

# 2006 West Nile Virus Summary Report for Oregon

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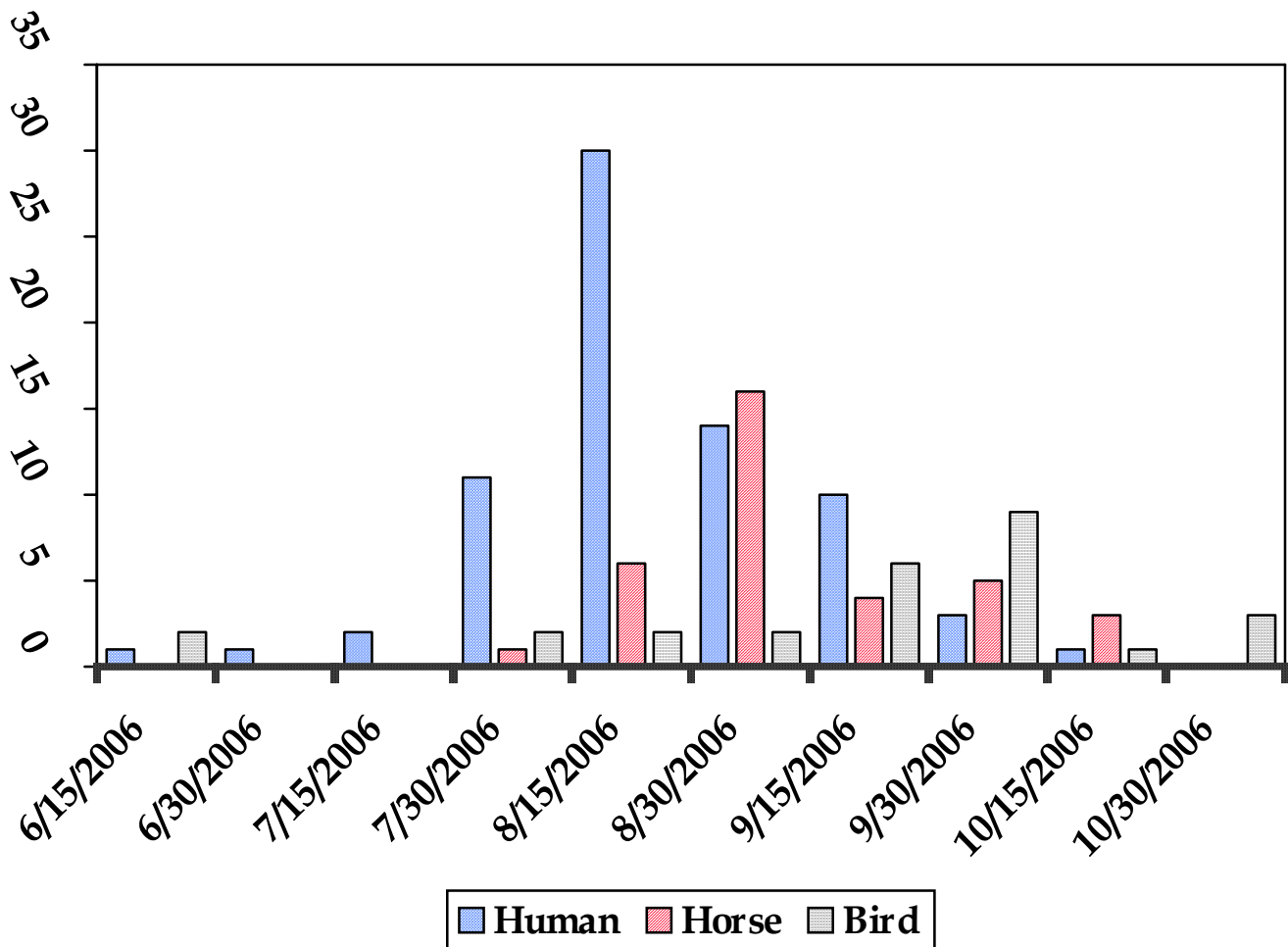
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## 2006 Program Highlights

Some of the principal findings and accomplishments of Oregon's surveillance, education, and planning programs for in 2006 include the following.

