
**State of Oregon
West Nile Virus Summary Report
2010**

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2010 Program Highlights

Some of the principal findings and accomplishments of Oregon’s surveillance, education, and planning programs for West Nile virus (WNV) in 2010 include the following:

- A sharp decrease in the number of WNV positive mosquito pools when compared to recent years.
- For the first time no human cases reported since first appearance in 2004.
- No cases of WNV positive birds, horses, and other mammals were reported.

Figure 1 summarizes positive WNV tests by month of collection in Oregon during 2010. Table 1 summarizes WNV in Oregon, by year, 2004-2010.

Figure 1. Positive WNV tests by month of collection for Oregon, 2010.

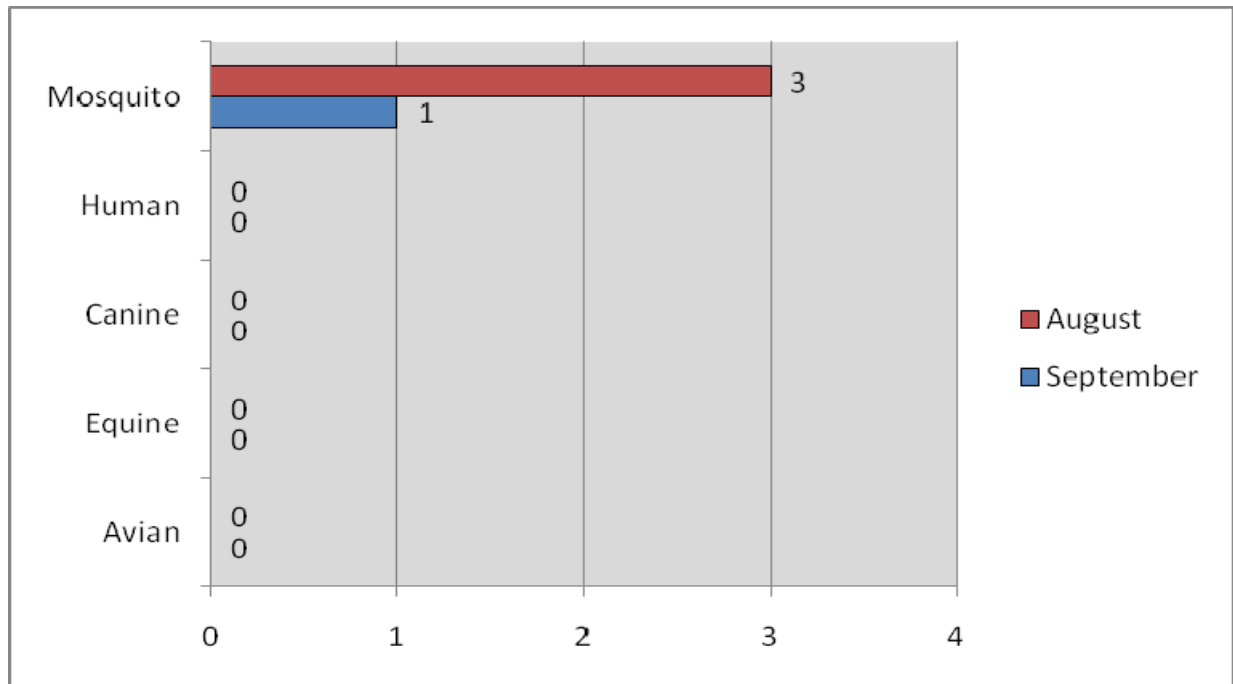


Table 1. Confirmed WNV infections in Oregon, 2004–2010.

Group	2004	2005	2006	2007	2008	2009	2010
Human	5	8	73	27	16	12	0
Horses	32	46	35	16	0	5	0
Birds	23	15	25	52	2	16	0
Mosquito Pools	0	11	22	28	16	262	4
Sentinel Chickens	0	15	0	11	0	0	0

