COLORADO
Department of Public Health & Environment

Colorado West Nile Virus Report

Final Summary 2014

West Nile Virus Surveillance

West Nile virus has continued to impact Colorado residents since its introduction in 2002. Because human cases are often reported weeks after the time of infection, mosquito surveillance has been essential in accurately assessing West Nile Virus to determine the human transmission risk and to implement control and prevention strategies.

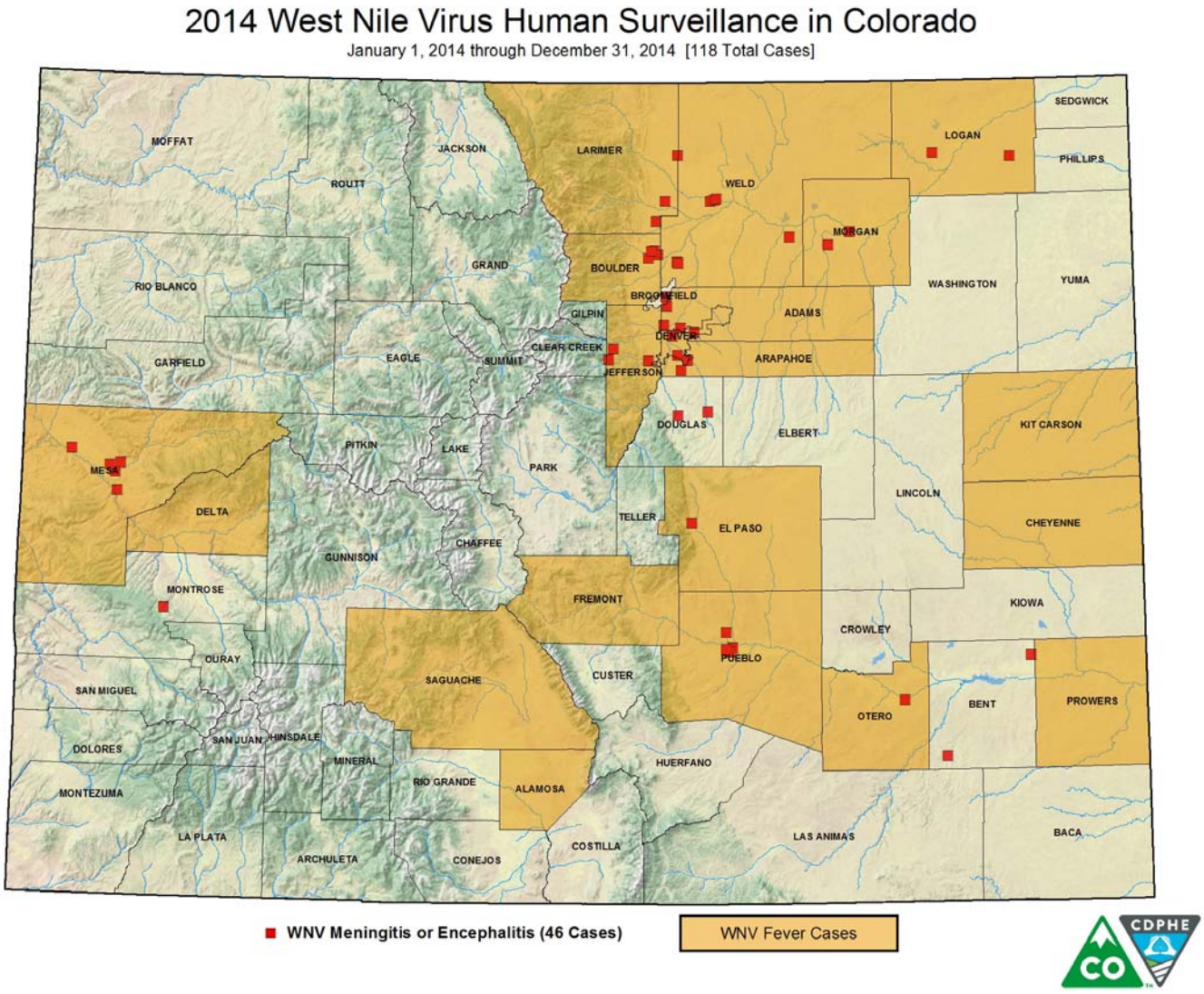
West Nile Virus Human Infections

In 2014, a total of 118 cases of human West Nile Virus (WNV) infection were identified in Colorado from 24 different counties (Table 1). The majority of cases are uncomplicated fever (61%); 28 (24%) were meningitis, and 18 (15%) were encephalitis. Four deaths were reported during the 2014 season from Alamosa (1), Denver (2) and Pueblo (1) counties.

