# 2005 West Nile Virus Summary Report for Oregon

December 2005


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## 2005 Program Highlights

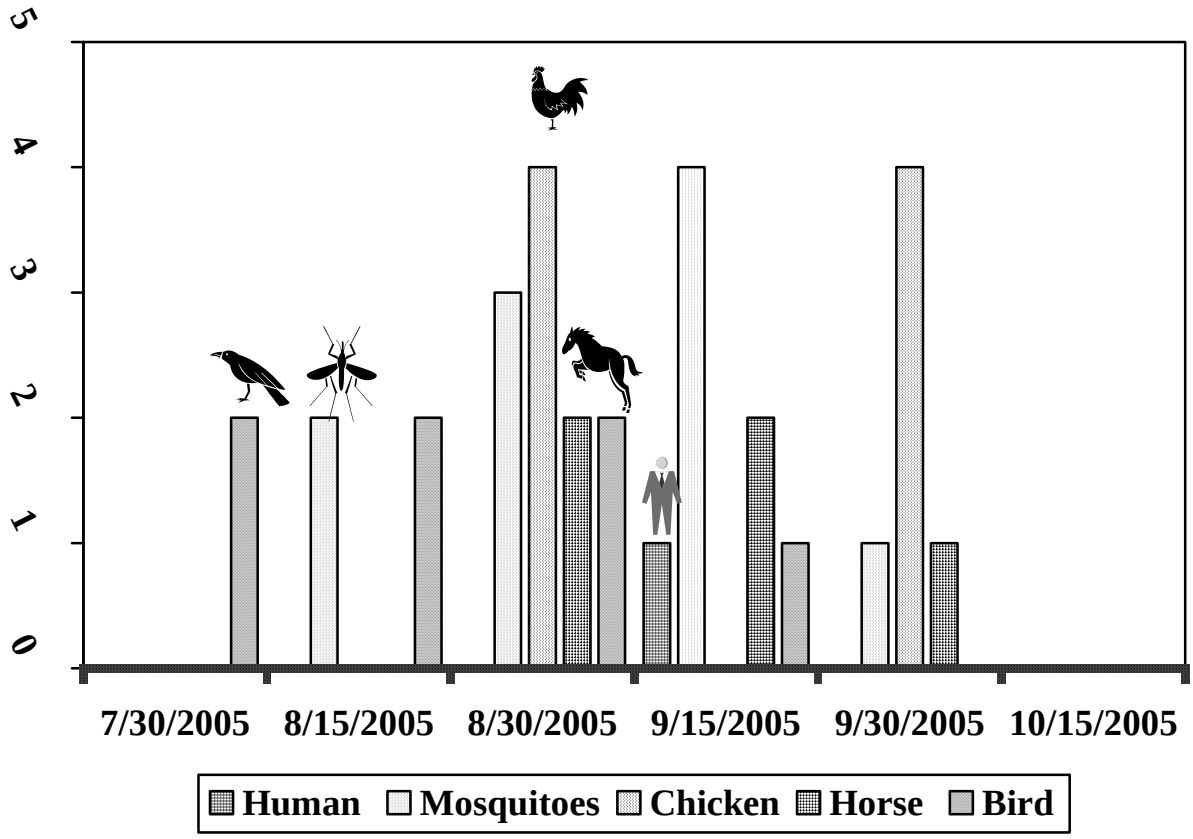
- The first Oregon sentinel chicken and mosquito pool positive for West Nile Virus (WNV) were identified in 2005.
- Surveillance for WNV was conducted in mosquitoes, birds, sentinel chickens, horses and other animals, and humans.
- Overall, WNV activity continued at a relatively low level in Oregon in 2005.
- The State of Oregon's WNV web pages and public information and education documents were updated to reflect current information and improve dissemination and communication of information.
- Implemented new, real-time testing procedures to assist local health departments and vector control districts in enhanced planning and response.
- Surveillance expansion included two additional county health departments (Lane and Jefferson).