Introduction

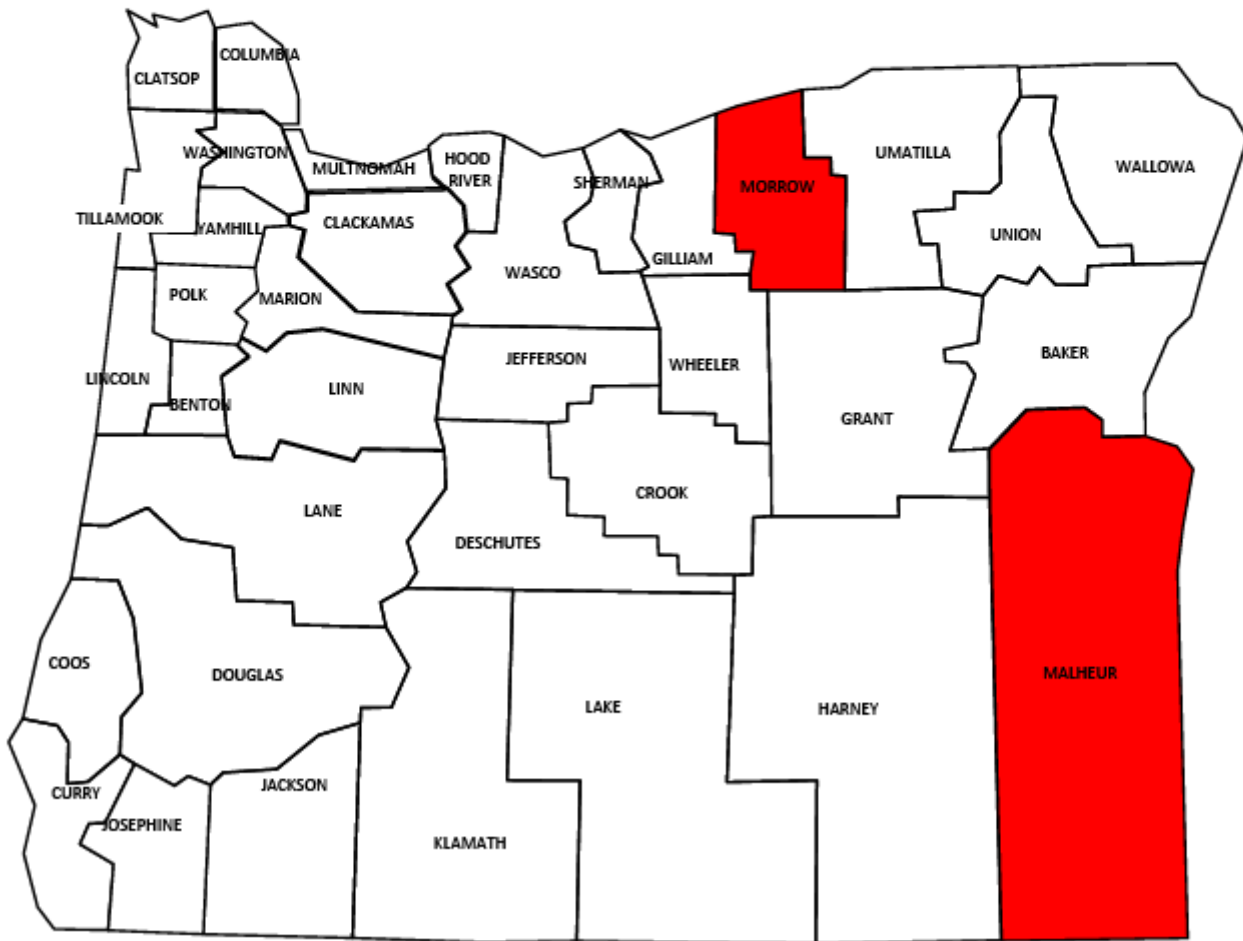
West Nile Virus (WNV) first appeared in Oregon in 2004. Our first human, avian, and equine WNV cases were all diagnosed in August 2004. In 2010, no humans, birds, horses, or domesticated canines were diagnosed with WNV infection.

Oregon's surveillance program for WNV was launched in 2001 and has since expanded to include 19 Vector Control Districts (VCDs) located throughout the state (see map of Oregon with participating VCDs highlighted in Figure 5). The VCDs collect mosquitoes and dead birds, identify them, and prepare them for testing. Some VCDs conduct initial WNV tests for mosquito pools and dead birds using RAMP (Rapid Analyte Measurement Platform). Because of financial constraints and reductions of labor resources, sentinel chicken surveillance was suspended by all VCDs in Oregon in 2009. In counties without VCD, this work may be conducted by the local health department. Confirmatory testing of WNV for humans 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.

The Oregon WNV surveillance findings for humans, horses, birds, and mosquitoes in 2010 are summarized in the sections that follow.

Figure 2. Map of Oregon with shaded counties reporting WNv, 2010.

WEST NILE VIRUS OREGON MAP, 2010



WNV Surveillance and Related Activities

Human Surveillance

In 2010, no Oregon residents tested positive for WNV by IgM antibody

Table 2. Trend data for Oregon residents who contracted WNV in Oregon, 2004–2010

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

Veterinary Surveillance

Surveillance for WNV in Oregon’s equine population also resulted in no positive tests.