- In 2006, a record number of 73 people in Oregon were infected with WNV.
- A total of 13 (18%) people were diagnosed with WNV encephalitis/meningitis.
- One person died of complication related to WNV.
- Human and animal infections were reported in September and October, later than in previous years.

**Figure 1. Number of positive WNV tests infections by week of specimen collection, Oregon, 2006.**



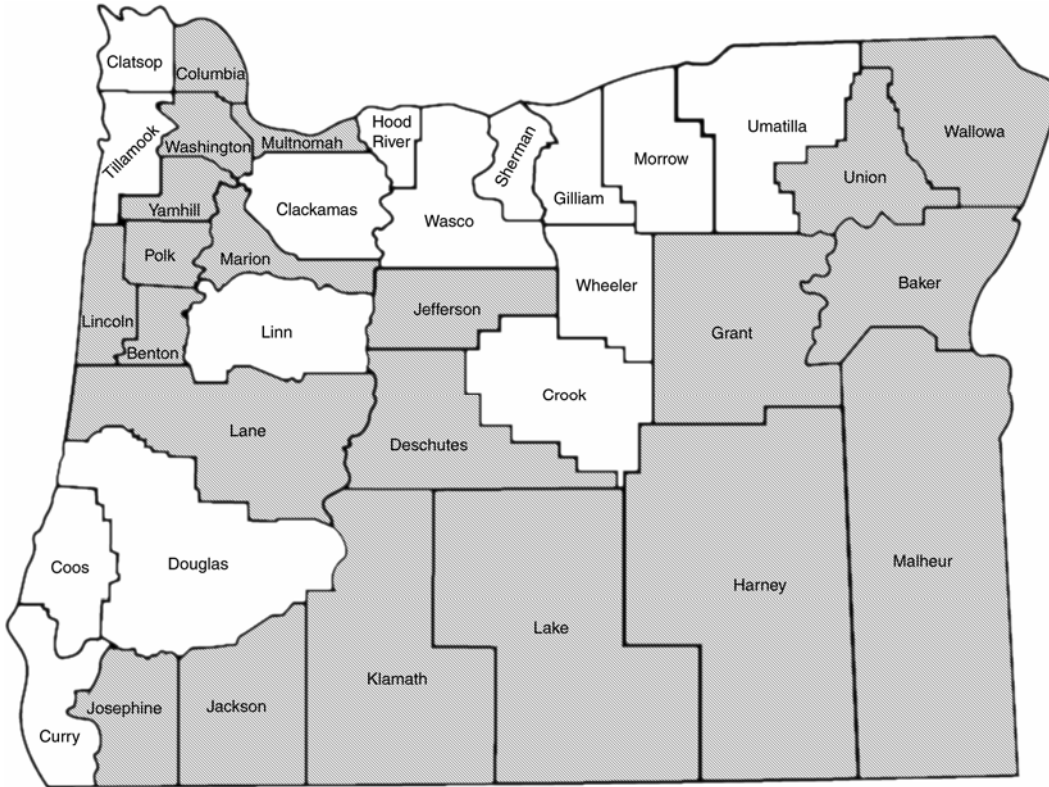
## Introduction

West Nile Virus (WNV) first appeared in Oregon in 2004. Our first human, avian, and equine WNV cases were all diagnosed in August of that year. In 2006, a total of 73 people, 25 birds, and 35 horses and over 1000 mosquitoes tested positive for WNV infection.

Oregon's surveillance program for WNV was launched in 2001 and now includes 17 Vector Control Districts (VCDs) located throughout the state (see map of Oregon with participating VCDs highlighted in Figure 3). Two additional districts are being formed. The VCDs collect mosquitoes, maintain sentinel chicken flocks, and conduct initial WNV tests of mosquitoes, sentinel chickens, and dead birds. Confirmatory testing of WNV for humans, mosquitoes, and sentinel chickens is performed by the Oregon State Public Health Laboratory (OSPHL). The Oregon State University (OSU) Veterinary Diagnostic Laboratory performs all WNV testing of horses and dead birds. With the arrival of WNV in Oregon in 2004, both labs increased their workload capacity and conducted more than twice the number of WNV-related tests in 2006 than in 2005.

