WEST NILE VIRUS SUMMARY REPORT 2013 SEASON
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 2013 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 2013 season. The intent of this report is to document the results of the efforts put forth by these entities during the 2013 WNV season.

Note: *The purpose of this report is to describe general trends that occurred during the 2013 season. Specific surveillance counts may be subject to change as data continues to be reconciled for the season.*

Introduction to WNV

During the summer of 2013, WNV reemerged in Utah. This was the eleventh year WNV activity was detected in Utah. WNV is a disease transmitted by mosquitoes. Birds are the natural hosts 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 will have high fevers, severe headaches, neck stiffness, and mental confusion. Hospitalization may be required and death is possible.

Introduction to WNV Surveillance in Utah

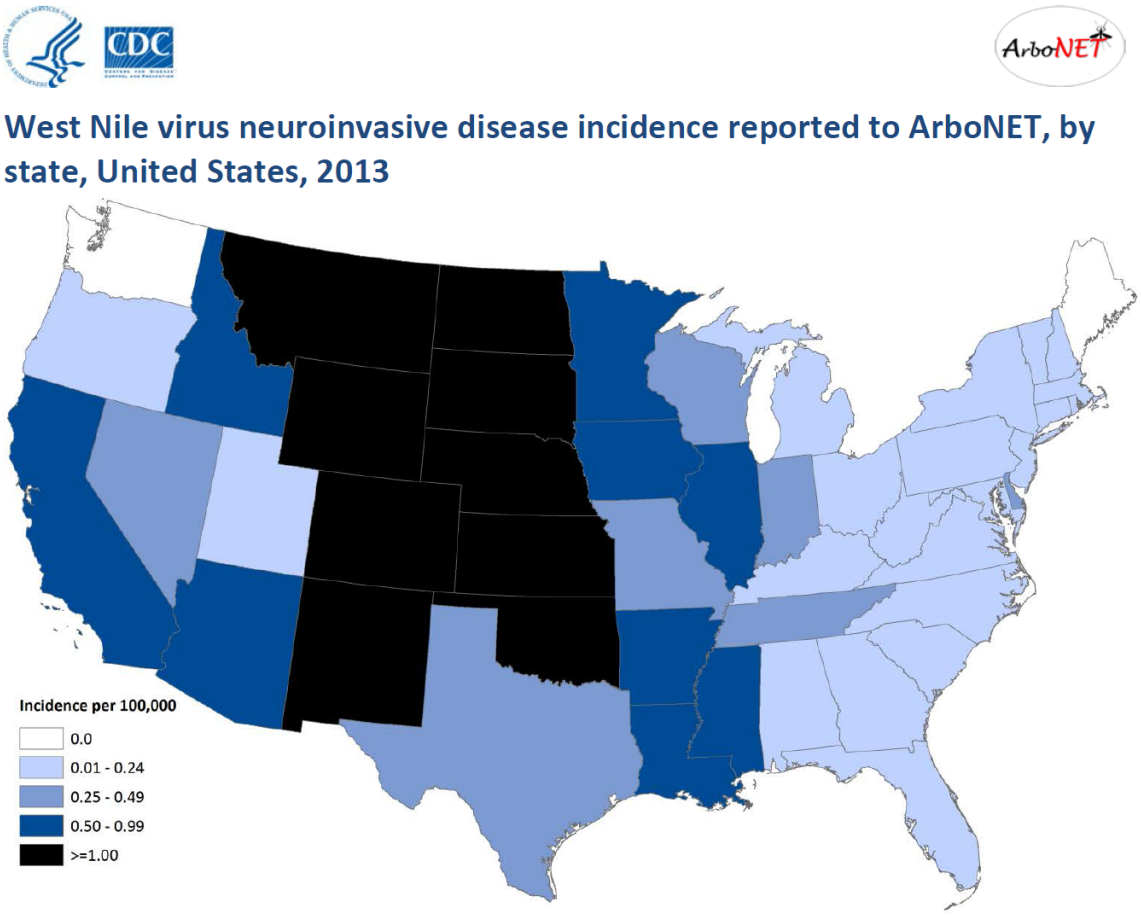
Surveillance for WNV activity involves several different components. Since the disease is zoonotic in nature, both human and animal surveillance occurs. In past years, WNV surveillance in Utah involved human, mosquito, wild bird, horse, and sentinel chicken populations. Due to the involvement of these different populations, surveillance efforts this season enlisted the expertise and abilities of many different agencies. Budget constraints again limited surveillance for the 2013 season, and in order to keep more critical surveillance running, wild bird testing, sentinel chicken testing and official coordinated equine testing efforts at UDAF were again eliminated from routine surveillance. Local mosquito abatement districts (MADs), in conjunction with the UMAA, performed necessary trapping and identification for mosquito surveillance. Confirmation of these mosquitoes occurred at the UPHL. Major health care providers submitted human samples across the state with testing occurring at both the UPHL and private laboratories such as ARUP (Associated Regional and University Pathologists). The three major blood banks servicing 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.