Table 1

	Clinical Diagnosis			Total Cases	Total Deaths
County of Residence	**Fever**	**Meningitis**	**Encephalitis**		
Adams	2	1	2	5	
Alamosa	1			1	1
Arapahoe	3	1		4	
Bent		2		2	
Boulder	7	4		11	
Broomfield			1	1	
Cheyenne	1			1	
Delta	3			3	
Denver	1	2	2	5	2
Douglas		2		2	
El Paso	1		1	2	
Fremont	2			2	
Jefferson	1	2	1	4	
Kit Carson	1			1	
Larimer	15	3		18	
Logan	2	1	1	4	
Mesa	2	4	1	7	
Montrose		1		1	
Morgan	1	1	1	3	
Otero		2		2	
Prowers	6			6	
Pueblo	2	2	3	7	1
Saguache	1			1	
Weld	19	1	5	25	
TOTAL	72	28	18	118	4

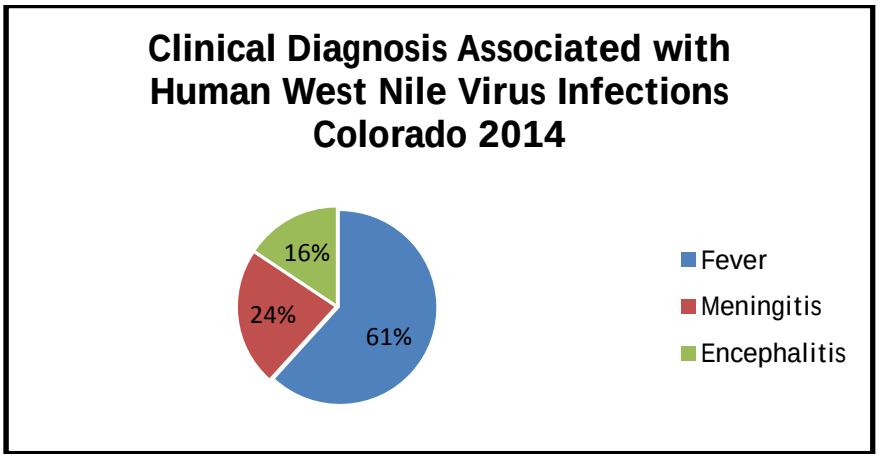
Image 1



Clinical Diagnosis Associated with Human West Nile Virus Infections

The diagnosis of WNV is based on clinical suspicion and WNV testing. Testing is conducted at the state health department lab and most commercial labs. Clinical disease ranges from mild febrile illness to severe encephalitis. However, most WNV infections (80%) are asymptomatic. For the purpose of surveillance and reporting, based on their clinical presentation, West Nile virus is categorized into two primary groups: neuroinvasive disease (meningitis or encephalitis) and non-neuroinvasive disease (fever). Of the 118 cases identified in 2014, 46 (39%) were neuroinvasive. CDC estimates that for every case of neuroinvasive disease identified there are 30 to 70 cases of “uncomplicated” fever (some are identified but most are not). Based on these calculations there were an estimated 1,380 to 3,220 cases of uncomplicated fever in Colorado during the 2014 season, yet only 72 cases were reported.

Figure 1



West Nile Virus by Age Group & Gender

All persons are at risk of being infected with WNV but those over the age of 50 or with weakened immune systems are at greater risk of developing serious illness. Persons over the age of 50 account for 71 (60%) of all cases identified during the 2014 season (Figure 3). The 50-59 year age group was the largest proportion of this with 29 (25%) cases. Four WNV deaths were reported during the 2014 season from Alamosa (1), Denver (2) and Pueblo (1) counties. All four deaths were in persons over the age of 50 with underlying health conditions.