The Oregon WNV surveillance findings for humans, birds, horses and mosquitoes in 2006 are summarized in the sections below.

**Figure 2. Map of Oregon with shaded counties reporting WNV in 2006.**



## WNV Surveillance and Related Activities

### Human Surveillance

In 2006, 73 Oregon residents tested positive for WNV by IgM antibody, including 70 people who contracted WNV in Oregon and 3 people who contracted WNV in another state. Three-quarters of Oregon cases were Malheur County residents. (See figure 2) Oregon also had its first human death related to WNV. Descriptive data for the 73 Oregon residents who contracted WNV are presented in Table 1.

**Table 1 Descriptive data for Oregon residents who contracted WNV infection in Oregon in 2006.**

		Number n=73	Percent
<b>Sex</b>	Male	26	36%
	Female	47	64%
<b>Age</b>	<19	7	10%
	19-29	7	10%
	30-39	18	25%
	40-49	13	18%
	50-59	13	18%
	60-69	7	10%
	70-79	7	10%
	>79	1	1%
<b>County of Residence</b>	Baker	9	12%
	Deschutes	1	1%
	Harney	6	8%
	Malheur	55	75%
	Multnomah	1	1%
	Union	1	1%
<b>Source</b>	In State	70	96%
	Out of State	3	4%
<b>Symptoms</b>	Uncomplicated fever	60	82%
	Encephalitis+Meningitis	10	14%
	Meningitis	3	4%
	Other/Unknown	0	0%

## Equine Surveillance

Surveillance for WNV in Oregon's equine population resulted in 35 positive test results out of 52 horses tested by OSU Veterinary Diagnostic Laboratory and other out-of-state certified animal laboratories. Positive test results for Oregon counties in 2006 are summarized in Table 2.

**Table 2 Positive Equine WNV test results, Oregon 2006.**

<b>County</b>	<b>Number of Positive Test Results</b>
Baker	3
Grant	7
Harney	7
Jackson	1
Jefferson	1
Klamath	1
Lake	3
Malheur	3
Umatilla	1
Union	7
Wallowa	1
Total	35

## Avian Surveillance

Surveillance for WNV in Oregon's avian population resulted in 25 positive test results out of 212 birds tested by OSU Veterinary Diagnostic Laboratory and the VCDs. Numbers of avian WNV tests and positive test results for Oregon counties in 2006 are summarized in Table 3. Numbers of WNV tests and positive test results by avian species are presented in Table 4.

**Table 3 Avian WNV tests and positive test results for Oregon counties in 2006.**

County*	Avian Specimens Tested	Positive Test Results
<b>Baker</b>	<b>1</b>	<b>1</b>
<b>Benton</b>	<b>6</b>	<b>1</b>
Clackamas	10	0
<b>Columbia</b>	<b>1</b>	<b>1</b>
Clatsop	1	0
Crook	3	0
<b>Deschutes</b>	<b>6</b>	<b>1</b>
Douglas	4	0
<b>Jackson</b>	<b>3</b>	<b>1</b>
<b>Josephine</b>	<b>5</b>	<b>2</b>
<b>Klamath</b>	<b>5</b>	<b>2</b>
Lake	1	0
<b>Lane</b>	<b>23</b>	<b>1</b>
<b>Lincoln</b>	<b>9</b>	<b>2</b>
Linn	3	0
<b>Malheur</b>	<b>6</b>	<b>4</b>
<b>Marion</b>	<b>10</b>	<b>2</b>
<b>Multnomah</b>	<b>40</b>	<b>4</b>
<b>Polk</b>	<b>1</b>	<b>1</b>
Tillamook	1	0
Umatilla	11	0
Union	2	0
Wasco	2	0
<b>Washington</b>	<b>52</b>	<b>1</b>
<b>Yamhill</b>	<b>6</b>	<b>1</b>
<b>TOTAL</b>	<b>212</b>	<b>25</b>

\* Counties with positive test results are indicated in **bold**.