Avian Surveillance

Surveillance for WNV in Oregon’s avian population resulted in no positive test results out of 24 birds tested by OSU’s Veterinary Diagnostic Laboratory and the VCDs. Of the 24 birds that were collected, 18 were of the family Corvidae (a.k.a. corvids) while the remaining six were American species other than corvid. Table 3 shows the avian species collection totals in Oregon by county for 2010. Trend data for avian WNV testing and positive test results for Oregon counties for the years 2004–2010 are presented in Table 4.

Table 3. Avian WNV test results for Oregon Counties, 2010.

Avian Species Collection Totals by County			
County	Total Corvid Tested	Total Other Tested	Total Positive Tests
Benton County	1	0	0
Clackamas County	2	0	0
Columbia County	1	1	0
Crook County	1	0	0
Klamath County	1	0	0
Lane County	1	0	0
Lincoln County	1	0	0
Morrow County	1	1	0
Multnomah County	3	1	0
Umatilla County	4	1	0
Washington County	2	1	0
Yamhill County	0	1	0
TOTAL	18	6	0

Table 4. Avian WNV tests and trend of positive test results for Oregon counties, 2004–2010.

Year	Number Tested	Number Positive	% Positive
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%

Mosquito Surveillance

In 2010, the VCDs conducted surveillance for WNV in Oregon’s mosquito population. Figure 4 shows the counties with participating VCDs and their activities. Statewide, 187,365 individual female mosquitoes were collected and 165,191 of those collected were tested for WNV. The mosquitoes submitted represent 18 mosquito species. PCR testing for WNV was conducted by OSPHL and RAMP was performed by some VCDs. Table 5 displays the number of mosquito pools per species that tested positive for WNV in Oregon in 2010 only. Table 6 displays the mosquito species and the number of individual female mosquitoes that VCDs collected for testing in Oregon in 2010. Table 7 displays the mosquito species in Oregon between 2004 through 2010 found positive for WNV. Figure 3 indicates the efficiency of vector transmission for various mosquito species (information obtained from the Centers for Disease Control and Prevention).

Table 5. WNV Positive Mosquito Pools, Oregon 2010.

VCD	Mosquito Species	Number of Positive Mosquito Pools	Collection Date
Morrow County	<i>Culex tarsalis</i>	1	8/2/2010
Malheur County	<i>Culex sp.</i>	1	8/18/2010
Morrow County	<i>Culex tarsalis</i>	1	8/23/2010
Morrow County	<i>Culex pipiens</i>	1	9/7/2010

Table 6. Female mosquitoes collected for testing by Oregon VCDs, 2010.

	<i>Aedes cinereus</i>	<i>Aedes dorsalis</i>	<i>Aedes increpitus</i>	<i>Aedes niphadopsis</i>	<i>Aedes sticticus</i>	<i>Aedes vexans</i>	<i>Anopheles freeborni</i>	<i>Anopheles punctipennis</i>	<i>Coquillettidia perturbans</i>	<i>Culex erythrothorax</i>	<i>Culex pipiens</i>	<i>Culex sp.</i>	<i>Culex tarsalis</i>	<i>Culiseta impatiens</i>	<i>Culiseta incidens</i>	<i>Culiseta inornata</i>	<i>Culiseta sp.</i>	Other Species / Unknown
Baker	0	0	0	0	0	93	0	0	0	0	0	0	2537	0	0	0	0	0
Clackamas	0	0	0	0	0	677	0	0	0	0	1715	0	99	0	0	0	0	0
Columbia	0	0	985	0	23162	21675	0	282	0	0	437	0	697	0	0	0	0	450
Deschutes	0	0	0	200	0	3675	0	0	0	0	160	0	800	0	0	485	0	110
Jackson	0	0	0	0	0	6634	0	0	4739	4498	318	0	2149	0	0	0	0	0
Klamath	0	1634	0	0	0	13757	0	0	0	0	0	0	3148	0	0	1393	0	0
Lane	0	0	0	0	0	1400	0	0	0	0	258	0	707	0	0	0	0	0
Malheur	0	0	0	0	0	0	0	0	0	0	0	2912	1004	0	0	0	0	0
Morrow	0	40	0	0	0	2268	0	0	0	0	3760	0	8315	0	0	0	0	0
Multnomah	27	0	0	0	1702	6746	0	0	0	0	1011	0	1930	0	115	0	0	0
Umatilla	0	0	0	0	0	0	0	0	0	0	11507	2648	17535	0	0	0	20	0
Union	0	0	0	0	0	0	0	0	0	0	53	0	1765	0	0	0	0	0
Washington	0	0	0	0	0	0	38	230	136	0	2144	0	314	39	0	58	0	0
TOTAL	27	1674	985	200	24864	56925	38	512	4875	4498	21363	5560	41000	39	115	1936	20	560

Table 7. Trend data, WNV Positive Mosquito Pools, Oregon 2004–2010.