2013 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 incidence of human neuroinvasive disease (i.e., meningitis, encephalitis, or acute flaccid paralysis) by state for 2012 ranging from 0.01-0.24, 0.25-0.49, 0.50-0.99, and greater than 1.00 per 100,000 population.

Figure 1



Source: ArboNET, Arboviral Diseases Branch, Centers for Disease Control and Prevention

West Nile virus neuroinvasive disease incidence maps present data reported by state and local health departments to CDC's ArboNET surveillance system. This map shows the incidence of human neuroinvasive disease (e.g., meningitis, encephalitis, or acute flaccid paralysis) by state for 2013 with shading ranging from 0.01-0.24, 0.25-0.49, 0.50-0.99, and greater than 1.00 per 100,000 population.

Neuroinvasive disease cases have been reported to ArboNET from the following states for 2013: Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, West Virginia, Wisconsin and Wyoming.

Nationally, 2013 was a milder season than 2012. For 2013, of the 2,374 human cases reported to CDC, 1,205 (51%) were reported as West Nile meningitis or encephalitis (neuroinvasive disease), and 1,169 (49%) were reported as West Nile fever (milder disease); as opposed to 5,674 total human cases in 2012 with 2,873 (51%) as West Nile meningitis or encephalitis and 2,801 (49%) reported as West Nile fever. A total of 114 cases were fatal in 2013 as opposed to 286 fatalities in 2012.

2013 Season Utah Highlights

Activity during the 2013 WNV season in Utah was higher than the 2012 season. The vast majority of activity occurred in the Southwest portion of the state, with sporadic cases in other areas of the state. A total of nine counties had activity detected during the 2013 season compared with eight counties in 2012. For 2013, all RAMP tests for mosquitoes were confirmed by PCR at UPHL.

A major development occurred regarding bald eagles and eared grebes late along the Great Salt Lake in 2013. This event involved between 15,000-20,000 eared grebes (*Podiceps nigricollis*) and 76 bald eagles (*Haliaeetus leucocephalus*).

Mortality in eared grebes was first reported in early November, but could have occurred as early as October. During this period of the mortality event the area was unseasonably warm and mosquito transmission could have been likely. Millions of eared grebes traditionally gather on the Great Salt Lake and begin staging for late season winter migration during this period. Thirty eared grebes collected from November to the end of January were WNV RT-PCR and/or isolation positive. This is the first reported occurrence of WNV infection in eared grebes. Although early morbidity and mortality may have begun with mosquito transmission we are not able to determine with a surety that all grebes were infected through this route; some may have become infected through contact with WNV shed orally or cloacally from other infected grebes. Beginning in early December, bald eagles were observed to display neurological symptoms, tremors, limb paralysis, and lethargy or they were found dead. At least 86 bald eagles had died by the end of February and another 4 were placed in rehabilitation centers. WNV was isolated from 9 of 9 bald eagles, 43 of 45 eared grebes and 11 of 14 additional bald eagles were positive for WNV by RT-PCR. The majority of bald eagles affected or found dead occurred during a period when temperatures dropped below freezing and mosquito transmission was not likely. This suggests that many of the bald eagles were infected with WNV via consumption of infected eared grebes or their carcasses or possibly through lateral transmission from contaminated fomites at roost sites.

Table 1: WNV activity, Utah 2013 (positive counts only)

Total West Nile Virus Positive Samples: Utah 2013					
County of Residence	**Human**	**Chicken***	**Horse**	**Mosquito**	**Total**
Beaver	0	0	0	0	0
Box Elder	0	0	2	7	9
Cache	0	0	0	1	1
Carbon	0	0	0	0	0
Daggett	0	0	0	0	0
Davis	0	2	0	0	2
Duchesne	0	0	0	0	0
Emery	0	0	0	0	0
Garfield	0	0	0	0	0
Grand	0	0	0	0	0
Iron	0	0	0	0	0
Juab	0	0	1	0	1
Kane	0	0	0	0	0
Millard	0	0	0	0	0
Morgan	0	0	0	0	0
Piute	0	0	0	0	0
Rich	0	0	0	0	0
Salt Lake	1	0	0	0	1
San Juan	0	0	0	0	0
Sanpete	0	0	0	0	0
Sevier	0	0	0	0	0
Summit	0	0	0	0	0
Tooele	0	0	0	0	0
Uintah	0	0	0	6	6
Utah	0	0	0	2	2
Wasatch	0	0	0	0	0
Washington	4	0	4	53	61
Wayne	0	0	0	0	0
Weber	2	0	0	0	2
State Total	***7***	***2***	***7***	***69***	***85***