**Table 4 WNV tests and positive test results by avian species in Oregon in 2005.**

Avian Type*	Number of Specimens Tested	Number of Positive Test Results
Corvid	205	24
Non-Corvid	7	1
<b>Total</b>	<b>212</b>	<b>25</b>

## Mosquito Surveillance

In 2006, the VCDs conducted surveillance for WNV in Oregon’s mosquito population. Statewide, approximately 160,000 mosquitoes were collected and tested, and at least 24 mosquito species were represented. PCR testing for WNV was conducted by OSPHL; over 1000 mosquitoes tested positive. Table 5 displays the number of mosquitoes collected by VCDs for each mosquito species. Table 7 indicates the efficiency of vector transmission for various mosquito species (information obtained from the Centers for Disease Control and Prevention).

**Table 5. Mosquitoes collected by Oregon VCDs for each species in 2006.**

Vector Control District	<i>Culex tarsalis</i>	<i>Aedes vexans</i>	<i>Culex pipiens</i>	<i>Aedes dorsalis</i>	<i>Culiseta inornata</i>	<i>Aedes increpitus</i>	<i>Aedes nigromaculis</i>	<i>Culex erythrothorax</i>	<i>Anopheles freebornia</i>	<i>Aedes washinoi</i>	<i>Anopheles punctipennis</i>	<i>Aedes sticticus</i>	<i>Culiseta incidens</i>
Baker	23,101	1,777	19	2,127	63		2,777		80				
Benton	133		12										
Clackamas	305	42	3,019		38				5	245	171	10	307
Columbia	241	11,220							74		25		
Crook	55		4		3								
Deschutes (Four Rivers)	85	1			1,288	2,465							
Jackson	6,543	5,670	4,426			1,101		1,609					
Jefferson	167				16								
Klamath	6,464	623	1,620	1,895	2,266				515				
Lane	4,550	23,050	4,656										
Morrow	9,322	539	5,480	53		359			338				
Multnomah	7,148	2,193	4,391		303					716	399	614	120
Umatilla	6,053	25	6,991										
Union	821		17										
Washington	133	82	686		65	38		342	2		53		35
<b>Total</b>	<b>65,121</b>	<b>45,222</b>	<b>31,321</b>	<b>4,075</b>	<b>4,042</b>	<b>3,963</b>	<b>2,777</b>	<b>1,951</b>	<b>1,014</b>	<b>961</b>	<b>648</b>	<b>624</b>	<b>462</b>

**Table 5 continued. Mosquitoes collected by Oregon VCDs for each species in 2006.**

<b>Vector Control District</b>	<i>Anopheles sp.</i>	<i>Culex stigmatosoma</i>	<i>Culiseta particeps</i>	<i>Culex sp.</i>	<i>Aedes sp.</i>	<i>Aedes cinereus</i>	<i>Anopheles franciscanus</i>	<i>Aedes sierrensis</i>	<i>Culiseta impatiens</i>	<i>Culex boharti</i>	<i>Culiseta sp.</i>	<b>Total</b>
Baker												<b>29,944</b>
Benton												<b>145</b>
Clackamas		24	123	1	31			5		1	3	<b>4,330</b>
Columbia												<b>11,560</b>
Crook					57							<b>119</b>
Deschutes (Four Rivers)												<b>3,839</b>
Jackson		174										<b>19,523</b>
Jefferson												<b>183</b>
Klamath												<b>13,383</b>
Lane	200											<b>32,456</b>
Morrow												<b>16,091</b>
Multnomah						27						<b>15,911</b>
Umatilla				110								<b>13,179</b>
Union												<b>838</b>
Washington		1	15		3		27		5	2		<b>1,489</b>
<b>TOTAL</b>	<b>200</b>	<b>199</b>	<b>138</b>	<b>111</b>	<b>91</b>	<b>27</b>	<b>27</b>	<b>5</b>	<b>5</b>	<b>3</b>	<b>3</b>	<b>160,663</b>

**Table 6. WNV Positive Mosquitoes, Oregon 2006**

<b>VCD</b>	<b>Mosquito species</b>	<b>Number of positive mosquitoes</b>	<b>Date of collection</b>
Baker	<i>Culex tarsalis</i>	850	7/18-8/18
Union	<i>Culex tarsalis</i>	250	8/22-8/23

**Table 7. Potential Oregon vectors of WNV based on laboratory vector competence studies (Turell et. al., 2005) Posted with permission.**

