

**State of Oregon  
West Nile Virus Summary Report  
2015**

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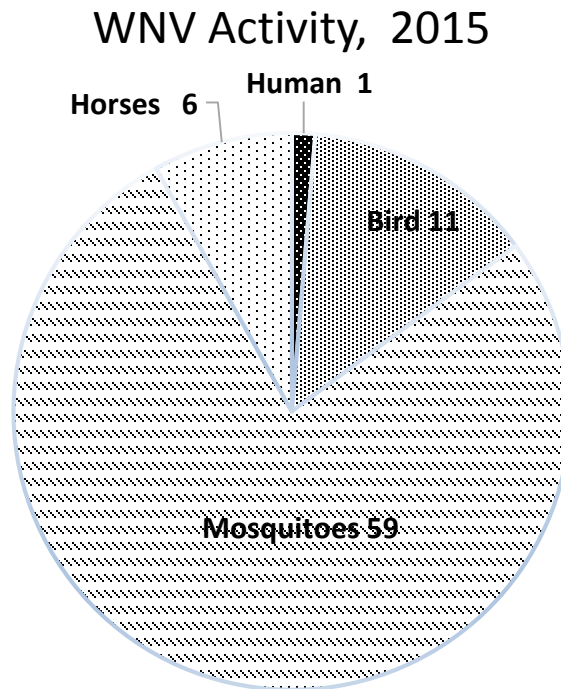
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## 2015 Program Highlights

Oregon's surveillance for West Nile virus (WNV) in 2015 identified the following:

- 1 human case
- 6 equine cases
- 11 bird cases
- 59 positive mosquito pools

**Figure 1. Number of positive WNV tests, Oregon, 2015.**



Source: Oregon State University, Veterinary Laboratory and Oregon State Public Health Laboratory

**Table 1. Confirmed WNV infections, by species, Oregon, 2004–2015.**

Confirmed WNV infections, by species												
Group	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Human	5	8	73	27	16	12	0	0	12	16	8	1
Horses	32	46	35	16	0	5	0	2	2	6	3	6
Birds	23	15	25	52	2	16	0	0	2	2	7	11
Mosquito Pools	0	11	22	28	16	262	4	3	71	89	58	59
Sentinel Chickens	0	15	0	11	0	0	0	0	0	0	0	0

Source: Oregon State University, Veterinary Laboratory and Oregon State Public Health Laboratory

