2018 WEST NILE VIRUS SUMMARY REPORT
UTAH DEPARTMENT OF HEALTH

Report Purpose

The purpose of this document is to provide Utah West Nile virus (WNV) partners a concise summary of this season's major results. Information displayed in this report has been compiled by the Utah Department of Health (UDOH), but reflects information obtained from concerted joint efforts. All activities related to WNV during the 2018 season involved major contributions from many different agencies. These include as follows: blood banks of Utah, local health departments (LHDs), Utah Department of Agriculture and Food (UDAF), Utah Division of Wildlife Resources (UDWR), Utah Mosquito Abatement Association (UMAA), the Utah Public Health Laboratory (UPHL), and the Utah Veterinary Diagnostic Laboratory (UVDL). In addition to the direct contribution of surveillance data, these agencies were also involved in systematic planning and preparation for the 2018 season. The intent of this report is to document the results of the efforts put forth by these entities during the 2018 WNV season.

Note: *This report describes the general trends that occurred during the 2018 season. Specific surveillance counts may be subject to change as data continue to be reconciled.*

Introduction

During the summer of 2018, WNV reemerged in Utah at below average levels when compared with the previous five years. WNV activity has been detected in Utah for 15 years. WNV is transmitted by mosquitoes. Birds are the natural host of the disease with humans and horses serving as accidental hosts. The majority of people infected with WNV never develop symptoms. A small percentage of infected individuals will display West Nile fever symptoms (i.e. fever, headache, and body aches). A more serious form of the disease, West Nile neuroinvasive illness, may also occur when the virus infects the central nervous system. People with this form of the disease experience high fever, severe headache, neck stiffness, and mental confusion. Hospitalization is often required and death is possible.

WNV Surveillance in Utah

Surveillance for WNV activity involves several different components. Since the disease is zoonotic in nature, both human and animal surveillance occurs. In past years, WNV surveillance in Utah involved human, mosquito, wild bird, horse, and sentinel chicken populations. Due to the involvement of these different populations, surveillance efforts this season enlisted the expertise and abilities of many different agencies. Budget constraints limited surveillance for the 2018 season. To ensure the most critical surveillance systems were maintained, wild bird testing, sentinel chicken testing, and official coordinated equine

testing efforts at UDAF were eliminated from routine surveillance. Local mosquito abatement districts (MADs) and tribal abatement districts, in conjunction with the Utah Mosquito Abatement Association, performed necessary trapping and identification for mosquito surveillance. Confirmatory testing of mosquito pools was conducted at UPHL. Health care providers across the state submitted human samples to both UPHL and private laboratories such as ARUP (Associated Regional and University Pathologists). The three major blood banks serving Utah (American Red Cross, ARUP, and Mountain Star) coordinated screening of donated blood for identification of viremic donors. All LHDs in Utah were involved with disseminating, investigating, and responding to surveillance data indicative of local WNV activity.

2018 Season National Highlights

West Nile virus neuroinvasive disease incidence maps present data reported by state and local health departments to CDC's ArboNET surveillance system. Figure 1 shows the states reporting WNV activity. Figure 2 shows the rate of human neuroinvasive disease (e.g., meningitis, encephalitis, or acute flaccid paralysis) by state for 2018.

Figure 1: West Nile Activity by State - United States, 2018 (as of November 13, 2018)