## Introduction

Oregon's WNV surveillance program was launched in 2001 and has since expanded to include 13 Vector Control Districts (VCDs) and three counties in the process of forming VCD located throughout the state (see Figure 2). The VCDs collect mosquito pools, maintain sentinel chicken flocks, and conduct initial WNV tests on mosquitoes, sentinel chickens, and dead birds. Confirmatory testing of WNV for humans, mosquitoes, and sentinel chickens is performed by the Oregon State Public Health Laboratory (OSPHL), which now has the capacity to do both enzyme immunoassay (EIA) and polymerase chain reaction (RT-PCR) for WNV. Oregon State University's (OSU's) Veterinary Diagnostic Laboratory performs all WNV testing of horses and dead birds.

WNV appeared in Oregon in 2004 with the first human, avian, and equine WNV cases diagnosed in August 2004. The 2005 Oregon WNV surveillance findings for humans, horses, birds, mosquitoes, and chickens are summarized in the sections below.

Figure 1.


5
4
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10/15/2005
Human
Mosquitoes
Chicken
Horse
Bird

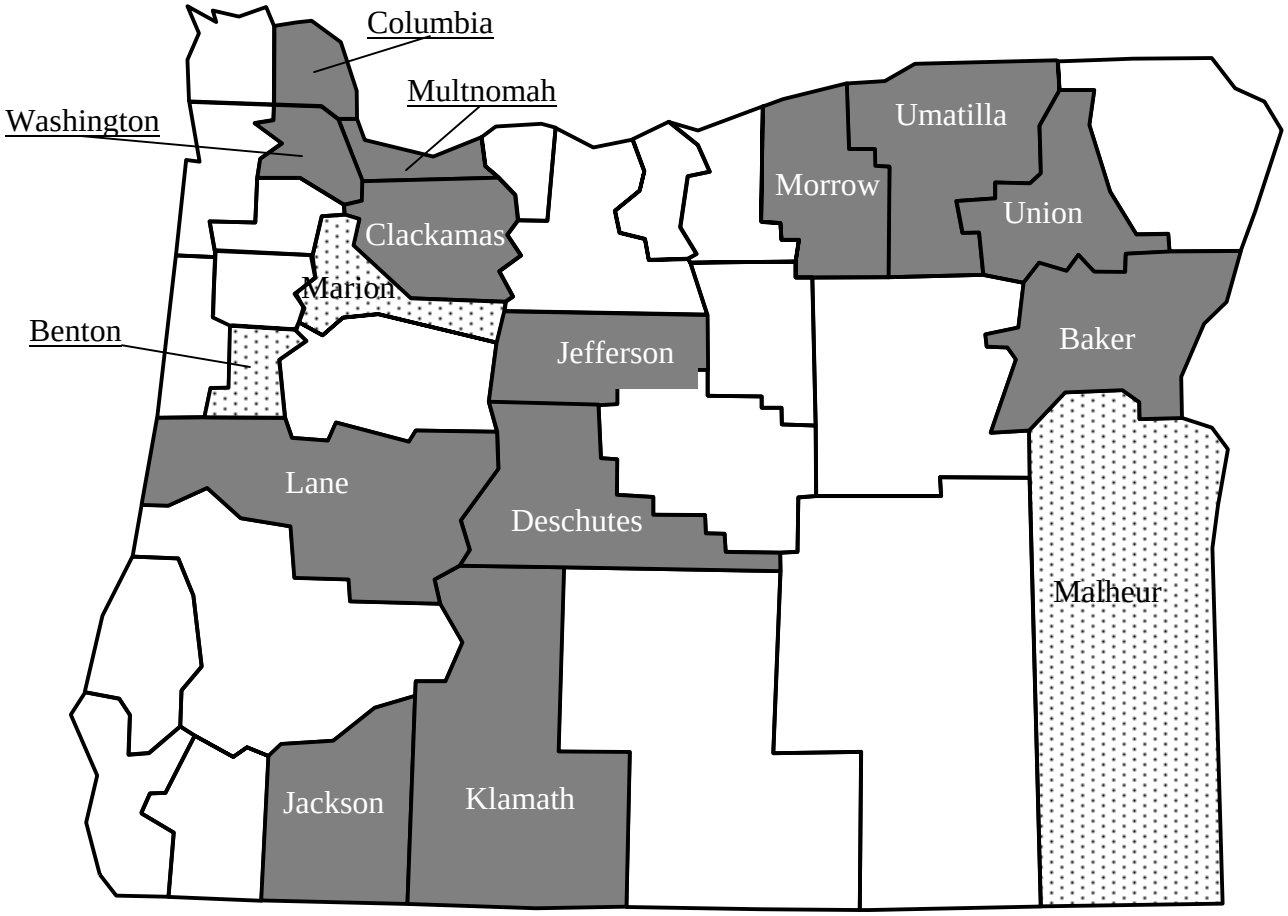


**Figure 2 Map of Oregon with the counties of participating Vector Control Districts (VCDs) and local county health departments marked in gray. Counties marked in grey pattern are in the process of forming a VCD.**

# WNV Surveillance and Related Activities

## Human Surveillance

In 2005, eight Oregon residents tested positive for WNV by IgM testing, including two people who contracted WNV out of state. One case was detected through testing of donated blood. There were zero fatalities and all cases were of White ethnicity, not Hispanic or Latino. The mean age was 38 years within a range of 29 to 50 years. Descriptive dates are presented in Table 1.

**Table 1 Descriptive data for Oregon residents who contracted WNV in Oregon in 2005.**

| Case | Collection date | Sex | County | County/State of exposure | Symptoms |
|---|---|---|---|---|---|
| 1 | 7/04/05 | F | Marion | California | West Nile Fever |
