State of Oregon
West Nile Virus Summary Report
2012

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2012 Program Highlights

Some of the principal findings and accomplishments of Oregon's surveillance, education, and planning programs for West Nile virus (WNV) in 2012 include the following:

- Continued statewide surveillance of mosquitoes, humans, birds, sentinel chickens, and horses.
- 12 human cases of WNV reported.
- No cases of WNV positive birds.

Figure 1. Number of positive WNV tests, Oregon, 2012.

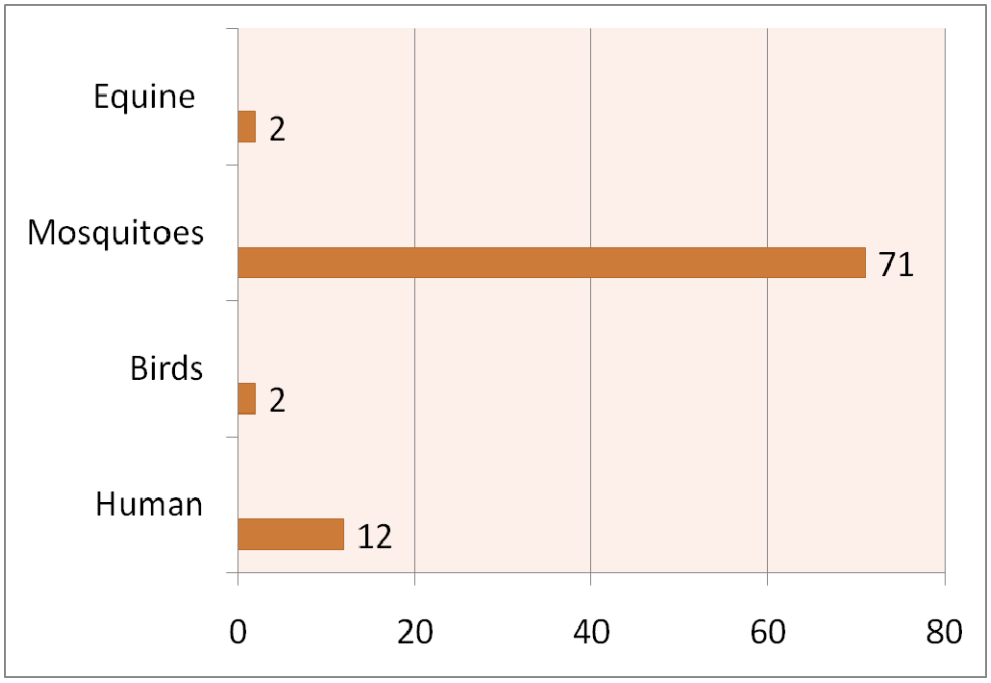


Table 1. Confirmed WNV infections in Oregon, 2004–2012.

Group	2004	2005	2006	2007	2008	2009	2010	2011	2012
Human	5	8	73	27	16	12	0	0	12
Horses	32	46	35	16	0	5	0	2	2
Birds	23	15	25	52	2	16	0	0	2
Mosquito Pools	0	11	22	28	16	262	4	3	71
Sentinel Chickens	0	15	0	11	0	0	0	0	0

Introduction

Oregon's surveillance program for WNV was launched in 2001. West Nile Virus (WNV) first appeared in Oregon in 2004 when the first human, avian, and equine WNV cases were diagnosed.

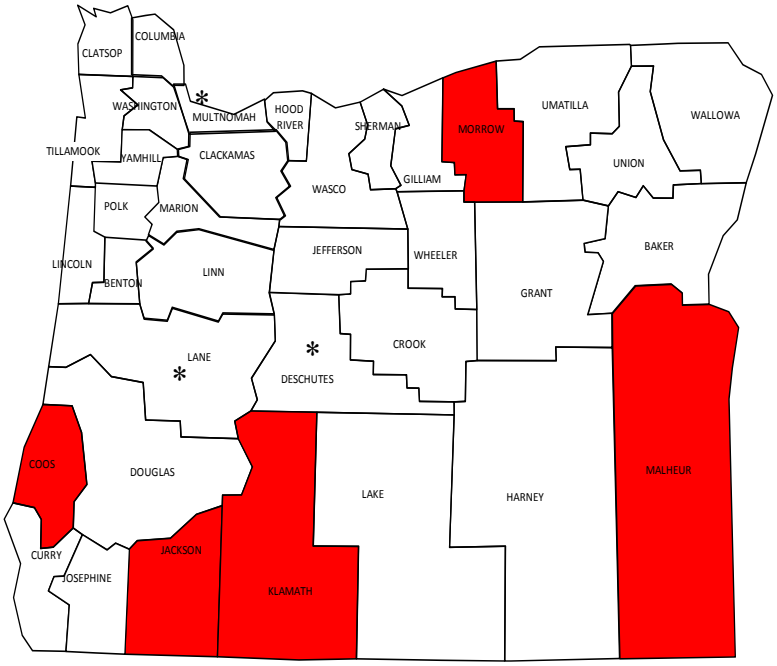
In 2012, 12 Oregonians, 2 birds, 2 horses and 71 mosquito pools were diagnosed with WNV.