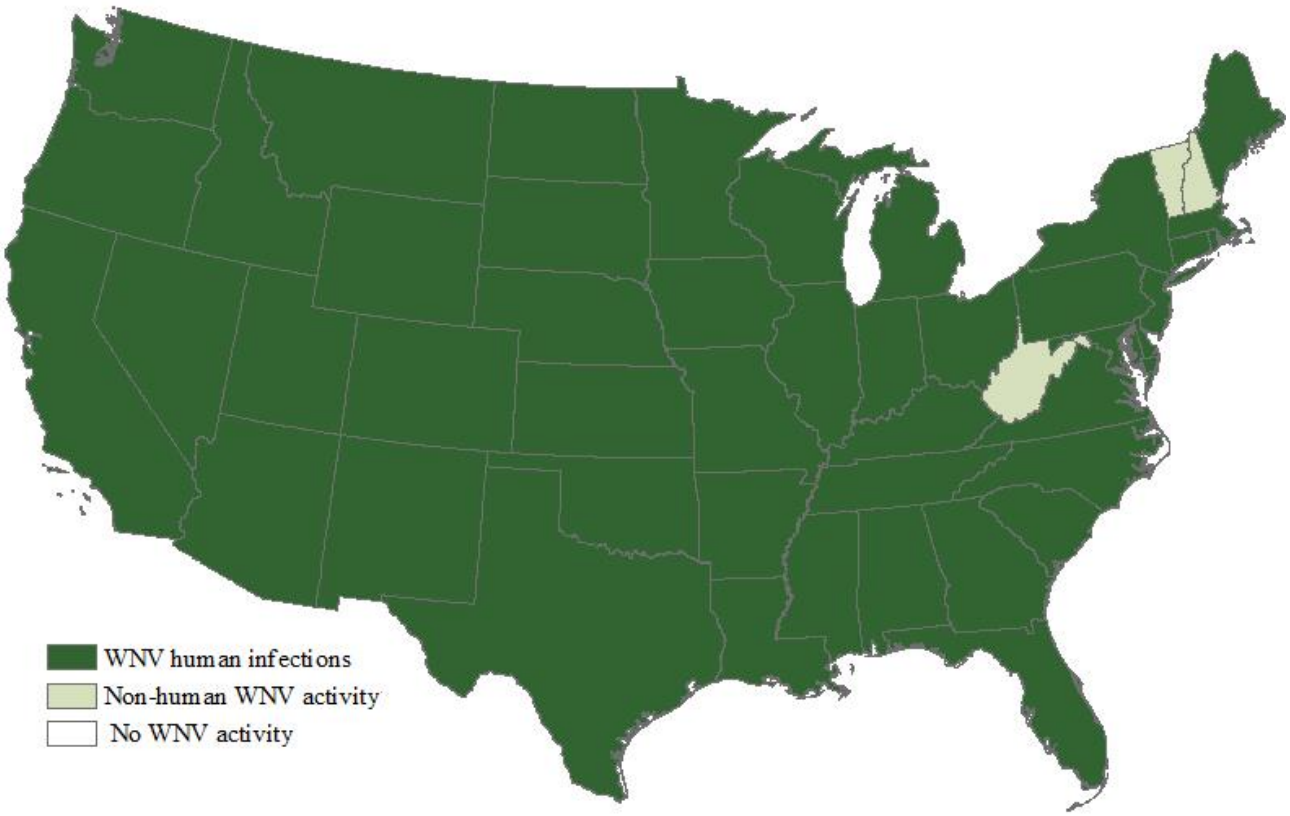
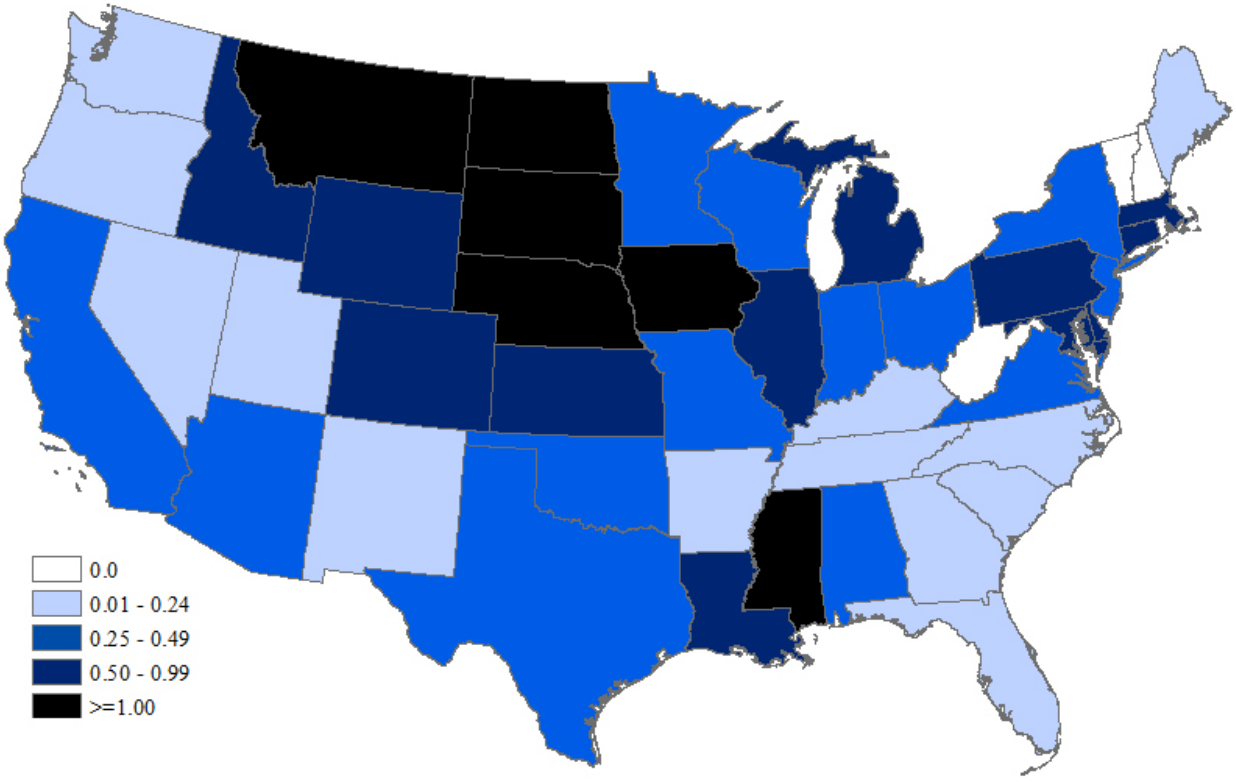


