2019

State of Oregon West Nile Virus Summary Report







Oregon Health Authority
PUBLIC HEALTH DIVISION
Acute and Communicable Disease Prevention Program

Acknowledgments

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Oregon's surveillance for West Nile virus (WNV) in 2019 identified the following:

- 9 human cases
- 9 equine cases
- 0 avian cases
- 87 positive mosquito pools

Figure 1. Number of positive WNV tests, Oregon, 2019

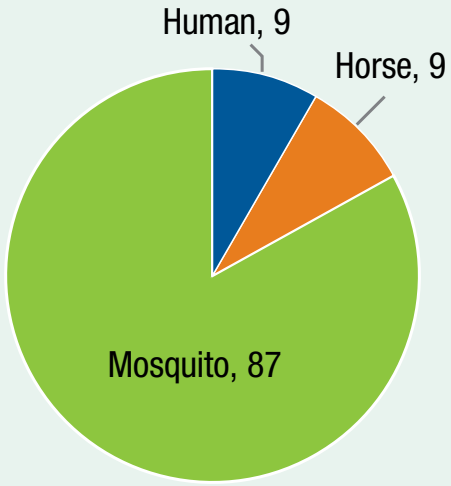


Table 1. Confirmed WNV infections by species, Oregon, 2004–2019

Group	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Human	5	8	73	27	16	12	0	0	12	16	8	1	4	6	2	9
Horse	32	46	35	16	0	5	0	2	2	6	3	6	6	5	2	9
Bird	23	15	25	52	2	16	0	0	2	2	7	11	12	1	1	0
Mosquito	0	11	22	28	16	262	4	3	71	89	58	59	51	92	57	87
Sentinel chickens*	0	15	0	11	0	0	0	0	0	0	0	0	0	0	0	0

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

*Sentinel chicken surveillance ended in 2011

Introduction

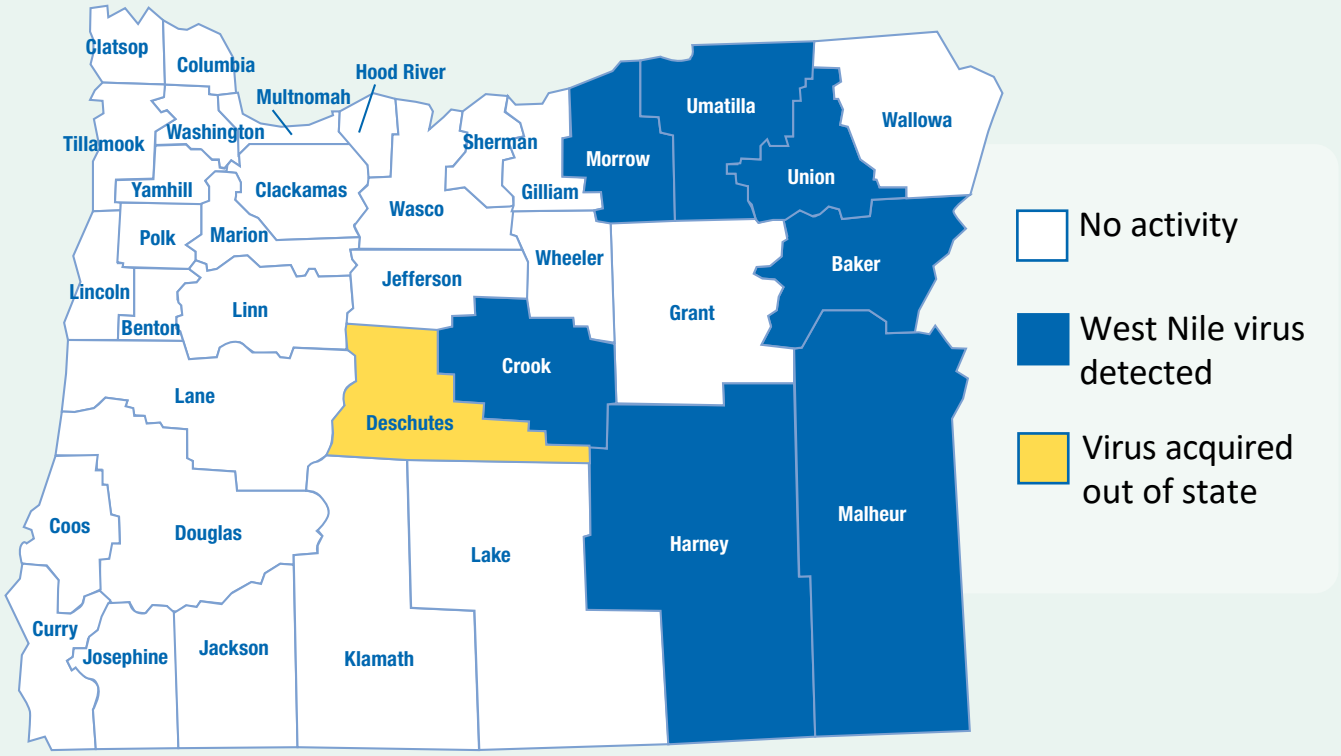
Oregon launched a West Nile virus (WNV) surveillance program in 2001. The virus was first identified in humans, birds and horses in Oregon in 2004. Our peak year followed in 2006 when 73 human cases were reported.