Twelve Vector Control Districts (VCDs) and one county health department perform mosquito surveillance in Oregon (Figure 4). One sentinel chicken surveillance flock is located in Jackson County (southern Oregon).

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). In counties without VCDs, this work may be conducted by the local health department or the Oregon Department of Fish and Wildlife (ODFW). 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 2012 are summarized in the sections that follow.

Figure 2. Map of Oregon with shaded counties reporting WNV, 2012.



County	Human	Chicken	Birds/Raptor	Horses	Mosquitoes
Coos	1	0	0	0	0
Deschutes	1*	0	0	0	0
Jackson	0	0	1	0	1
Klamath	0	0	0	2	0
Lane	1*	0	0	0	0
Malheur	8	0	1	0	68
Morrow	0	0	0	0	2
Multnomah	1*	0	0	0	0
Total	**12**	**0**	**2**	**2**	**71**

* Human infections acquired out-of-state

Updated: November 1, 2012

WNV Surveillance and Related Activities

Human Surveillance

In 2012, 12 Oregon residents tested positive for WNV by IgM antibody.

Table 2. Trend data for Oregon residents who contracted WNV in Oregon, 2004–2012

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

Veterinary Surveillance

Surveillance for WNV in Oregon's equine population resulted in 2 positive tests while 14 other equine tests were negative for WNV. Positive test results for Oregon counties in 2012 are summarized in Table 3. No other mammals tested positive for WNV in 2012.

Table 3. Positive Equine WNV test results, Oregon 2012.

County	Number of Positive Test Results
Klamath	2
Total	**2**

Avian Surveillance

Surveillance for WNV in Oregon's avian population resulted in two positive test results out of 35 birds tested by OSU's Veterinary Diagnostic Laboratory and the VCDs. Of the 35 birds that were collected, 20 were of the family Corvidae (a.k.a. corvids) while the remaining 15 were American species other than corvid. Table 4 shows the avian species collection totals in Oregon by county for 2012. Trend data for avian WNV testing and positive test results for Oregon counties for the years 2004–2012 are presented in Table 5.

Table 4. Avian WNV test results for Oregon Counties, 2012.

Avian Species Collection Totals by County			
County	**Total Corvid Tested**	**Total Other Species Tested**	**Total Positives**
Baker	0	1	0
Benton	1	9	0
Clatsop	1	0	0
Harney	1	1	0
Jackson	2	0	1
Klamath	0	1	0
Lake	0	1	0
Lane	4	0	0
Malheur	1	0	1
Morrow	1	0	0
Multnomah	8	1	0
Umatilla	1	0	0
Union	0	1	0
TOTAL	20	15	2

Table 5. Avian WNV tests and trend of positive test results for Oregon counties, 2004–2012.

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%
2011	20	0	0%
2012	35	2	6%

Sentinel Chicken Surveillance

The only sentinel chicken flock for 2012 was located in Jackson County. None of the sentinel chickens were diagnosed with WNV in 2012. Additionally, United States Department of Agriculture collected blood samples from chickens showed at several county fairs including Jefferson, Crook, Wasco and Deschutes counties. None of the samples tested positive for WNV.

Mosquito Surveillance

In 2012, the VCDs conducted surveillance for WNV in Oregon's mosquito population. Figure 3 indicates the efficiency of vector transmission for various mosquito species (information obtained from the Centers for Disease Control and Prevention). Figure 4 (page 12) shows the counties with participating VCDs and their activities. Statewide, 179,754 individual female mosquitoes were collected and tested for WNV. The mosquitoes submitted represent 14 mosquito species. PCR testing for WNV was conducted by OSPHL and RAMP was performed by some VCDs. Table 6 displays the number of mosquito pools per species that tested positive for WNV in Oregon in 2012 only. Table 7 displays the mosquito species and the number of individual female mosquitoes that VCDs collected for testing in Oregon in 2012. Table 8 displays the mosquito species in Oregon between 2004 through 2012 found positive for WNV.

Table 6. WNV Positive Mosquito Pools, Oregon 2012.

VCD	Mosquito Species	Number of Positive Mosquito Pools	Collection Date
Jackson	*Culex tarsalis*	1	8/10
Malheur	*Culex tarsalis*	1	7/26
Malheur	*Culex pipiens*	52	7/26 – 9/7
Malheur	*Culex* sp.	15	7/12 - 8/31
Morrow	*Culex tarsalis*	1	8/15
Morrow	*Culex pipiens*	1	8/15

Table 7. Female mosquitoes collected for testing by Oregon VCDs, 2012.

