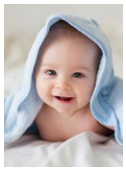
2021

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 2021 identified the following:

- 5 human cases
- 2 avian cases
- 8 equine cases
- 75 positive mosquito pools

Figure 1. Number of positive WNV tests, Oregon, 2021

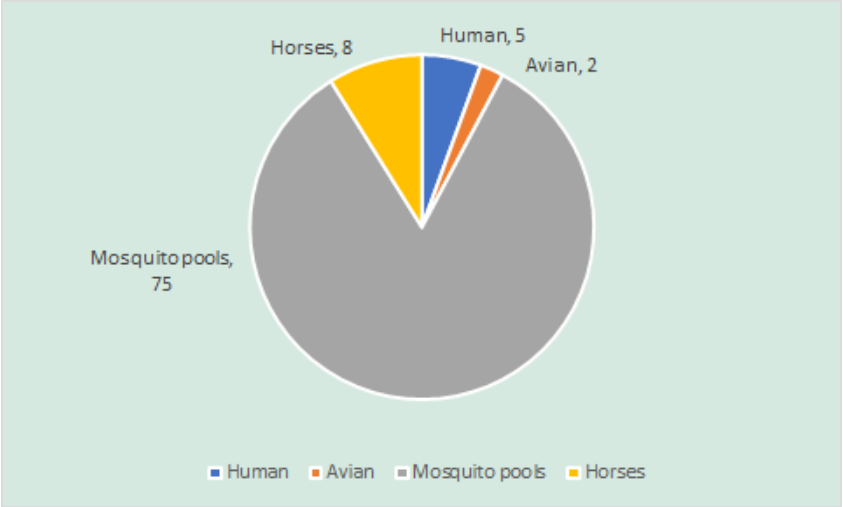


Table 1. Confirmed WNV infections by species, Oregon, 2004–2021

Group	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Human	5	8	73	27	16	12	0	0	12	16	8	1	3	7	2	9	1	5
Horse	32	46	35	16	0	5	0	2	2	6	3	6	6	5	2	9	0	8
Bird	23	15	25	52	2	16	0	0	2	2	7	11	12	1	1	0	1	2
Mosquito	0	11	22	28	16	262	4	3	71	89	58	59	51	92	57	87	3	75
Sentinel chickens*	0	15	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Oregon State University Veterinary Diagnostic 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 two years later when 73 human cases were reported.

The incidence of human WNV disease remained low in Oregon in 2021. Five human cases, 2 birds, 8 horses, and 75 mosquito pools tested positive for WNV in 2021.

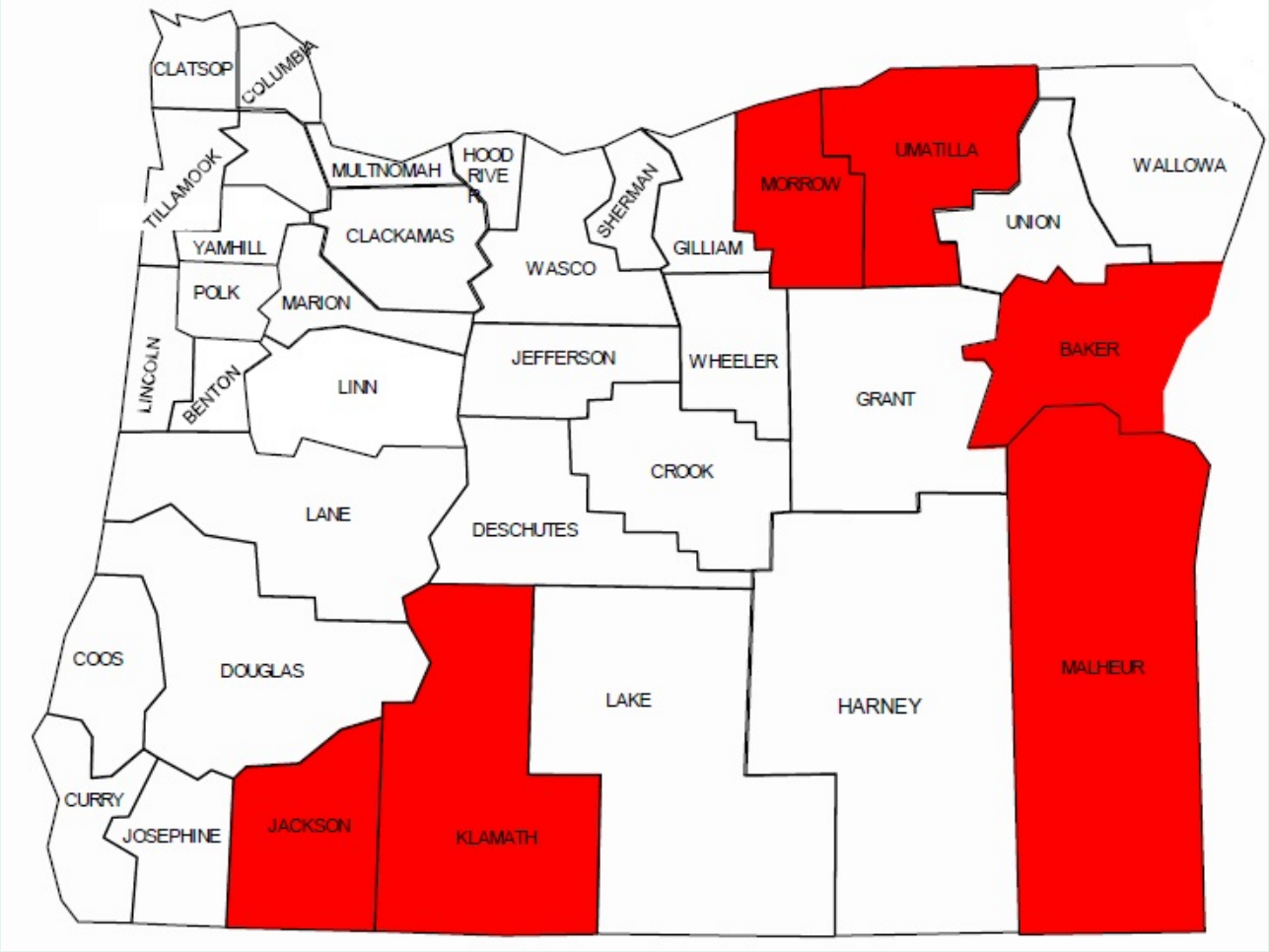
Thirteen vector control districts (VCDs) collect, identify and test dead birds and mosquitoes (in pools of approximately 40 females of the same species) for purposes of WNV surveillance (Figure 4). Some VCDs conduct initial WNV tests for mosquito pools and dead birds using the Rapid Analyte Measurement 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 2021.