Year	Mosquito Species	Number of Positives
2004	-	-
2005	<i>Culex tarsalis</i>	(11 pools)*
	<i>Culex stigmatosoma</i>	
2006	<i>Culex pipiens</i>	(22 pools)
	<i>Culex tarsalis</i>	
2007	<i>Aedes Vexans</i>	(8 pools)
	<i>Culex pipiens</i>	(2 pools)
	<i>Culex tarsalis</i>	(23 pools)
2008	<i>Aedes vexans</i>	(5 pools)
	<i>Culex pipiens</i>	(3 pools)
	<i>Culex tarsalis</i>	(8 pools)
2009	<i>Aedes vexans</i>	(1 pool)
	<i>Anopheles freeborni</i>	(1 pool)
	<i>Anopheles punctipennis</i>	(1 pool)
	<i>Coquillettidia perturbans</i>	(1 pool)
	<i>Culex pipiens</i>	(75 pools)
	<i>Culex tarsalis</i>	(131 pools)
2010	<i>Culex sp.</i>	(52 pools)
	<i>Culex pipiens</i>	(1 pool)
	<i>Culex tarsalis</i>	(2 pools)
	<i>Culex sp.</i>	(1 pool)

*1 pool ≈ 50 mosquitoes

Figure 3. Potential Oregon vectors of WNV based on laboratory vector competence studies (2). *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 ^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
<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 ^f	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 ^f	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).

^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.

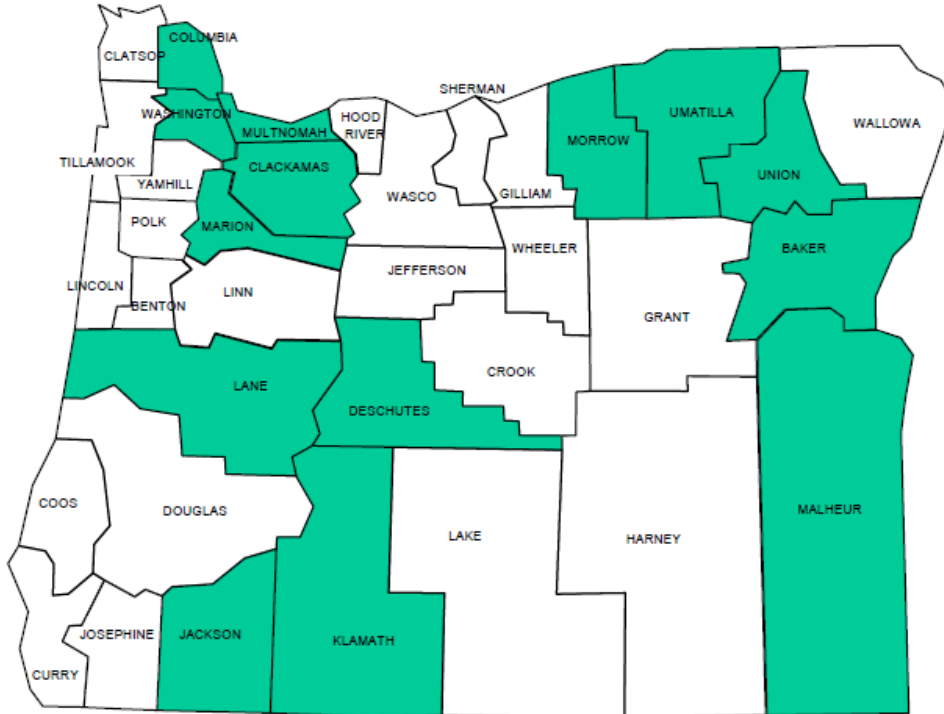
^d Potential for this species to be an enzootic or maintenance vector based on virus isolations from the field, vector competence, feeding behavior, etc. 0, little to no risk; +++++, this species may play a major role.

^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.

Vector Control Districts

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



District/county	Mosquito collection	Mosquito fish	Sentinel Chickens	Bird collection	Larvaciding	Adulticiding
Columbia	*			*	*	*
Deschutes	*			*	*	*
Jackson	*			*	*	*
Klamath	*	*		*		*
Lane	*			*		
Malheur				*		
Marion	*			*	*	*
Morrow	*			*	*	*
Multnomah	*	*		*	*	*
Umatilla	*	*		*	*	*
Union	*	*		*	*	*
Washington	*	*		*	*	*

References

1. Kilpatrick AM, Kramer LD, Jones MJ, Marra PP, Daszak P (2006) West Nile virus epidemics in North America are driven by shifts in mosquito feeding behavior. PLoS Biol 4(4): e82.
2. 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).

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