County	*Aedes cinereus*	*Aedes dorsalis*	*Aedes increpitus*	*Aedes sticticus*	*Aedes vexans*	*Anopheles freeborni*	*Anopheles punctipennis*	*Coquillettidia perturbans*	*Culex erythrothorax*	*Culex pipiens*	*Culex sp.*	*Culex tarsalis*	*Culiseta inornata*	*Other Species/Unkown*	
Baker	0	0	0	0	0	0	61	0	0	0	0	4,569	11	0	
Clackamas	0	0	0	6	8	52	100	4	0	1,445	0	65	1	449	
Columbia	0	0	2	927	378	0	720	968	0	3,645	0	519	3	19	
Crook	0	0	0	0	0	125	0	0	0	0	0	911	40	88	
Deschutes	0	0	0	0	22,129	348	0	0	0	80	0	260	428	929	
Jackson	0	6	6,055	34	4,393	527	878	5,562	20,479	3,446	106	6,616	223	916	
Klamath	0	0	0	0	966	1,104	0	0	0	86	50	4,266	2,004	1,905	
Lane	0	0	0	0	1,089	0	0	0	0	618	0	381	0	42	
Malheur	0	0	0	0	0	0	0	0	0	32	563	2,786	0	301	
Morrow	0	23	522	0	1,387	1,159	20	43	0	8,778	0	8,599	1,391	0	
Multnomah	21	0	697	3,980	9,802	34	906	211	0	4,760	9	4,860	215	868	
Umatilla	0	0	0	0	0	0	0	0	0	8,055	262	2,621	0	11	
Union	0	0	0	0	0	0	0	0	0	1,548	0	1,548	0	0	
Washington	2	0	0	0	3,661	28	540	39	0	2,859	694	1,118	13	3,746	
Total	23	29	7,276	4,947	43,813	3,377	3,225	6,827	20,479	35,352	1,684	39,119	4,329	9,274	total 179,754

Table 8. Trend data, WNV Positive Mosquito Pools, Oregon 2004–2012.

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

*1 pool ≈ 50 mosquitoes

Figure 3. Potential Oregon vectors of WNV based on laboratory vector competence studies.[1] ***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]
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.

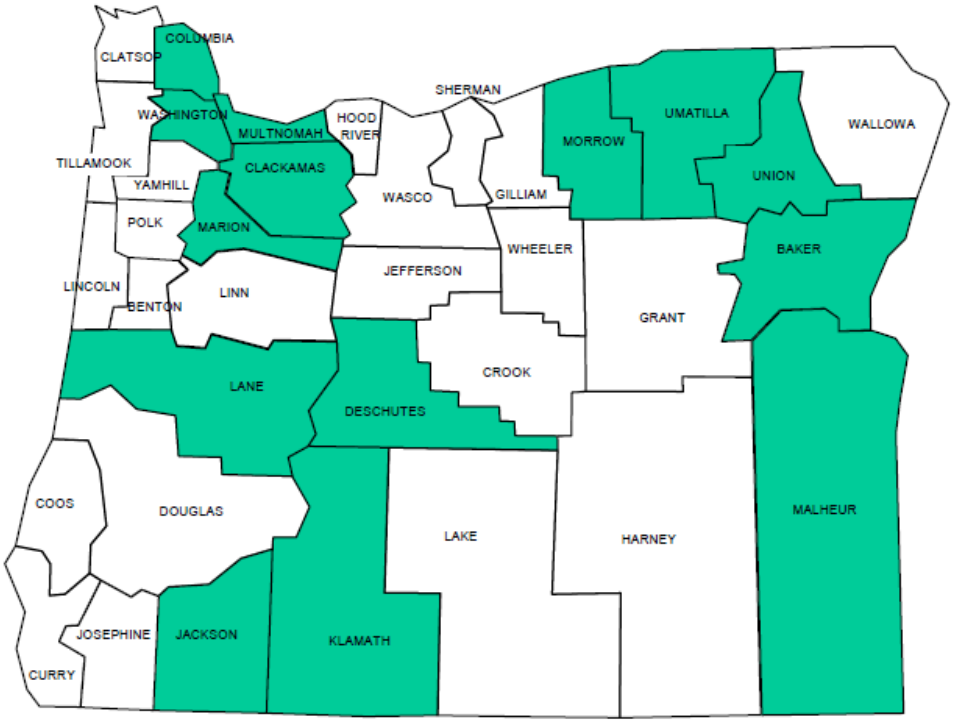
[d] Potential for this species to be an enzootic or maintenance vector based on virus isolations from the field, vector competence, feeding behavior, etc. 0, little to no risk; +++++, this species may play a major role.

[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.

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. 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).

Acknowledgment:

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