Figure 2: West Nile Virus Neuroinvasive Disease Incidence by State -- United States 2018 (as of November 13, 2018)



This map shows the incidence of human West Nile virus neuroinvasive disease (e.g., meningitis, encephalitis, or acute flaccid paralysis) by state for 2018 with shading ranging from 0.01-0.24, 0.25-0.49, 0.50-0.99, and greater than, or equal to, 1.00 case per 100,000 population.

Neuroinvasive disease cases were reported to ArboNET from the following states for 2018: Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah,Virginia, Washington, Wisconsin and Wyoming.

For 2018, of the 2,204 human cases reported to CDC, 1,342 (61%) were reported as West Nile meningitis or encephalitis (neuroinvasive disease) and 862 (39%) were reported as West Nile fever (milder disease). In comparison, 1,921 human cases were reported to CDC in 2017, with 1,276 (67%) reported as West Nile meningitis or encephalitis (neuroinvasive disease), and 642 (34%) reported as West Nile fever (milder disease). A total of 102 fatalities were reported in 2018, compared with 115 fatalities reported in 2017.

2018 Season Utah Highlights

Activity during the 2018 WNV season in Utah was below the five-year average for human and animal infection, as shown in Figure 3. Mosquito activity occurred in the highest numbers in Salt Lake, Uintah, Davis, Cache, Box Elder and Tooele counties. Sixteen

counties reported WNV activity during the 2018 season. Only PCR positive mosquito pools were included in surveillance data. Individual RAMP tests without PCR confirmation were not included. Many mosquito abatement districts (MADs) have started conducting their own PCR testing at their respective locations. Surveillance data from MADs whose testing was validated by UPHL are included in UDOH surveillance data throughout the mosquito season.