## Introduction

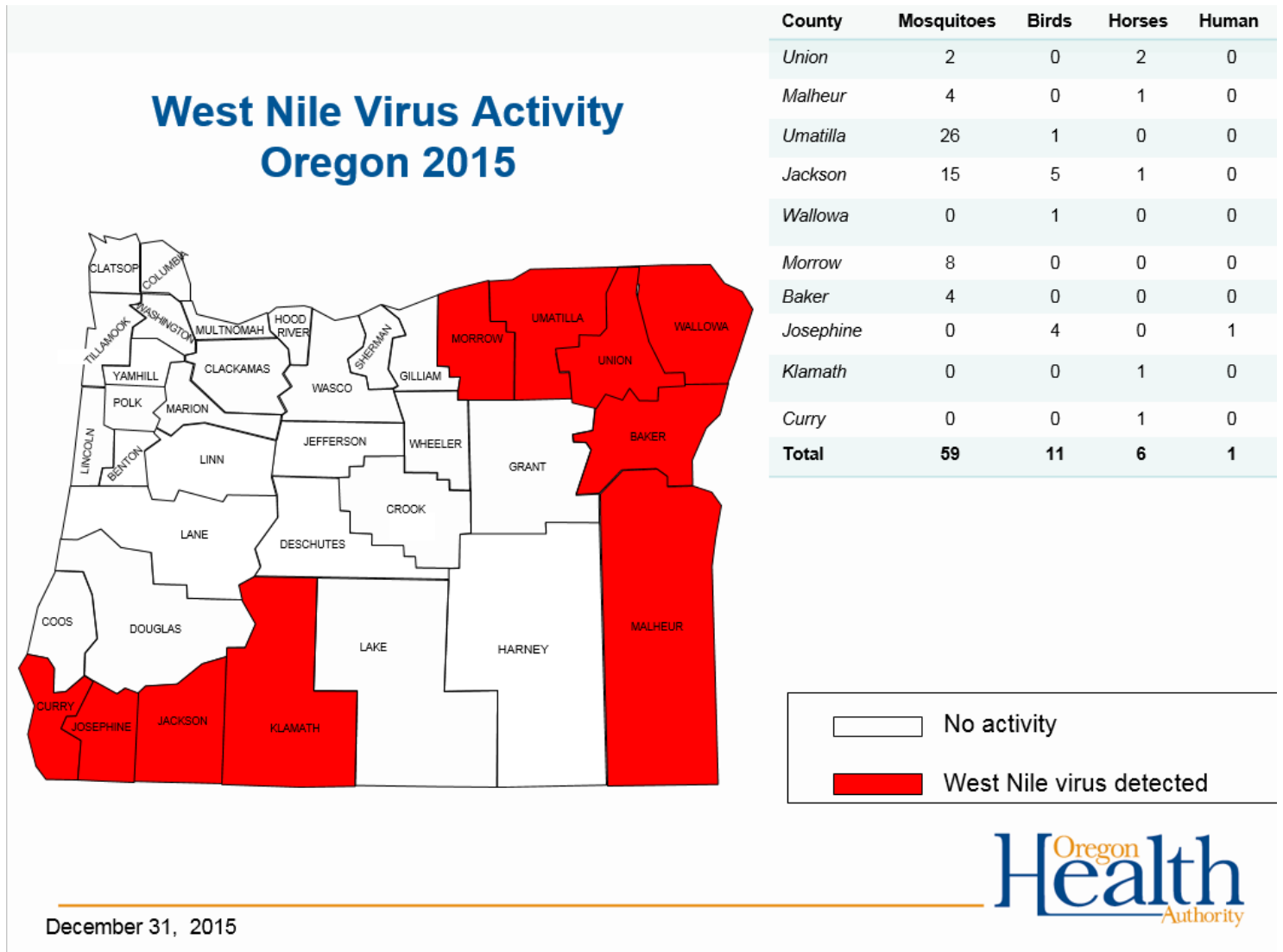
Oregon's surveillance program for West Nile virus (WNV) was launched in 2001. The virus first appeared in Oregon in 2004 when the first human, avian, and equine WNV cases were diagnosed. Our peak year followed two years later, when 73 human cases were reported.

Incidence of human WNV disease remained low in Oregon in 2015, with one human case. In addition, 11 birds, 6 horses and 59 mosquito pools tested positive for WNV in 2015.

Thirteen Vector Control Districts (VCDs) in Oregon perform mosquito surveillance (collection, identification and testing) (Figure 4). The VCDs collect (and dead birds), identify, and prepare mosquitoes for testing. Some VCDs conduct initial WNV tests for mosquito pools and dead birds using the Rapid Analyte Measurement Platform (RAMP). Confirmatory testing of WNV for human specimens is performed by the Oregon State Public Health Laboratory (OSPHL). Oregon State University's (OSU's) Veterinary Diagnostic Laboratory performs WNV testing of mosquitoes, dead birds, horses, and other mammals.

Oregon WNV surveillance findings for humans, horses, birds, and mosquitoes in 2015 are summarized in the following sections.

Figure 2. Map of Oregon with shaded counties reporting WNV, 2015.



For more information about West Nile virus, visit <https://public.health.oregon.gov/DiseasesConditions/DiseasesAZ/WestNileVirus/Documents/countymap15.pdf>

# WNV Surveillance and Related Activities

## Human Surveillance

In 2015, one Oregon resident tested positive for WNV by IgM antibody; none had neuroinvasive disease.