Figure 2

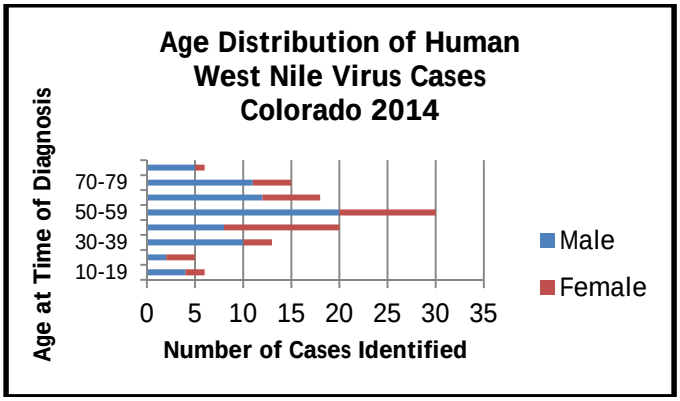
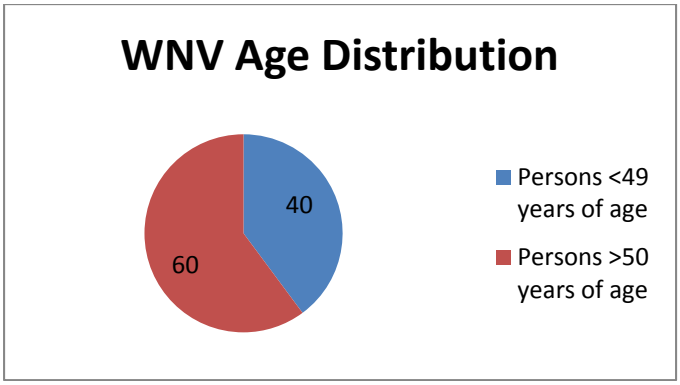