Human Cases of WNV: Utah 2013					
Age Group	**Total**	**% Total**	**Fever**	**Death**	**Neuroinvasive**
< 18	0				
18-39	2	29%	2		
40-64	3	42%	1		2
≥ 65	2	29%			2
State Total	**7**	**100%**	**3**	**0**	**4**

*The state is not conducting sentinel chicken surveillance in 2013. However, some counties still maintain sentinel chicken flocks.

Past Season Comparison

2003 was the first year WNV activity was established in Utah. Similar to many initial seasons in other states, activity was muted. One human case was reported for the 2003 season in Utah, in addition to one viremic donor who did not develop symptoms. Horse activity was the main indication of WNV presence in 2003. 2004 was the first year WNV activity was established in northern Utah along the Wasatch Front. The majority of activity for 2004 occurred in extreme southern and eastern areas of Utah, such as Washington and Grand counties. During 2005, activity expanded into more northern regions of the state and Utah and Uintah counties served as focal points for detected activity. The 2006 season was the most active season. Activity was focused along the Wasatch Front in the more populated areas, Salt Lake County and Utah County. With an increase in activity, there was also an increase in fatalities, with Utah experiencing five. 2007 started the decline in the number of cases, as well as a decrease in the number of fatalities. 2007 also showed that the virus was moving into the more northern parts of the state, with the bulk of cases being in Cache and Box Elder counties. Activity during the 2008 WNV season decreased compared to activity detected during the 2007 season. The 2009 - 2011 seasons saw an even more dramatic decrease in the level of activity. Due to inconsistencies with RAMP testing, it was decided that mosquito pools would only be 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, 2011 and 2012 seasons. For the 2013 season, Washington County, in the southwest portion of the state, saw the majority of activity, both human and animal.

Table 2: WNV season comparison, Utah 2003-2013

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Human	1	11	52	158	70	27	2	2	3	5	7
Horse	35	5	68	59	18	8	6	3	1	3	7
Bird*	2	8	22	76	19	3	0	0	0	0	40
Chicken*	9	32	79	107	74	16	1	1	0	1	2
Mosquito Pools	3	181	80	466	225	140	284	31	23	21	69
Counties with Detection	9	11	17	19	19	14	12	5	6	8	9

*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.

2013 Utah Activity Timeline

The majority of surveillance measures began in June 2013. West Nile virus activity was detected the week of June 5, 2013 in one mosquito pool, confirmed by PCR, from Washington County. Activity was detected throughout the summer and into October, with WNV activity being detected

in most surveillance measures (horse, mosquito) by August. Utah's first human case was reported the week of August 14, 2013. Human, mosquito and equine cases continued to be reported into October. The die-off of eared grebes and bald eagles along the Great Salt Lake occurred around October 2013 and continued into January 2014. All active surveillance for the 2013 season had ceased by the end of October. However, testing of suspect human and horse cases continues year-round.

Human Surveillance

Human surveillance occurs primarily through reporting of results indicative of acute infection from major laboratories. LHDs were immediately notified in these instances for the initiation of case investigations. Due to issues with testing kits from a major reference laboratory from the 2008 season, it was again determined that all human samples would be confirmed at UPHL. Additionally, major blood banks servicing Utah screened donations for the presence of WNV.

The total Utah human case count for the 2013 season currently stands at seven identified cases.

There were five individuals identified as being infected with WNV through blood donation screening.