**Table 2. Trend data for Oregon residents who contracted WNV in Oregon, 2004–2015.**

<b>Trend data for Oregon residents who contracted WNV</b>			
<b>Year</b>	<b>All Cases</b>	<b>Neuroinvasive</b>	<b>Deaths</b>
2004	5	0	0
2005	8	1	0
2006	73	13	1
2007	27	7	1
2008	15	3	0
2009	8	0	0
2010	0	0	0
2011	0	0	0
2012	12	1	0
2013	16	8	0
2014	8	2	0
2015	1	0	0
<b>Total</b>	<b>173</b>	<b>35</b>	<b>2</b>

Source: Oregon State Public Health Laboratory

## Veterinary Surveillance

Surveillance for WNV in Oregon’s equine population resulted in six positive tests, while 29 other equine tests were negative for WNV. Positive test results by county are summarized in Table 3. No other mammals tested positive for WNV in 2015.

**Table 3. Positive equine WNV test results, Oregon, 2015.**

<b>Positive equine WNV test results</b>	
<b>County</b>	<b>Horses with Positive WNV Test Results</b>
Curry	1
Jackson	1
Klamath	1
Malheur	1
Union	2
<b>Total</b>	<b>6</b>

Source: Oregon State University, Veterinary Diagnostic Laboratory

## Avian Surveillance

Surveillance for WNV in Oregon’s avian population resulted in eleven positive test results out of 36 birds tested by OSU’s Veterinary Diagnostic Laboratory and the VCDs. Of the 36 birds that were collected, 24 were of the family *Corvidae* (a.k.a. corvids), while the remaining twelve were American species other than corvid. Table 4 shows the avian species collection totals in Oregon by county for 2015. Trend data for avian WNV testing and positive test results for Oregon counties for the years 2004–2015 are presented in Table 5.

**Table 4. Avian WNV test results by county, Oregon, 2015.**

<b>Avian species collection totals by county</b>			
<b>County</b>	<b>Corvids Tested</b>	<b>All Other Species Tested</b>	<b>Total Positives</b>
Clackamas	0	1	0
Jackson	12	3	5
Josephine	5	2	4
Lane	1	0	0
Marion	1	0	0
Multnomah	4	0	0
Umatilla	0	5	1
Wallowa	0	1	1
Washington	1	1	0
<b>TOTAL</b>	<b>24</b>	<b>12</b>	<b>11 (30%)</b>

Source: Oregon State Public Health Laboratory

**Table 5. Avian WNV tests and trend of positive test results, Oregon, 2004–2015.**

<b>Avian WNV tests and trend of positive test results</b>			
<b>Year</b>	<b>Number Tested</b>	<b>Number Positive</b>	<b>% Positive</b>
2004	448	23	5%
2005	298	15	5%
2006	212	25	12%
2007	246	55	22%
2008	117	2	2%
2009	90	16	18%
2010	24	0	0%
2011	20	0	0%
2012	35	2	6%
2013	22	2	9%
2014	35	7	20%
2015	36	11	30%

Source: Oregon State Public Health Laboratory

## Sentinel Chicken Surveillance

None tested in 2015

## Mosquito Surveillance

In 2015, the VCDs conducted surveillance for WNV in Oregon’s mosquito population. Figure 4, page 13, shows the counties with participating VCDs and their activities. Statewide, 208,987 mosquitoes or 4180 mosquito pools were collected (see Table 7, page 9). Of those, 171,100 mosquitoes or 3422 mosquito pools were tested for WNV (see Table 8, page 10). The mosquitoes submitted represent 20 mosquito species. Polymerase Chain Reaction (PCR) testing for WNV was conducted by OSU, and RAMP was performed by some VCDs. Table 6 on page 8 displays the number of mosquito pools by species that tested positive for WNV in Oregon in 2015. Table 9 on page 11, displays the mosquito species in Oregon between 2004 through 2015 found positive for WNV. Figure 3 on page 12 indicates the efficiency of vector transmission for various mosquito species (information obtained from the Centers for Disease Control and Prevention).