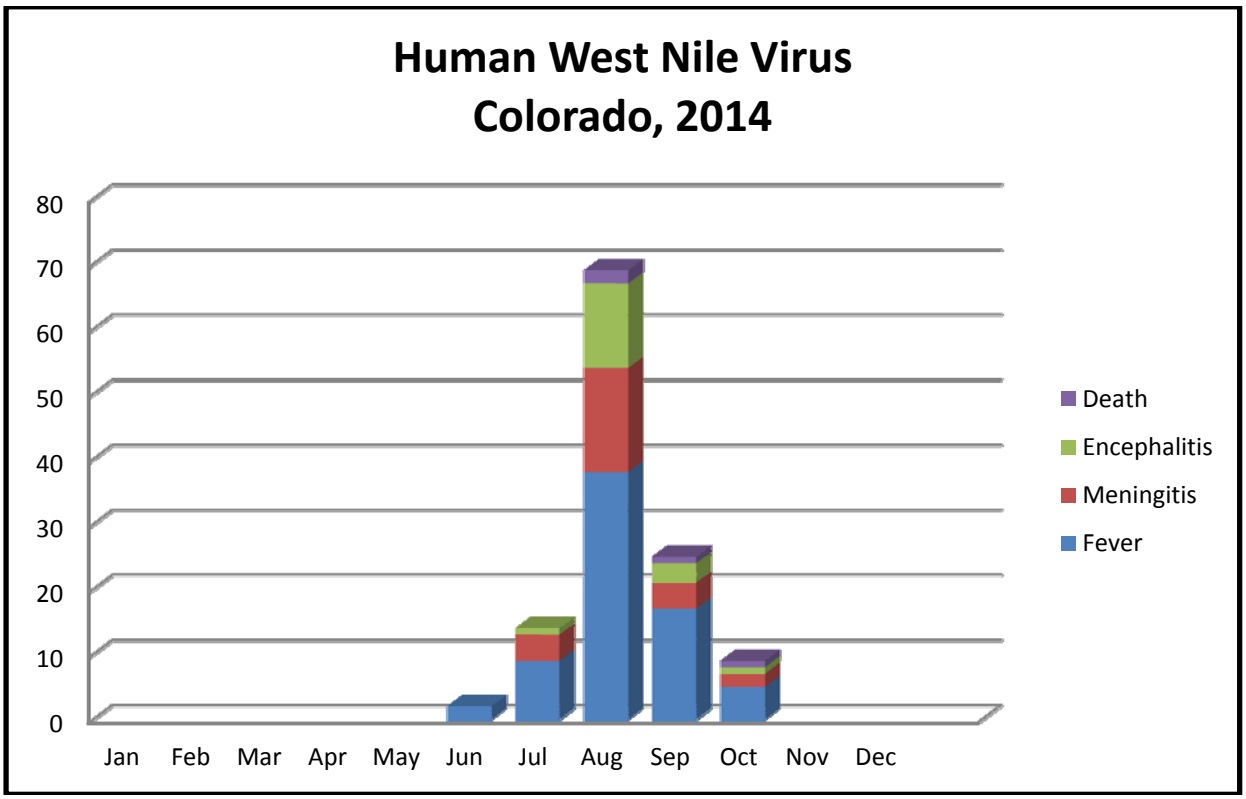
Figure 3



Human West Nile Virus Infections by Month of Onset

In Colorado, WNV human cases can be identified as early as May and as late as December of each year with the vast majority of cases identified in August and September (Figure 4). The majority of patients will be exposed to WNV during the warm summer months via the bite of an infected mosquito. However, other modes of WNV transmission have been described: organ transplant, receipt of blood products, breastfeeding and intrauterine transmission. These modes of transmission are expected to occur infrequently.

Figure 4



Colorado Identified Infections and Susceptibility

CDC estimates that only 20% of people who are infected with WNV will develop symptomatic infections, leaving the remaining 80% of infections asymptomatic. It is also estimated that for every case of neuroinvasive disease reported there are 30 to 70 cases of uncomplicated fever (some are identified but most are not).

Based on this arboviral math (using Colorado data from 2002-2014) 165,750 to 386,750 Coloradoans have been infected with West Nile virus and 33,150 to 77,350 (20%) have developed symptoms, yet only 5,117 cases have been reported (4,012 uncomplicated fever, 667 meningitis, and 438 encephalitis). Meaning that at least 92% of the population are still susceptible to infection (plus new births which are not counted).

West Nile Virus Seasonal Fluctuation

The number of human cases of WNV (and other vector-borne diseases) fluctuates every season because WNV is transmitted by insects and the weather influences the numbers of insects we have in the environment. Temperature, humidity, and rainfall thus influence the amount of disease we will see season-to-season.

