightly above average year for mosquito populations, with 44,857 more than last year. We had 3 inches more rain and it averaged .85 degrees warmer April through October, contributing to the slight increase in mosquitoes. The species known to be capable of transmitting Eastern Equine Encephalitis (EEE) and West Nile virus (WNV) were in-house tested using VECTOR™ tests to detect EEE and WNV. A total of 1,191 tests were completed totaling 52,561 mosquitoes tested. Twenty-two (22) mosquito pools tested positive for EEE and twenty-one (21) tested positive for WNV. Sixteen (16) of the WNV positives were *Cx. pipiens*, a first for Chesapeake! This is a significant find as *Cx. pipiens* are capable of transmitting WNV and feed on humans. There were **no confirmed human or horse cases**.



Mosquitoes Trapped by District in 2014

CHESAPEAKE CITY WIDE FOR YEAR 2014								
Overnight Low Temperature:				Avg / Trap		203		
DATE COLLECTED:	TRAPPING PERIOD: 4/11 to 10/30/			2014		Week		
District Supervisor:	Allen Peoples, Leroy Bohn, Bobby Whitaker							
BIOLOGIST:	Lisa Wagenbrenner							
TRAP LOCATION:	Deep Creek	Greenbrier	Southern	TOTAL:	PERCENT:			
				Totals				
DAYS TRAPPED:	372	0	366	0	349	0	0	1087
MALES (ALL SPECIES):	362	0	700	0	1816	0	0	2878
								1%
								0.00%
								0.00%
<i>Ae albopictus</i>	525	1300	394	2219	1.01%			
<i>Ae vexans</i>	1287	1342	1356	3985	1.81%			
<i>An crucians / bradleyi</i>	1779	4596	12338	18713	8.49%			
<i>An punctipennis</i>	108	69	461	638	0.29%			
<i>An quadrimaculatus</i>	193	131	1480	1804	0.82%			
<i>Cq perturbans</i>	6615	11729	21055	39399	17.88%			
<i>Cs inornata</i>	1	1	2	0.00%				
<i>Cs melanura</i>	68278	4539	26198	99015	44.92%			
<i>Cx erraticus</i>	885	1130	2345	4360	1.98%			
<i>Cx pipiens</i>	1782	4861	1417	8060	3.66%			
<i>Cx restuans</i>	143	104	125	372	0.17%			
<i>Cx salinarius</i>	3032	2912	2937	8881	4.03%			
<i>Cx territans</i>	7	14	78	99	0.04%			
<i>Oc atlanticus/tormentor</i>	2745	207	1443	4395	1.99%			
<i>Oc canadensis</i>	7969	1918	2439	12326	5.59%			
<i>Oc cantator</i>	1	6	7	0.00%				
<i>Oc fulvus pallens</i>		1	1	0.00%				
<i>Oc grossbecki</i>	1		1	0.00%				
<i>Oc hendersoni</i>	1	1	2	0.00%				
<i>Oc infirmatus</i>	533	540	551	1624	0.74%			
<i>Oc japonicus</i>	1		1	0.00%				
<i>Oc mitchellea</i>	1		1	2	0.00%			
<i>Oc sollicitans</i>		2	2	0.00%				
<i>Oc sticticus</i>	1	2	2	5	0.00%			
<i>Oc taeniorhynchus</i>	3	8	1	12	0.01%			
<i>Oc triseriatus</i>	52	49	73	174	0.08%			
<i>Or signifera</i>	13	12	12	37	0.02%			
<i>Ps ciliata</i>	25	2	17	44	0.02%			
<i>Ps columbiae</i>	1348	172	1865	3385	1.54%			
<i>Ps ferox</i>	3582	1109	2623	7314	3.32%			
<i>Ps howardii</i>	65	29	86	180	0.08%			
<i>Tox rutilus sept</i>		1	1	0.00%				
<i>Ur sapphirina</i>	30	31	409	470	0.21%			
								0.00%
TOTAL FEMALES:	101006	36818	79706	217530	98.69%			
TOTAL MOSQUITOES:	101368	37518	81522	220408	100.00%			
Both EEE & WNV Vectors								
EEE Primary & Bridge Vectors								
WNV Primary & Bridge Vectors	46%	17%	37%					



CHESAPEAKE WEATHER 2014

Jan.-March 3.37 rain averaged 2.56° Cooler

MONTH	Normal Rainfall	2014 Rainfall	+ or -- Difference	Normal Average Temp.	2014 Season Temp.	+ or -- Difference
April	3.41	4.87	1.46	58.20°	58.00°	0.20°
May	3.41	4.64	1.23	66.60°	69.60°	3.00°
June	4.26	1.91	2.35	75.30°	76.60°	1.30°
July	5.14	7.87	2.73	79.60°	78.60°	1.00°
August	5.52	3.01	2.51	77.90°	77.00°	0.90°
Sept.	4.76	9.17	4.41	72.30°	73.80°	1.50°
October	3.42	1.57	1.85	62.10°	64.30°	2.20°
Totals:	29.92	33.04	3.12	70.28°	71.13°	0.85°

Sentinel Chickens



The purpose of the Sentinel chicken program is to get an early warning of an active presence of the West Nile virus and/or Eastern Equine Encephalitis virus. The use of chickens has proven to be very effective and true sentinels over the years.