**Table 6. WNV-positive mosquito pools, Oregon 2015.**

<b>WNV-Positive Mosquito Pools</b>			
<b>VCD</b>	<b>Mosquito Species</b>	<b>Number of Positive Mosquito Pools</b>	<b>Collection Date</b>
Baker	<i>Culex tarsalis</i>	4	8/14–8/28
Jackson	<i>Culex tarsalis</i>	9	7/28-9/2
Jackson	<i>Culex pipiens</i>	6	7/22–9/11
Malheur	<i>Culex tarsalis</i>	2	7/14
Malheur	<i>Genus Culex</i>	2	9/1
Morrow	<i>Culex pipiens</i>	4	9/11–9/17
Morrow	<i>Culex tarsalis</i>	4	8/14–9/11
Umatilla	<i>Culex pipiens</i>	10	7/23–10/1
Umatilla	<i>Culex tarsalis</i>	14	8/6–9/22
Umatilla	<i>Genus Culex</i>	2	9/11
Union	<i>Culex tarsalis</i>	2	7/10–7/17
<b>Total</b>		<b>59</b>	

Source: Oregon Vector Control Districts



**Table 7. Female mosquitoes collected for surveillance purposes by Oregon VCDs, 2015.**

County / Vector Control District	<i>Aedes chtr eus</i>	<i>Aedes dorsalis</i>	<i>Aedes implicatus</i>	<i>Aedes ino capitus</i>	<i>Aedes speices</i>	<i>Aedes sticticus</i>	<i>Aedes vexans</i>	<i>Aedes /Oc. washingtoni</i>	<i>Anopheles punctipennis</i>	<i>Anopheles freeborni</i>	<i>Coolia ethiopia</i>	<i>Culex pipiens</i>	<i>Culex species</i>	<i>Culex quinquefasciatus</i>	<i>Culex stigmatosoma</i>	Total	
Baker	11830			4788		788			153			10				17569	
Clackamas					11	63	13	156	0	7		1181	0	52		1483	
Columbia			287		84	634		168		2466		129				3768	
Coos	2094	99					249	2		201						2645	
Crook									1926							1926	
Deschutes (FourRivers)						17322						1265				18587	
Jackson	128		688	381	1	4014		360	521	1514	4624	9127	4	350		21712	
Klamath	1179					4518			2220			937				8854	
Malheur												1457				1457	
Morrow	251		710	3		451			2031	5		4361	0			7812	
Multnomah	2					7099	684	960	68	952		2107				11872	
Umatilla	1390		177			12094		220	966	92		4703				19642	
Union						6744			1967			7320				16031	
Washington	57			15		1403	646	883	103	312		14829	49		99	18396	
<b>Total:</b>	<b>59</b>	<b>15693</b>	<b>99</b>	<b>1862</b>	<b>5187</b>	<b>96</b>	<b>55130</b>	<b>1592</b>	<b>2749</b>	<b>9955</b>	<b>5549</b>	<b>4624</b>	<b>45969</b>	<b>1510</b>	<b>350</b>	<b>151</b>	<b>151754</b>
<b>Additional Mosquito species</b>																	
County / Vector Control District	<i>Culex tarsalis</i>	<i>Culex territans</i>	<i>Culiseta inopatiens</i>	<i>Culiseta picidens</i>	<i>Culiseta inornata</i>	<i>Culiseta</i>	<i>minnesotae</i>	<i>Culiseta particeps</i>	<i>Culiseta species</i>	<i>Ochlerotatus canadensis</i>	<i>Ochlerotatus implicatus</i>	<i>Ochlerotatus intrudens</i>	<i>Ochlerotatus sierrensis</i>	<i>Ochlerotatus sticticus</i>	<i>Ochlerotatus sp</i>	Total	
Baker	3994			132												4126	
Clackamas	191	5	949	1		1										1147	
Columbia	469			339		264										1072	
Coos	56			4		194								12		266	
Crook	539															539	
Deschutes (FourRivers)	1200															1200	
Jackson	12339		59	194		168										12760	
Klamath	6532			1828												8360	
Malheur																0	
Morrow	6281			463												6744	
Multnomah	8845		2453	133		6					90	6469				17996	
Umatilla	3623			276							1					3900	
Union	4452			123												4575	
Washington	6802		3	3998	250	592	54	33	2	1	9	8	10			11762	
<b>Total:</b>	<b>55323</b>	<b>5</b>	<b>3</b>	<b>7459</b>	<b>3743</b>	<b>592</b>	<b>687</b>	<b>33</b>	<b>2</b>	<b>1</b>	<b>9</b>	<b>99</b>	<b>6479</b>	<b>12</b>	<b>74447</b>		