The incidence of human WNV disease increased in 2019 relative to recent years. Nine human cases, nine horses and 87 mosquito pools tested positive for WNV in 2019.

Thirteen vector control districts (VCDs) collect, identify and test dead birds and mosquitoes (in pools of approximately 40 females of the same species) for purposes of WNV surveillance (Figure 4). Some VCDs conduct initial WNV tests for mosquito pools and dead birds using the Rapid Analyte Measurement Platform (RAMP). The Oregon State Public Health Laboratory (OSPHL) performs confirmatory testing of WNV for human specimens. Oregon State University's (OSU's) Veterinary Diagnostic Laboratory performs WNV testing of mosquitoes, dead birds, horses and other mammals.

The following sections summarize Oregon WNV surveillance findings for humans, horses, birds and mosquitoes in 2019.

Figure 2. West Nile virus activity in Oregon, 2019



County	Mosquitoes	Birds	Horses	Human
Baker	4	0	1	2
Crook	0	0	1	0
Deschutes	0	0	0	1*
Harney	0	0	2	3
Malheur	4	0	3	3
Morrow	70	0	0	0
Umatilla	9	0	1	0
Union	0	0	1	0
Total	**87**	**0**	**9**	**9**

*Acquired out-of-state

November 2019

See https://www.oregon.gov/oha/PH/DISEASESCONDITIONS/DISEASESAZ/WESTNILEVIRUS/Pages/wnile.aspx for more information about West Nile virus.

WNV surveillance and related activities

Human surveillance

In 2019, nine Oregon residents tested positive for WNV by immunoglobulin M (IgM) antibody and Polymerase Chain Reaction (PCR); six had neuroinvasive disease. Illnesses related to neuroinvasive disease are usually characterized by the acute onset of fever with stiff neck, altered mental status, seizures, limb weakness, cerebrospinal fluid (CSF) pleocytosis or abnormal neuroimaging. Acute flaccid paralysis (AFP) may result from anterior myelitis, peripheral neuritis or post-infectious peripheral demyelinating neuropathy (i.e., Guillain-Barré syndrome). Less common neurological manifestations, such as cranial nerve palsies, also occur.

Table 2. Trend data for Oregon residents who contracted WNV in Oregon, 2004–2019

Year	All cases	Neuroinvasive	Deaths
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
2016	3	1	0
2017	7	4	1
2018	2	2	0
2019	9	6	0
TOTAL	**194**	**48**	**3**

Source: Oregon State Public Health Laboratory

Veterinary surveillance

WNV surveillance in Oregon's equine population resulted in nine positive tests. Table 3 summarizes positive test results by county. No other mammals tested positive for WNV in 2019.

Table 3. Positive equine WNV test results, Oregon, 2019

County	Horses Tested for WNV	Horses with Positive WNV Test Results
Baker	2	1
Clackamas	1	0
Columbia	1	0
Crook	1	1
Grant	1	0
Harney	2	1
Josephine	1	0
Klamath	1	0
Malheur	5	4
Umatilla	1	1
Union	2	1
Total	**18**	**9**

Source: Oregon State University Veterinary Diagnostic Laboratory

Avian surveillance

The WNV surveillance in Oregon's avian population resulted in zero positive tests for the 19 birds tested by OSU's Veterinary Diagnostic Laboratory and the VCDs. Of the 19 birds collected, 11 were of the family Corvidae (aka corvids), seven were American species other than corvids and one was a non-American species. Table 4 shows Oregon's avian species collection totals by county for 2019. Table 5 presents trend data for avian WNV testing and positive test results for Oregon counties for the years 2004–2019.