Image 5

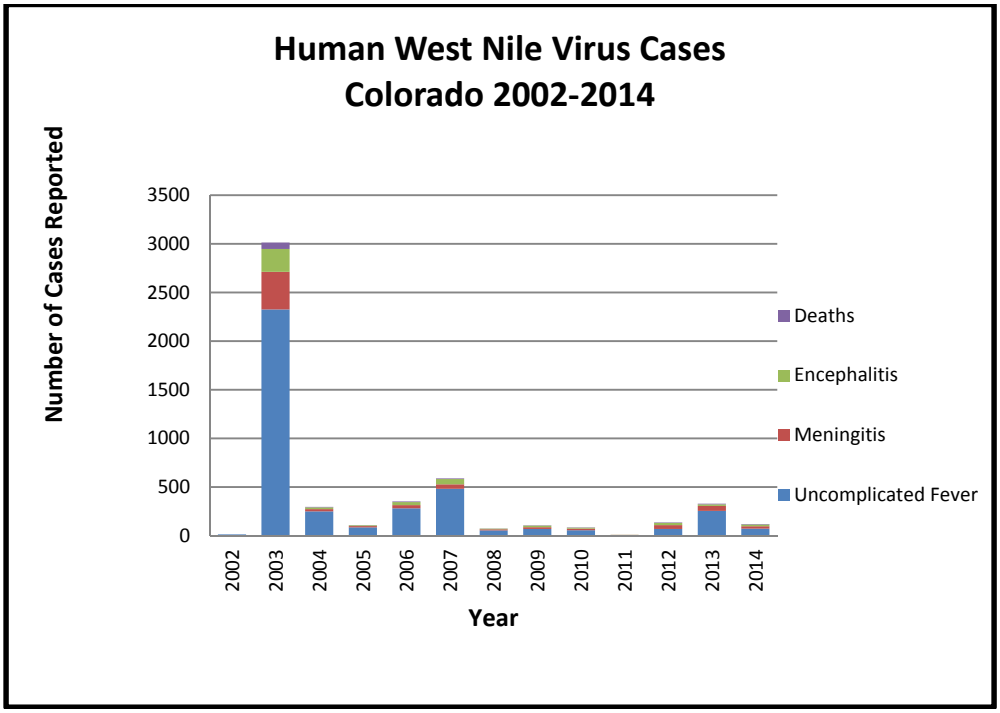


Table 2

Year	Fever	Neuroinvasive Meningitis & Encephalitis		Total Cases	Deaths
2002	13	0	0	13	0
2003	2325	388	234	2947	66
2004	250	22	19	291	4
2005	85	13	8	106	2
2006	280	34	31	345	7
2007	482	45	55	582	7
2008	54	11	6	71	1
2009	68	18	17	103	3
2010	55	17	9	81	4
2011	5	1	1	7	0
2012	69	39	23	131	5
2013	254	51	17	322	7
2014	72	28	18	118	4

Mosquito Surveillance for West Nile virus

West Nile virus mosquito surveillance runs June through August of each year. Mosquitoes are captured in traps set out overnight. The traps catch a sample of the mosquitoes flying around in an area. Many species of mosquitoes are caught in traps, but only *Culex* species mosquitoes are tested for WNV.

Table 3

Number of mosquito pools tested for WNV in 2014

Counties	Negative	Positive	Total
Adams	45	9	54
Arapahoe	23	2	25
Boulder	115	16	131
Delta	29	19	48
Denver	4	1	5
Jefferson	14	2	16
Larimer	1402	70	1472
Mesa	72	6	78
Pueblo	55	6	61
Weld	258	64	322
Total	2017	195	2212