Table 1: WNV activity, Utah 2018 (positive counts only)

Total West Nile Virus Positive Samples: Utah 2018				
County of Residence	**Human**	**Horse**	**Mosquito**	**Total**
Beaver	-	-	-	-
Box Elder	2	-	28	30
Cache	-	2	15	17
Carbon	-	-	-	-
Daggett	-	-	-	-
Davis	-	-	22	22
Duchesne	1	1	4	6
Emery	-	-	-	-
Garfield	-	-	-	-
Grand	1	-	-	1
Iron	-	-	-	-
Juab	-	-	-	-
Kane	-	1	-	1
Millard	-	-	-	-
Morgan	-	-	-	-
Piute	-	-	-	-
Rich	-	-	-	-
Salt Lake	5	1	86	92
San Juan	-	-	-	-
Sanpete	-	-	-	-
Sevier	-	-	-	-
Summit	-	-	-	-
Tooele	-	1	8	9
Uintah	1	-	15	16
Utah	1	-	-	1
Wasatch	-	-	-	-
Washington	-	-	-	-
Wayne	-	-	-	-
Weber	-	-	2	2
Hill Air Force Base	-	-	-	-
State Total	**11**	**6**	**180**	**197**

Human Cases of WNV: Utah 2018					
Age Group	**Total**	**% Total**	**Fever**	**Death**	**Neuroinvasive**
<18	0	0%	2	-	-
18-39	1	9%	5	-	-
40-64	6	55%	11	-	4
≥65	4	36%	6	1	3
State Total	**11**	**100%**	**24**	**1**	**7**

*The state did not conduct sentinel chicken surveillance in 2018. However, some counties still maintained sentinel chicken flocks.

Past Season Comparison

WNV activity was first detected in Utah in 2003. Similar to many initial seasons in other states, activity was muted. Only one human case was reported during the 2003 season in Utah, in addition to an asymptomatic viremic donor. WNV illness detected in horses was the main indication of WNV presence in the state in 2003. WNV became firmly established in Utah in 2004 with significant activity in northern Utah along the Wasatch Front. During 2005, activity expanded into more northern regions of the state. Utah and Uintah counties served as focal points for detected activity.

Thus far, the 2006 season was the most active season we have experienced in Utah. During this season, WNV activity was focused along the Wasatch Front, particularly in Salt Lake and Utah counties. With an increase in activity, there was also an increase in fatalities, with five deaths reported. In 2007, the number of cases (as well as the number of deaths) began to decline. During this season, the virus moved farther north with the bulk of cases reported in Cache and Box Elder counties.

WNV activity continued to decrease from 2008–2011. Due to inconsistencies with RAMP testing, mosquito pools were counted if they were confirmed by PCR. This led to a decrease in the number of positive mosquito pools detected throughout the state. The southwestern portion of Utah saw the most animal (mosquito) activity for the 2010–2012 seasons.

In 2013, Washington County, in the southwest portion of the state, saw the majority of activity, both human and animal. From 2014–2016, WNV activity was centered mostly along the Wasatch Front, but was also seen in Box Elder, Grand, and Weber counties.