Figure 2. Map of Oregon with shaded counties reporting WNV, 2021

County	Mosquitoes	Birds	Horses	Human
Baker	20	0	1	1
Jackson	3	0	1	1
Klamath	0	0	1	1
Malheur	1	0	3	2
Morrow	50	2	1	0
Umatilla	1	0	1	0
Total	**75**	**2**	**8**	**5**



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 2021, five Oregon residents tested positive for WNV by Immunoglobulin M (IgM) antibody (Table 2). 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, 2004–2021

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
2020	1	0	0
2021	5	0	0
Total	**200**	**48**	**3**

Source: Oregon State Public Health Laboratory

Veterinary surveillance

WNV surveillance in Oregon's equine population resulted in 8 positive tests in 2021. Table 3 summarizes the test results by county.

Table 3. Positive equine WNV test results, Oregon, 2021

County	Horses Tested for WNV	Horses with Positive WNV Test Results
Baker	1	1
Jackson	1	1
Klamath	1	1
Malheur	3	3
Morrow	1	1
Umatilla	1	1
Total	**8**	**8**

Source: Oregon State University Veterinary Diagnostic Laboratory

Avian surveillance

WNV surveillance in Oregon's avian population resulted in 2 positive test results out of 32 birds tested by OSU's Veterinary Diagnostic Laboratory and the VCDs; both positives were from birds recovered in Morrow County. Of the 32 birds collected, 15 were of the family Corvidae (aka corvids), while the remaining 17 were American species other than corvid. Table 4 shows Oregon's avian species collection totals by county for 2021. Table 5 presents trend data for avian WNV testing and positive test results for Oregon counties for the years 2004–2021.

Table 4. Avian WNV test results by county, Oregon, 2021

County	Corvids tested	All other species tested	Total	Total Positive
Baker	0	2	2	0
Benton	0	8	8	0
Clackamas	2	4	6	0
Lane	3	0	3	0
Lincoln	0	1	1	0
Crook	0	1	1	0
Morrow	2	0	2	2
Multnomah	5	0	5	0
Umatilla	1	0	1	0
Union	0	1	1	0
Washington	2	0	2	0
TOTAL	**15**	**17**	**32**	**2**

Source: Oregon State Public Health Laboratory

Table 5. Avian WNV tests and trend of positive test results, Oregon, 2004–2021

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%
2020	24	1	4.2%
2021	32	2	6.3%

Source: Oregon State Public Health Laboratory

Sentinel chicken surveillance

Sentinel chicken surveillance was discontinued in 2011.

Mosquito surveillance

In 2021, the VCDs conducted WNV surveillance in Oregon's mosquito population. Figure 4, page 11 shows the counties with participating VCDs and their activities. Statewide, 2,614 mosquito pools were sampled (see Table 7, page 7). The tested mosquitoes comprise 13 mosquito species. OSU conducted polymerase chain reaction (PCR) testing.