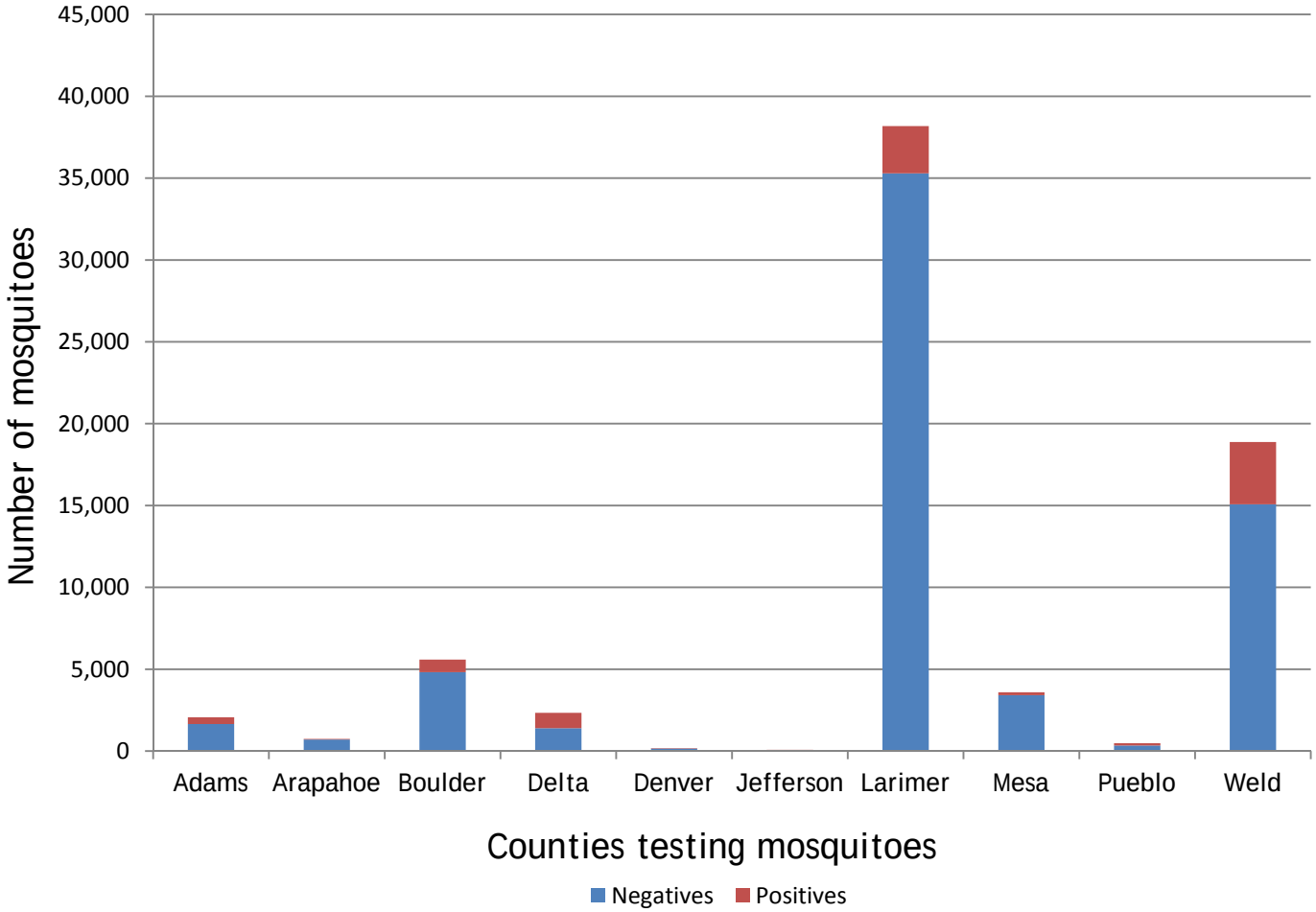
Local health departments calculate a value called the vector index from their mosquito surveillance data. The vector index is a human health risk value obtained from combining

1) the number of captured mosquitoes and
2) an estimate of the number of infected mosquitoes in the population.

The vector index is used to predict human risk for WNV disease transmission in an area. A vector index (VI) of 0.5 indicates some risk of local WNV activity. A VI = 0.75 means risk is increasing and disease prevention efforts are recommended. A value of the vector index greater than 0.75 indicates intense local transmission of the virus, and may signal the beginning of an epidemic of human disease.

Local public health officials report county level risk information to their residents throughout the season, so residents should check their health department's website for the most up to date information on WNV risk in their area.