Total for all species: 226201

Source: Oregon Vector Control Districts

**Table 8. Female mosquitoes collected by Oregon VCDs and tested for WNV at Oregon State University, 2015.**

County	<i>Aedes dorsalis</i>	<i>Aedes inopitius</i>	<i>Aedes vexans</i>	<i>Anopheles freeborni</i>	<i>Anopheles punctipennis</i>	Class Insecta	<i>Coquillettidia perturbans</i>	<i>Culex erythrorhoxus</i>	<i>Culex pipiens</i>	<i>Culex stigmatosoma</i>	<i>Culex tarsalis</i>	<i>Culiseta invidiosa</i>	<i>Culiseta inornata</i>	<i>Culiseta particeps</i>	Family Culicidae	Genus <i>Aedes</i>	Genus <i>Coquillettidia</i>	Genus <i>Culex</i>	Genus <i>Ochlerotatus</i>	<i>Ochlerotatus strictus</i>	Total	
Baker		4			1				122													127
Columbia		17		6		54		5	13		8	5						5	2			115
Coos		1							12		1	7			1	1		10				33
Deschutes		31	22					8	23													84
Jackson		134				44	111	314	435		1						6					1045
Klamath	31		62	48				25	116		39											321
Malheur									2								6					8
Morrow	3	8	6	33				157	233		4							2				446
Multnomah			33		9	1	7	16	124	29	1					1		2	10			233
Umatilla								35	52								8					95
Union			35		1			154	93					4								287
Washington			13	20		6		357	1	188								1				586
Yakima								11	27													38
<b>Total:</b>	<b>34</b>	<b>8</b>	<b>336</b>	<b>103</b>	<b>35</b>	<b>3</b>	<b>111</b>	<b>111</b>	<b>1082</b>	<b>1</b>	<b>1440</b>	<b>29</b>	<b>54</b>	<b>12</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>23</b>	<b>17</b>	<b>12</b>	<b>3418</b>	

Source: Oregon Vector Control Districts and Oregon State University

**Table 9. Trend data, WNV-positive mosquito pools, Oregon 2004–2015.**

<b>Trend data, WNV-positive mosquito pools</b>		
<b>Year</b>	<b>Mosquito Species</b>	<b>Number of Positives</b>
2004	-	-
2005	<i>Culex tarsalis</i> <i>Culex stigmatosoma</i> <i>Culex pipiens</i>	11 pools*
2006	<i>Culex tarsalis</i>	22 pools
2007	<i>Aedes vexans</i> <i>Culex pipiens</i> <i>Culex tarsalis</i>	8 pools 2 pools 23 pools
2008	<i>Aedes vexans</i> <i>Culex pipiens</i> <i>Culex tarsalis</i>	5 pools 3 pools 8 pools
2009	<i>Aedes vexans</i> <i>Anopheles freeborni</i> <i>Anopheles punctipennis</i> <i>Coquillettidia perturbans</i> <i>Culex pipiens</i> <i>Culex tarsalis</i> <i>Culex sp.</i>	1 pool 1 pool 1 pool 1 pool 75 pools 131 pools 52 pools
2010	<i>Culex pipiens</i> <i>Culex tarsalis</i> <i>Culex sp.</i>	1 pool 2 pools 1 pool
2011	<i>Culex sp.</i>	3 pools
2012	<i>Culex pipiens</i> <i>Culex tarsalis</i> <i>Culex sp.</i>	53 pools 3 pools 15 pools
2013	<i>Culex pipiens</i> <i>Culex tarsalis</i> <i>Anopheles freeborni</i>	14 pools 74 pools 1 pool
2014	<i>Aedes vexans</i> <i>Culex pipiens</i> <i>Culex tarsalis</i>	4 pools 13 pools 41 pools
2015	<i>Culex pipiens</i> <i>Culex tarsalis</i> Genus <i>Culex</i>	20 pools 35 pools 4 pools

\*1 pool ≈ 40 mosquitoes

Source: Oregon Vector Control Districts

Figure 3. Potential Oregon vectors of WNV based on laboratory vector competence studies.\*

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. erythrorhox</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.