Table 4. Avian WNV test results, by county, Oregon, 2019

County	Corvids tested	All other species tested	Total positives
Baker	0	1	0
Douglas	0	1	0
Jackson	1	0	0
Lane	1	0	0
Lincoln	1	1	0
Multnomah	3	0	0
Morrow	3	0	0
Union	0	4	0
Umatilla	1	1	0
Washington	1	0	0
TOTAL	**11**	**8**	**0**

Source: Oregon State Public Health Laboratory

Table 5. Avian WNV tests and trend of positive test results, Oregon, 2004–2019

Year	Number tested	Number positive	% positive
2004	448	23	5.1%
2005	298	15	5.0%
2006	212	25	11.8%
2007	246	55	22.4%
2008	117	2	1.7%
2009	90	16	17.8%
2010	24	0	0.0%
2011	20	0	0.0%
2012	35	2	5.7%
2013	22	2	9.1%
2014	35	7	20.0%
2015	36	11	30.6%
2016	44	12	27.3%
2017	27	1	3.7%
2018	30	1	3.3%
2019	19	0	0.0%

Source: Oregon State Public Health Laboratory

Sentinel chicken surveillance

Oregon discontinued sentinel chicken surveillance in 2011.

Mosquito surveillance

In 2019, the VCDs conducted WNV surveillance in Oregon's mosquito population. Figure 4, on page 11, shows the counties with participating VCDs and their testing, and some VCDs performed RAMP. Table 6 below displays the number of Oregon mosquito pools by species that tested positive for WNV in 2019. Table 8 (pages 8-9) displays Oregon mosquito species between 2004 and 2019 found positive for WNV. Figure 3 (page 10) 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, 2019

VCD	Mosquito species	Number of positive mosquito pools	Collection date
Baker	*Culex tarsalis*	4	6/12 to 8/15/2019
Malheur	*Culex pipiens*	1	7/11/2019
	Culex tarsalis	3	7/11 to 8/8/2019
Morrow	*Culex pipiens*	58	6/12 to 9/10/2019
	Culex tarsalis	12	7/8 to 8/12/2019
Umatilla	*Culex pipiens*	6	7/16 to 8/20/2019
	Culex tarsalis	3	7/9 to 8/29/2019

Source: Oregon vector control districts

Table 7. Female mosquito pools collected by Oregon VCDs and tested for WNV at Oregon State University, 2019

Total Mosquito Pools tested by OSU

Source: OSU Report

County / VCD	*Aedes dorsalis*	*Aedes increpitus*	*Aedes nigromaculis*	*Aedes vexans*	*Anopheles freeborni*	*Coquillettidia perturbans*	*Culex erythrothorax*	*Culex pipiens*	*Culex tarsalis*	*Culiseta inornata*	*Culiseta particeps*	*Genus Culex*	*Ochlerotatus nigromaculis*	Total mosquito pools
Baker								2	343					**345**
Clackamas				1				35	5					**41**
Columbia						1		60	43		2	1		**107**
Deschutes				10	8			13	21	10				**62**
Jackson								227	113			1		**341**
Klamath	13		1	330	149				83	49			98	**723**
Malheur								1	5					**6**
Morrow		53		18		1	1	533	310					**916**
Multnomah									39					**39**
Umatilla								33	38			1		**72**
Union				175				29	168					**372**
Washington								98	53					**151**
Total:	**13**	**53**	**1**	**534**	**157**	**2**	**1**	**1031**	**1221**	**59**	**2**	**3**	**98**	**3175**