Table 3: WNV clinical comparison of human cases, United States vs. Utah, 2013

	Utah	United States
Case Number	7	2,469
Fatalities	0	119
Percent Fatalities	0%	5%
Percent Neuroinvasive Disease	57%	51%

Table 4: WNV, clinical and demographic comparison of human cases, Utah 2003-2013

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Case Number	1	11	52	158	70	28	2	2	3	5	7
Fatalities	0	0	1	5	2	0	0	0	0	1	0
Percent Male	100%	45%	54%	51%	51%	79%	50%	100%	66%	60%	57%
Median Age	47 years	53 years	43 years	47 years	50 years	41 years	50 years	66 years	35 years	70 years	61 years
Age Range	NA	5-80 years	6-86 years	1-88 years	3-89 years	4-79 years	57-44 years	54-78 years	24-68 years	22-87 years	20-85 years

Table 5: WNV clinical and demographic characteristics by age group, Utah 2013

	< 18 years	18-39 years	40-64 years	≥ 65 years
Case Number	0	2	3	2
Fatalities	0	0	0	0
Neuroinvasive # (%)	0	0	2 (29%)	2 (29%)
Hospitalized # (%)	0	0	2 (29%)	2 (29%)
Male # (%)	0	0	2 (29%)	2 (29%)

Figure 2 represents human and mosquito pool positivity over time. The first activity for 2013 was detected in mosquitoes during the week of June 1, 2013. This graph represents the activity in Utah from June – September 2013.

Figure 2

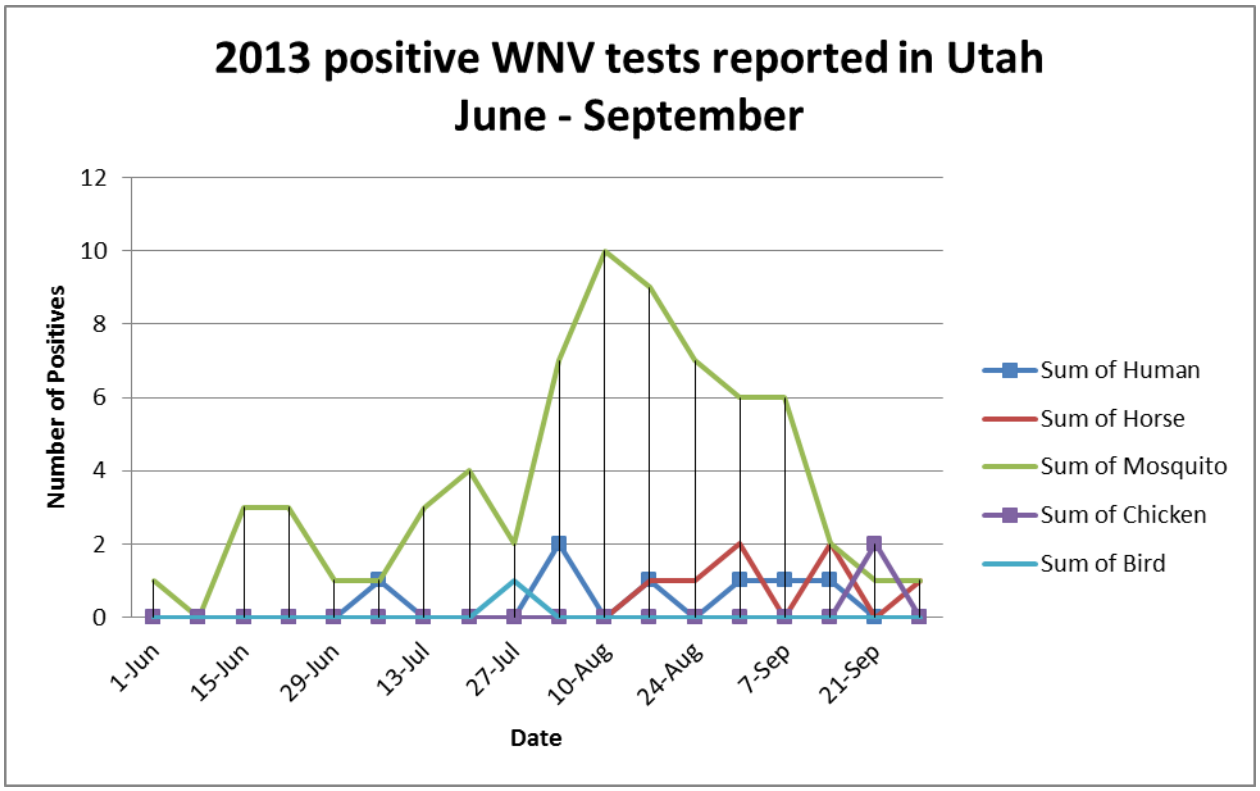


Figure 3 represents activity in Utah for the months of October – December 2013. There was no human, horse or chicken activity during those months. Toward the end of November, there is an increase of dead birds due to the bald eagle and grebe die-off, described previously.