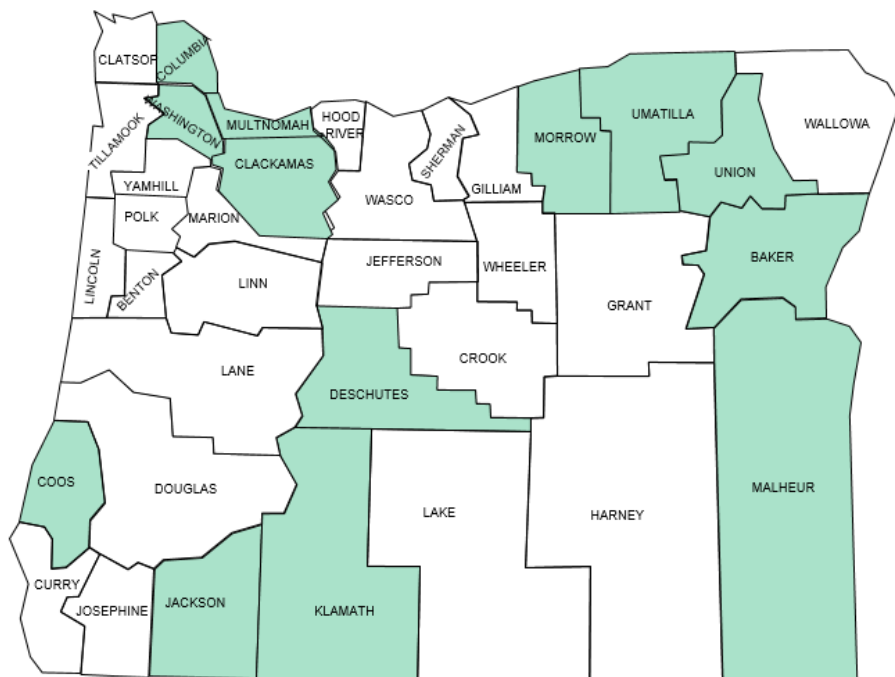
<sup>f</sup> Feeds primarily on avian hosts in spring and early summer and mixed between avian and mammalian hosts in late summer and fall.

\*Turell MJ, Dohm DJ, Sardelis MR, Oquinn ML, Andreadis DJ, Blow JA. An update on the potential of North American mosquitoes (*Diptera: Culicidae*) to transmit West Nile virus. J Med Entomol 2005; 42: 57–62. Used with permission.

## Vector Control Districts in Oregon

Figure 4. Oregon counties with participating vector control districts (VCDs) and their activities.

### Location of Vector Control Districts OREGON MAP 2015



Updated: Feb 24, 2016

Arboviral Surveillance Performed		
County	Mosquito Pools	Dead Birds
Baker	Y	Y
Clackamas	Y	Y
Columbia	Y	Y
Coos	Y	Y
Deschutes	Y	Y
Jackson	Y	Y
Klamath	Y	Y
Malheur	Y	Y
Morrow	Y	Y
Multnomah	Y	Y
Umatilla	Y	Y
Union	Y	Y
Washington	Y	Y
Lane	N	Y
Benton	N	Y
Clatsop	N	Y
Crook	N	Y
Curry	N	Y
Douglas	N	Y
Gilliam	N	Y
Grant	N	Y
Hamey	N	Y
Hood River	N	Y
Josephine	N	Y
Lake	N	Y
Lincoln	N	Y
Linn	N	Y
Marion	N	Y
Polk	N	Y
Sherman	N	Y
Tillamook	N	Y
Wallowa	N	Y
Wasco	N	Y
Wheeler	N	Y

Source: Oregon Health Authority

#### Acknowledgment:

All Oregon Vector Control Districts and the Oregon State University Veterinary Diagnostic Laboratory, without whose input and hard work, this report would not be possible.