**Table 3. Potential for selected North American mosquitoes to transmit WNV based on bionomics, vector competence, virus isolations, and involvement with other arboviruses**

Species	Association with other viruses <sup>a</sup>	Host preference	Activity time	Flight range	Vector competence for WNV <sup>b</sup>	Field isolations of WNV <sup>c</sup>	Potential to serve as a	
							Enzootic vector <sup>d</sup>	Bridge vector <sup>e</sup>
<i>Ae. aegypti</i>		Mammals	Crepuscular/day	200 m	+++ , 3	+	0	+
<i>Ae. albopictus</i>	EEE	Opportunistic	Crepuscular/day	200 m	++++, 3, 6	+	+	++++
<i>Ae. vexans</i>	EEE, WEE, SLE	Mammals	Crepuscular/night	>25 km	++ 1, 5, 8	+++	0	++
<i>Cq. perturbans</i>	EEE	Opportunistic	Crepuscular/night	5 km	+, 4	+	+	+
<i>Cs. melanura</i>	EEE	Birds	Crepuscular/night	9 km	+, 8	++	++	0
<i>Cs. inornata</i>	WEE	Mammals	Crepuscular/night	2 km	+++ , 5	+	+	++
<i>Cx. stigmatosoma</i>	SLE	Birds	Night	1 km	+++ , 5	0	+++	+
<i>Cx. erythrothorax</i>	WEE	Opportunistic	Crepuscular/day	<2 km	++++, 5	0	++	+++
<i>Cx. nigripalpus</i>	EEE, SLE	Opportunistic <sup>f</sup>	Crepuscular	5 km	++ , 4	+++	+++	++
<i>Cx. pipiens</i>	SLE	Birds	Crepuscular/night	2 km	+++ , 1, 3, 5	++++	++++	++
<i>Cx. quinquefasciatus</i>	SLE	Birds	Crepuscular/night	2 km	+++ , 4, 5	0	++++	++
<i>Cx. restuans</i>	SLE	Birds	Crepuscular/night	2 km	++++, 4	+++	++++	++
<i>Cx. salinarius</i>	EEE, SLE	Opportunistic	Crepuscular/night	10 km	++++, 4	+++	+++	++++
<i>Cx. tarsalis</i>	WEE, SLE	Opportunistic <sup>f</sup>	Crepuscular/night	>6 km	++++, 5, 7	++++	++++	+++
<i>Oc. atropalpus</i>		Mammals	Day and night	1 km	++++, 3	+	+	++
<i>Oc. canadensis</i>	EEE	Mammals	Day	2 km	++ , 8	+	0	++
<i>Oc. cantator</i>	EEE	Mammals	Day	>10 km	++ , 8	+	0	++
<i>Oc. dorsalis</i>	WEE	Mammals	Day and night	5 km	+++ , 5	+	0	++
<i>Oc. japonicus</i>	JE?	Mammals	Crepuscular/day	unk	++++, 2, 3	+++	+	++++
<i>Oc. melanimon</i>	WEE	Mammals	Day and night	>10 km	+++ , 5	0	0	++
<i>Oc. sierrensis</i>		Mammals	Crepuscular/day	1 km	+, 5	0	0	+
<i>Oc. sollicitans</i>	EEE	Mammals	Crepuscular/night	>25 km	++ , 1, 3	+	0	+
<i>Oc. taeniorhynchus</i>	EEE	Mammals	Day and night	>25 km	+, 1, 3	+	0	+
<i>Oc. triseriatus</i>		Mammals	Day	200 m	+++ , 8	++	0	+++
<i>Ps. ferox</i>	SLE	Mammals	Day	2 km	0, 8	+	0	0

Distribution and bionomics based on and generalized from information in Carpenter and LaCasse (1955), Darsie and Ward (1981), and Moore et al. (1993).

<sup>a</sup> Known association with other viruses with a similar transmission cycle. EEE, eastern equine encephalomyelitis virus; JE; Japanese encephalitis virus; SLE; St. Louis encephalitis virus; WEE; western equine encephalomyelitis virus. Based on Karabatsos (1985).