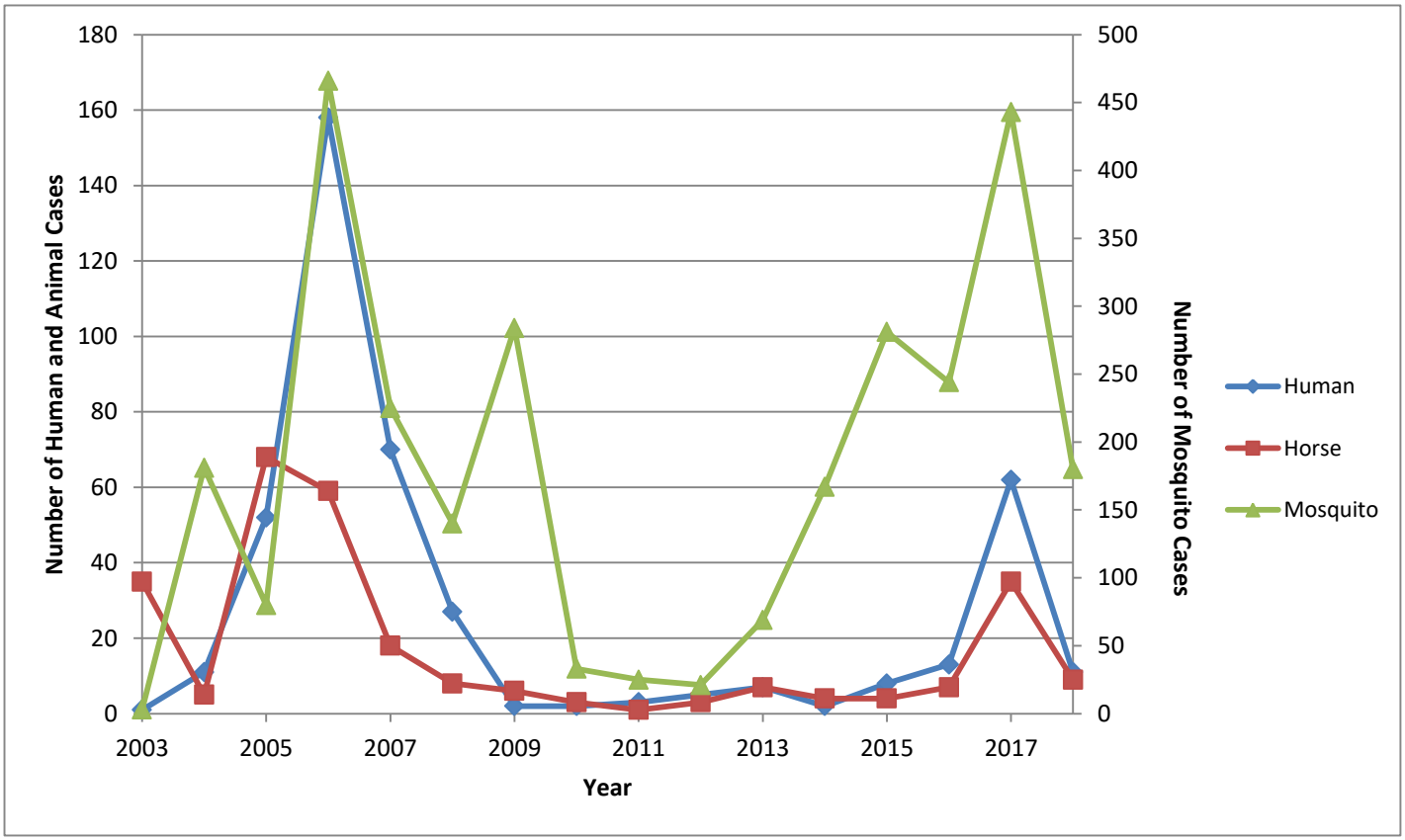
In 2017, Utah saw a dramatic increase in WNV activity, with the largest number of human and animal infections, along with the greatest number of positive mosquito pools, in more than ten years.

Table 2: WNV season comparison, Utah 2008–2018

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Human	27	2	2	3	5	7	2	8	13	62	11
Horse	8	6	3	1	3	7	4	4	7	35	6
Bird*	3	0	0	0	0	40	2	-	-	3	4
Chicken*	16	1	1	0	1	2	1	4	-	-	-
Mosquito Pools	140	284	31	23	21	69	167	281	244	443	180
Counties with Detection	14	12	5	6	8	9	9	8	8	17	16

*Wild bird and sentinel chickens were not part of Utah's active surveillance in 2011–2013. However, the large increase in bird activity was due to an eared grebe and bald eagle die-off in October 2013–January 2014.