Source: Oregon vector control districts and Oregon State University

Table 8. Trend data, WNV-positive mosquito pools*, Oregon, 2004–2019

Year	Mosquito species	Number of positives
2004	-	-
2005	*Culex tarsalis*	11 pools
	Culex stigmatosoma	
	Culex pipiens	
2006	*Culex tarsalis*	22 pools
2007	*Aedes vexans*	8 pools
	Culex pipiens	2 pools
	Culex tarsalis	23 pools
2008	*Aedes vexans*	5 pools
	Culex pipiens	3 pools
	Culex tarsalis	8 pools
2009	*Aedes vexans*	1 pool
	Anopheles freeborni	1 pool
	Anopheles punctipennis	1 pool
	Coquillettidia perturbans	1 pool
	Culex pipiens	75 pools
	Culex tarsalis	131 pools
	Culex sp.	52 pools
2010	*Culex pipiens*	1 pool
	Culex tarsalis	2 pools
	Culex sp.	1 pool
2011	*Culex sp.*	3 pools
2012	*Culex pipiens*	53 pools
	Culex tarsalis	3 pools
	Culex sp.	15 pools
2013	*Culex pipiens*	14 pools
	Culex tarsalis	74 pools
	Anopheles freeborni	1 pool
2014	*Aedes vexans*	4 pools
	Culex pipiens	13 pools
	Culex tarsalis	41 pools

Source: Oregon State University Veterinary Diagnostic Laboratory

*1 pool ≈ 40 mosquitoes

Continued on page 9

Table 8. Trend data, WNV-positive mosquito pools*, Oregon, 2004–2019, cont.

Year	Mosquito species	Number of positives
2015	*Culex pipiens*	20 pools
	Culex tarsalis	35 pools
	Genus Culex	4 pools
2016	*Culex pipiens*	21 pools
	Culex tarsalis	28 pools
	Genus Culex	2 pools
2017	*Culex pipiens*	49 pools
	Culex tarsalis	15 pools
	Genus Culex	28 pools
2018	*Culex pipiens*	13 pools
	Culex tarsalis	37 pools
	Genus Culex	7 pools
2019	*Culex pipiens*	65 pools
	Culex tarsalis	22 pools

Source: Oregon State University Veterinary Diagnostic Laboratory

*1 pool ≈ 40 mosquitoes

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

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

[a] 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).

[b] 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).

[c] Relative number of WNV-positive pools detected. 0, none; +, few; ++++, many.

[d] 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.

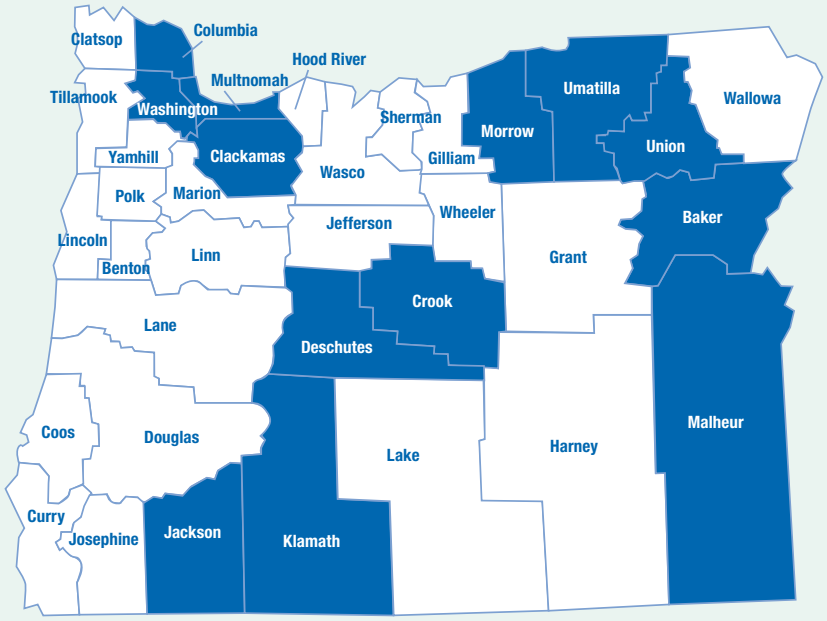
[e] Potential for this species to be an epizootic or bridge vector based on virus isolations from the field, vector competence, feeding behavior, etc. 0, little to no risk; +++++, this species may play a major role.

[f] 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 of Oregon, 2019

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



Oregon vector control districts

County	Mosquito collection	Bird collection
Baker	Yes	Yes
Clackamas		
Columbia		
Crook		
Deschutes		
Jackson		
Klamath		
Malheur		
Morrow		
Multnomah		
Umatilla		
Union		
Washington		

Mosquito/bird collection only		
County	Mosquito collection	Bird collection
Lane	Yes	Yes
Linn		

Source: Oregon Health Authority

Oregon Health Authority
PUBLIC HEALTH DIVISION
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