Ten (10) flocks of three chickens each were strategically placed throughout the City. Biology staff drew blood samples from chickens each week. This serum was tested for Eastern Equine Encephalitis (“EEE”) and West Nile virus (“WNV”) by the DCLS in Richmond. There were 14 conversions for EEE and ten (10) for WNV. Eight out of the ten locations had positive chickens.



Taking a Serum Sample from a Chicken



Service Request Data for 2014

Type	Greenbrier	Southern	Deep Creek	Citywide
Mosquito	592	679	989	2,260
Ditches Need Cleaning	22	46	56	124
Special Fogging	102	147	178	427
Standing Water	33	32	39	104
Property Release	2	22	7	31
Other	5	21	16	42
Total:	756	947	1,285	2,988

Larviciding

Larviciding is the act of controlling mosquito larvae and pupae in the water by the application of *Bacillus thuringiensis israelensis (Bti)*. It is harmless to fish and other aquatic organisms. Larviciding is one of the most important activities of the Commission staff during the breeding season. Inspections performed throughout the City identify those areas where breeding occurs and, when found, an appropriate larvicide technique is employed according to the area and/or stage of breeding found. In addition to the aerial larviciding, 3,342 acres were treated by hand, All-Terrain Vehicles and roadside vehicles. **In 2014, a total of 12,196 acres were larvicided.**

Aerial Larviciding

Chesapeake Mosquito Control Commission contracts with Kritter Cropdusting, Inc. to conduct aerial larviciding. On April 9-12, 2014 8,854 acres were treated with larvicide by helicopter. Biology and operational staff worked 80 hours to assist in these aerial operations to perform calibrations and help ensure successful application of the larvicide.

2014 Larviciding Totals

	Deep Creek	Greenbrier	Southern	Citywide	Aerial	Totals
ACRES LARVICIDED	1,055	856	1,431	3,342	8,854	12,196
PERSONNEL HOURS	7,319	5,813	8,001	21,134	80	21,214
AVG WORKFORCE HOUR PER ACRE	6.94	6.79	5.59	6.32	0	1.74

Larviciding Application Techniques



Backpack Sprayer



All-Terrain Vehicle (ATV)



Roadside Vehicle

Adulticiding

During mosquito control season, it is impossible to find and larvicide all breeding sites. In addition, mosquitoes migrate into control areas from adjacent non-controlled areas. The Commission performs adulticiding as needed.

Adulticiding is the act of operating a machine to uniformly disperse small amounts of pesticide over a target area to control adult mosquitoes. This is achieved by using various forms of ultra-low-volume (ULV) spraying equipment.

The City, excluding the Great Dismal Swamp Wildlife Refuge, is divided into approximately 30 truck routes and 15 ATV routes. Additional adulticiding, special fog requests and individual yards are treated by ULV backpack or hand-held sprayers, as needed or requested.

The rainfall and temperatures in 2014 were normal, resulting in average larviciding and adulticiding.

2014 Adulticiding Totals

	Deep Creek	Greenbrier	Southern	Aerial	Citywide
ACRES ADULTICIDING	149,114	95,367	190,751	0	435,232
PERSONNEL HOURS	1,367	1,057	981	0	3,405
AVG ACRE/HOUR	109	90	194	0	128

Adulticiding Application Techniques



Backpack Application



Hand Held Sprayer Application



Thermo Fogger Application



Application by Truck



Application by Helicopter



Application by ATV

FINANCIAL OVERVIEW

CITY OF CHESAPEAKE, VIRGINIA 2014 COMPREHENSIVE ANNUAL FINANCIAL REPORT

Statement of Revenues, Expenditures, and Changes in Fund Balance
Chesapeake Mosquito Control Commission
Year Ended June 30, 2014

REVENUES

Property taxes*	\$ 3,902,508
Investment income	9,860
Other	128,852
Total revenues	4,041,220

EXPENDITURES

Other salaries and wages	1,794,701
Other fringe benefits	710,962
Other repairs and supplies	572,247
Other post-employment benefits	98,535
Insurance premiums	274,753
Capital outlay	120,647
Other	346,507
Total expenditures	3,918,352
Excess of revenues over expenditures	122,868
Fund balance – beginning	\$ 4,507,681
Fund balance – ending	\$ 4,630,549

Reconciliation to Change in Net Assets:

Governmental funds report capital outlay as expenditures. However, when reporting net assets, the cost of those assets is allocated over their estimated useful lives and reported as depreciation expense.

Net change in fund balance	\$ 122,868
Depreciation expense	(186,118)
Loss on disposal	(34,581)
Capital outlay expenditures	<u>120,647</u>
Change in Net Position	<u>\$ 22,816</u>

**The City finances the operations of the Commission through incremental property taxes of \$.01 per \$100 of assessed value for real estate properties and \$.08 per \$100 of assessed value for personal property.*