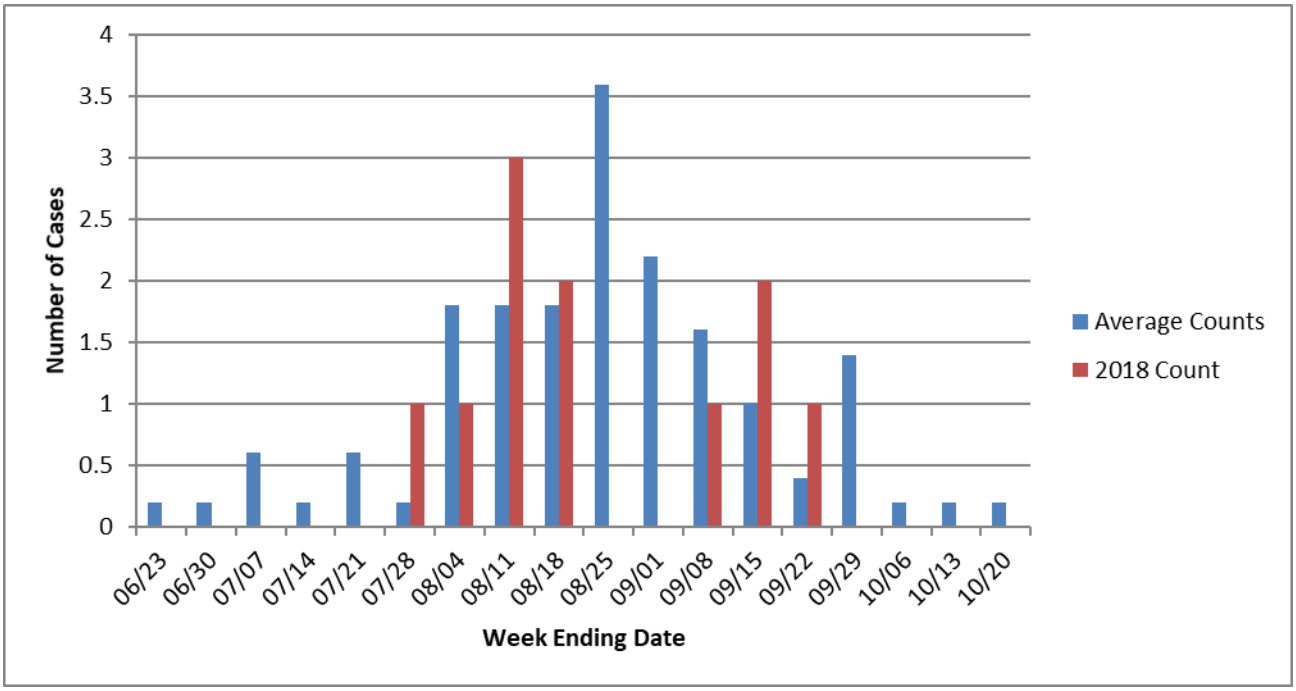
Figure 3: WNV Positive Cases from 2003-2018



2018 Utah Activity Timeline

In 2018, WNV activity appeared in Utah during the beginning of July. Mosquito activity was first detected in mosquito pools during the week of July 9, 2018, in Box Elder, Davis, and Duchesne counties. Activity was detected throughout the summer and into October, with WNV activity detected in horses, humans, and mosquitoes by August. Utah's first human case was reported on August 2, 2018, as shown in Figure 4. Active surveillance for the 2018 season ceased in the middle of October. However, testing of suspect human and horse cases continues year-round. Average counts for comparison were calculated from human case data reported between the years 2013 and 2017.