<sup>b</sup> Efficiency with which this species is able to transmit WNV in the laboratory. 0, incompetent; +, inefficient; +++++, extremely efficient vector. Based on 1 (Turell et al. 2000), 2 (Sardelis and Turell 2001), 3 (Turell et al. 2001), 4 (Sardelis et al. 2001), 5 (Goddard et al. 2002), 6 (Sardelis et al. 2002), 7 (Turell et al. 2003), or 8 (present study).

<sup>c</sup> Relative number of WNV-positive pools detected. 0, none; +, few; +++++, many.

<sup>d</sup> Potential for this species to be an enzootic or maintenance vector based on virus isolations from the field, vector competence, feeding behavior, etc. 0, little to no risk; +++++, this species may play a major role.

<sup>e</sup> Potential for this species to be an epizootic or bridge vector based on virus isolations from the field, vector competence, feeding behavior, etc. 0, little to no risk; +++++, this species may play a major role.

<sup>f</sup> Feeds primarily on avian hosts in spring and early summer and mixed between avian and mammalian hosts in late summer and fall.

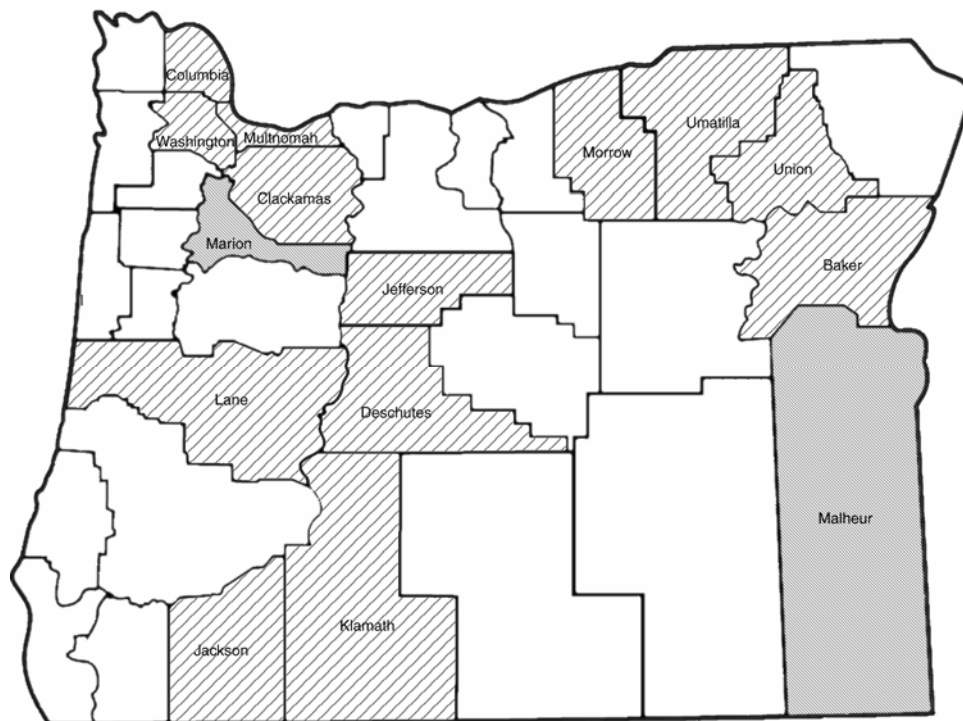
## Zoo Surveillance

Data were collected on avian specimens found at the Oregon Zoo.

A total of 21 specimens were tested with no positive results for WNV.

## Vector Control Districts

Figure 3. Map of Oregon counties with participating Vector Control Districts (VCDs) marked with stripes. Darker areas denote newly created VCDs.



**Table 8. WNV confirmed cases in Oregon 2004 2006**

	<b>2004</b>	<b>2005</b>	<b>2006</b>
Human	5	8	73
Horses	32	46	35
Birds	23	15	25
Mosquitoes	0	550	1100
Sentinel chickens	0	15	0

## **References**

Turell, MD, et. al. "An Update on the Potential of North American Mosquitoes (*Diptera: Culicidae*) to Transmit West Nile Virus. J. Med. Entomol. 42(1): 57-62 (2005).