Figure 3

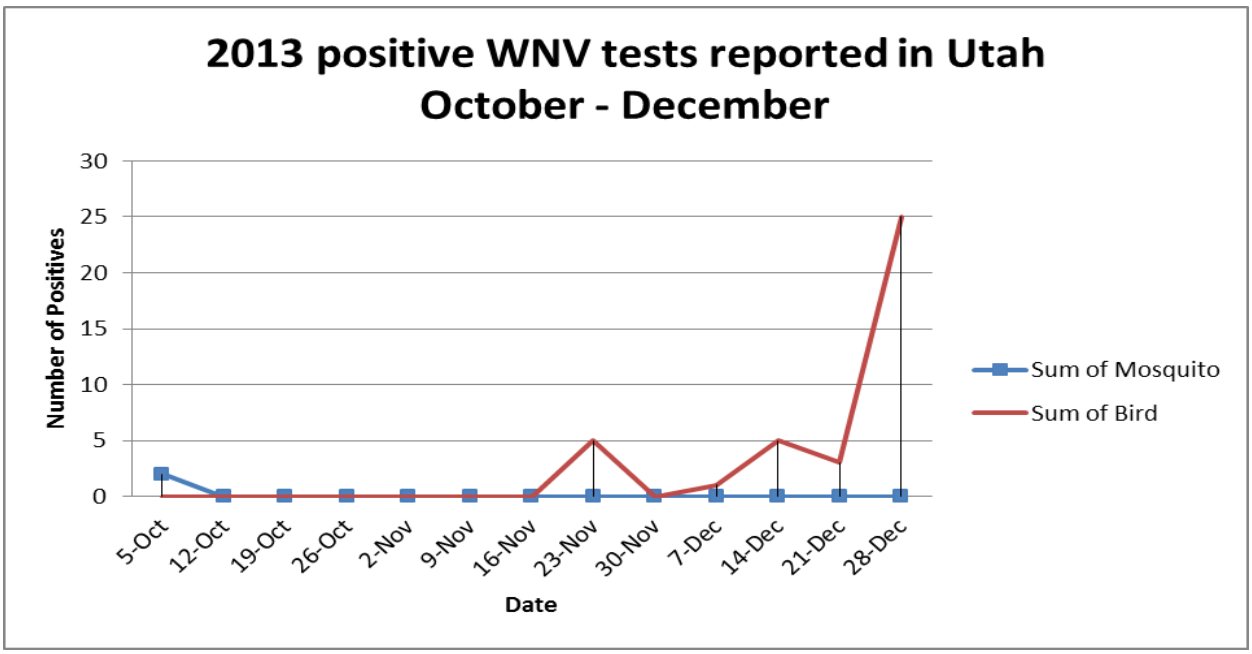


Table 6 compares Utah to surrounding states. Although many states were seeing increased activity, Utah experienced only seven human cases with no fatalities.

Table 6

Utah in comparison to surrounding states, as reported to CDC ArboNet, for 2013

	Neuroinvasive disease cases		Non-neuroinvasive disease cases		Total cases		Deaths	
State	Case Count	Rate per 100,000 person years	Case Count	Rate per 100,000 person years	Case Count	Rate per 100,000 person years	Case Count	Rate per 100,000 person years
Arizona	50	0.77	12	0.19	62	0.96	6	0.09
Colorado	90	1.76	232	4.53	322	6.29	7	0.14
Idaho	14	0.88	26	1.64	40	2.52	2	0.13
Montana	10	1.00	28	2.81	38	3.81	2	0.20
New Mexico	24	1.15	14	0.67	38	1.82	3	0.14
Utah	4	0.14	3	0.11	7	0.25	0	0.00
Wyoming	16	2.82	25	4.40	41	7.22	1	0.18

Mosquito Surveillance

Personnel from mosquito abatement districts across the state performed the primary functions of trapping mosquitoes at various locations in their district. Trapped mosquitoes were identified and sorted into "pools" based on species. Each mosquito pool contained 50-100 individual mosquitoes. These pools were shipped to the UPHL for testing by PCR.

Horse surveillance

Surveillance of equine disease related to WNV infection was again 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 the UDAF to the 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 accomplished through distribution of pamphlets and periodic updates using the Utah Veterinary Alert Listserver.

Wild bird surveillance

Due to budget constraints, routine wild bird surveillance was discontinued for the 2013 season. Funding has been requested to assist the DWR in their increased surveillance efforts.

Sentinel chicken surveillance

Due to budget constraints, routine sentinel chicken surveillance was discontinued for the 2013 season.

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