Figure 4: WNV Human Epidemiologic Curve by Week



Human Surveillance

Human surveillance relies primarily on reporting of results indicative of acute infection from major laboratories. LHDs were immediately notified of positive lab results and conducted case investigations. Specimens were sent to CDC for confirmation on the first two human cases, fatal suspect cases, and abnormal test results.

Additionally, major blood banks serving Utah screen donations for the presence of WNV and report positive results to UDOH. However, no blood donation screening tests were positive for WNV in 2018.

Table 3: WNV clinical comparison of human cases, Utah vs United States, 2018

	Utah	United States
Number of cases	11	2,544
Fatalities (% fatal)	1 (9.1%)	137 (5.4%)
Neuroinvasive Disease (percent neuroinvasive)	7 (64%)	1,594 (63%)

Table 4: Clinical and demographic characteristics of human cases, Utah 2008–2018

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Number of cases	27	2	2	3	5	7	2	8	13	62	11
Fatalities	0	0	0	0	1	0	0	0	1	5	1
Percent Male	79%	50%	100%	66%	60%	57%	100%	75%	54%	70%	64%
Median Age (years)	41	NA*	NA*	NA*	70	61	NA*	55	60	61	49
Age Range (years)	4-79	NA*	NA*	NA*	22-87	20-85	NA*	18-90	18-90	14-86	32-88

*Not available: data suppressed due to small number of reported cases in this year

Table 5: Utah WNV human case clinical and demographic characteristics, compared with surrounding states, 2018

Utah in comparison to surrounding states, as reported to CDC ArboNet, 2018							
	Neuroinvasive disease cases		Non-neuroinvasive disease cases		Total cases	Deaths	
State	**Number**	**Percentage (%)**	**Number**	**Percentage (%)**	**Number**	**Number**	**Percentage (%)**
Arizona	86	83	18	17	104	8	8
Colorado	28	42	38	58	66	4	6
Idaho	14	61	9	39	23	0	0
Montana	3	27	8	73	11	0	0
New Mexico	21	70	9	30	30	1	3
Utah	38	62	23	38	61	4	7
Wyoming	4	57	3	43	7	0	0

Mosquito Surveillance

Mosquito abatement districts (MADs) and tribal mosquito abatement districts across the state perform the primary function of trapping mosquitoes at various locations throughout the state. Trapped mosquitoes are identified and sorted into “pools” of 50–100 mosquitoes based on species. Some MADs conduct their own PCR testing which is verified by a UPHL proficiency panel. Other MADs ship their mosquito pools to UPHL for testing by PCR. All PCR tests are reported to UDOH and included in surveillance measures. RAMP tests without PCR confirmation are also reported to UDOH; however, they are not included in weekly surveillance measures.

Horse surveillance

Surveillance of equine disease related to WNV infection in Utah is coordinated by the UDAF. Veterinarians across the state were encouraged to submit samples from suspect equine cases to the UVDL-Logan for testing. Results of these serum tests were reported by UDAF to UDOH with appropriate notification occurring for positive cases. The majority of samples submitted for testing were from domestic, privately owned horses with symptoms indicative of infection and no history of vaccination. Disease awareness among veterinarians and horse owners was increased through distribution of pamphlets and periodic updates using the Utah Veterinary Alert Listserv. UDAF also maintains an interactive map showing positive equine cases across the state. https://www.arcgis.com/home/webmap/viewer.html?webmap=a5a404efda6b43e4b265c2cebe5bdeee&extent=-119.0804,35.0043,-101.744,43.0138

Wild bird surveillance

Due to budget constraints, routine wild bird surveillance was not conducted in 2018. However, WNV positive reports of a common raven from Kane County, a barn owl and a red-tailed hawk in Salt Lake County, and a red-tailed hawk in Utah County, were received.

Sentinel chicken surveillance

Due to budget constraints, routine sentinel chicken surveillance was not conducted in 2018.

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