Table 6 below displays the number of Oregon mosquito pools by species that tested positive for WNV in 2021. Table 8 (pages 8-9) displays Oregon mosquito species between 2004 and 2021 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, 2021

VCD	Mosquito species	Number of positive mosquito pools	Collection date
Baker	*Culex pipiens*	1	7/20/2021
	Culex tarsalis	18	7/30 to 9/8/2021
	Culex NFS	1	8/19/2021
Jackson	*Culex NFS*	2	8/11 to 8/31/2021
	Culex tarsalis	1	8/4/2021
Malheur	*Culex tarsalis*	1	7/21/2021
Morrow	*Culex pipiens*	34	8/4 to 9/22/2021
	Culex tarsalis	16	8/4 to 9/22/2021
Umatilla	*Culex pipiens*	1	8/12/2021

Source: Oregon vector control districts

Table 7. Female mosquito pools collected by Oregon VCDs and tested for WNV at Oregon State University, 2021

County / VCD	*Aedes dorsalis*	*Aedes increpitus*	*Aedes nigromaculis*	*Aedes vexans*	*Anopheles freeborni*	*Anopheles punctipennis*	*Coquillettidia perturbans*	*Culex* NFS	*Culex pipiens*	*Culex tarsalis*	*Culiseta incidens*	*Culiseta inornata*	*Ochlerotatus nigromaculis*	Total mosquito pools
Baker								21	10	241				**272**
Clackamas				1		1			18	1	13			**34**
Columbia				5		2	2		111	20				**140**
Deschutes				10	2				17	6		1		**36**
Jackson								139	58	78				**275**
Klamath	49	1	26	33	93					30		33	5	**270**
Lane										12				**12**
Linn								68						**68**
Malheur									2	10				**12**
Morrow				17			6		409	242				**674**
Multnomah				10		1			7	14	1			**33**
Umatilla								5	30	22				**57**
Union				257					20	59				**336**
Washington						2			59	334				**395**
Total:	**49**	**1**	**26**	**333**	**95**	**6**	**8**	**233**	**741**	**1069**	**14**	**34**	**5**	**2614**

Source: Oregon vector control districts and Oregon State University

Table 8. Trend data, WNV-positive mosquito pools*, Oregon, 2004–2021

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

2014	*Aedes vexans*	4
	Culex pipiens	13
	Culex tarsalis	41
2015	*Culex pipiens*	20
	Culex tarsalis	35
	Genus Culex	4
2016	*Culex pipiens*	21
	Culex tarsalis	28
	Genus Culex	2
2017	*Culex pipiens*	49
	Culex tarsalis	15
	Genus Culex	28
2018	*Culex pipiens*	13
	Culex tarsalis	37
	Genus Culex	7
2019	*Culex pipiens*	65
	Culex tarsalis	22
2020	*Culex pipiens*	2
	Culex tarsalis	1
2021	*Culex NFS*	3
	Culex pipiens	36
	Culex tarsalis	36

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.

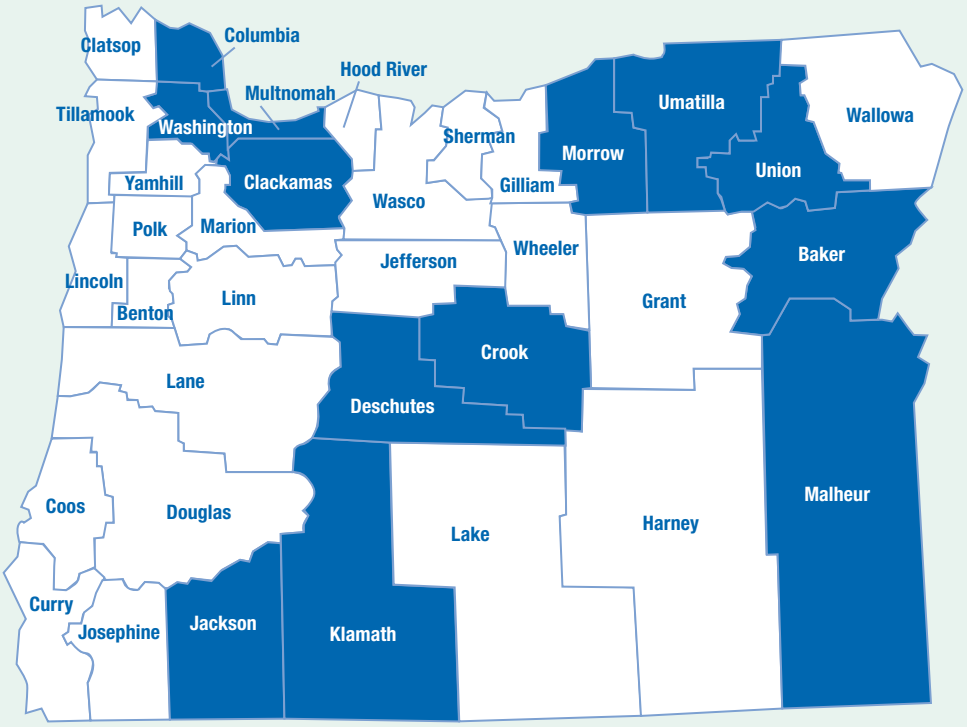
[f] Feeds primarily on avian hosts in spring and early summer and mixed between avian and mammalian hosts in late summer and fall.

* 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 in Oregon

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

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



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