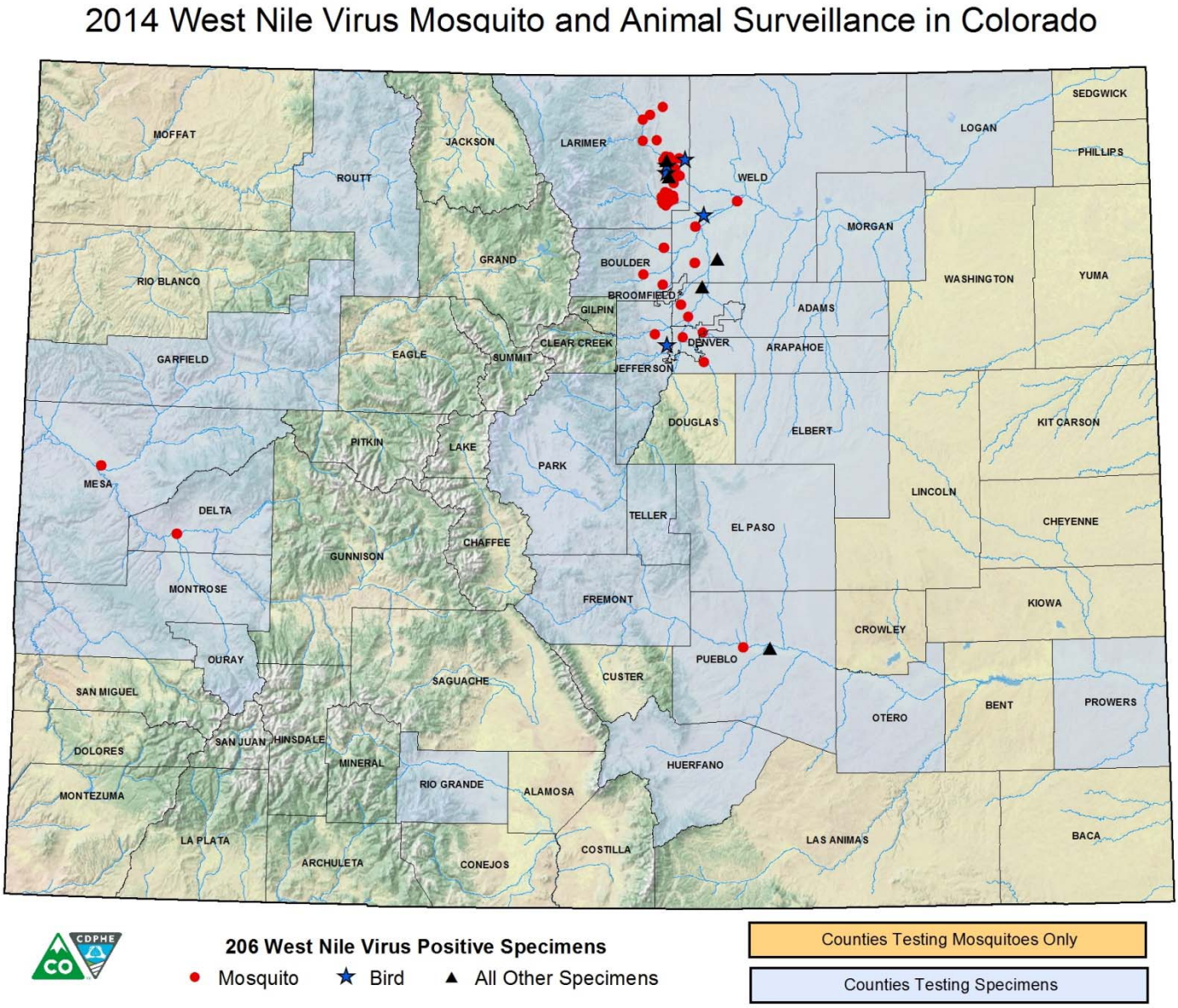
Only a few mosquitoes in the population will be infected with WNV. The graph below shows how many mosquitoes tested positive for WNV in each county out of all the captured mosquitoes. Nonetheless, the relatively few WNV positive mosquitoes that were out there did bite people and transmit WNV to them.



Not all counties in Colorado collect and test mosquitoes for WNV, but mosquitoes can be found everywhere in Colorado. Mosquitoes in your area may carry WNV. It is best to assume you have some risk for WNV if you have mosquitoes. Since mosquitoes can fly it is also not safe to think that only areas that have positive mosquitoes might be risky.

Mosquitoes usually die after freezing temperatures are reached in an area. However, some may find shelter and come out on warm days. If you live in an area that has had WNV positive mosquitoes continue to use repellent products as long as you see mosquitoes. In Colorado we have seen cases of WNV in people who were bitten by a mosquito as early as April, or as late as October.

In Colorado horses and birds can also be tested for WNV. The map below shows which counties have tested mosquitoes, horses, or birds for WNV, and whether they were positive.



West Nile virus Disease Prevention and Mosquito Control

One public health response to increasing risk for human WNV disease is to do mosquito control in threatened communities. A variety of products are available to control mosquitoes in the environment. If you are interested in learning about mosquito control larvicides, adulticides, synergists, and repellents you should visit the National Pesticide Information Center's website. For more information on WNV and mosquitoes you may visit the CDC's website.