| 2 | 7/12/05 | M | Lane | Josephine Co., Oregon | Asymptomatic/Blood donor |
| 3 | 7/21/05 | M | Benton | California | West Nile Fever |
| 4 | 7/23/05 | F | Malheur | Malheur Co. | West Nile Fever |
| 5 | 8/01/05 | M | Malheur | Malheur Co. | West Nile Fever |
| 6 | 8/21/05 | F | Jackson | Jackson Co. | West Nile Fever |
| 7 | 8/27/05 | F | Malheur | Malheur Co. | West Nile Fever |
| 8 | 9/27/05 | F | Malheur | Malheur Co. | West Nile Encephalitis |

## Equine Surveillance

Surveillance for WNV in Oregon's equine population resulted in 46 positive results tested by Oregon State University's Veterinary Diagnostic Laboratory. Numbers of equines tested and found positive for WNV, by county, are summarized in Table 2.

**Table 2 Equine found positive for WNV, by county, in 2005.**

| County* | Number of Equines Tested | Number of Positive Test Results |
|---|---|---|
| **Baker** | **1** | **1** |
| Benton | 0 | 0 |
| Clackamas | 0 | 0 |
| Clatsop | 1 | 0 |
| Crook | 0 | 0 |
| Curry | 1 | 0 |
| Deschutes | 3 | 0 |
| Douglas | 1 | 0 |
| Grant | 1 | 0 |
| **Harney** | **57** | **32** |
| **Jackson** | **9** | **5** |
| **Josephine** | **5** | **1** |
| **Klamath** | **8** | **4** |
| Lane | 0 | 0 |
| Linn | 1 | 0 |
| **Malheur** | **3** | **2** |
| Marion | 0 | 0 |
| Polk | 0 | 0 |
| **Umatilla** | **1** | **1** |
| **Union** | **2** | **0** |
| Wallowa | 4 | 0 |
| Washington | 0 | 0 |
| Wheeler | 1 | 0 |
| Yamhill | 1 | 0 |
| Total | 100 | 46 (46%) |

* Counties with positive test results are indicated in bold

## Avian Surveillance

Surveillance for WNV in Oregon's avian population resulted in 15 positive birds tested by OSU's Veterinary Diagnostic Laboratory and the VCDs. Avian species, found positive for WNV in Oregon in 2005 are presented in Table 4.

**Table 3 Avian WNV tests and positive test results for Oregon counties in 2005.**

| County* | No. of Avian Specimens Tested | No. of Positive Test Results |
|---|---|---|
| Baker | 5 | 0 |
| Benton | 9 | 0 |
| Clackamas | 21 | 0 |
| Clatsop | 5 | 0 |
| Columbia | 5 | 0 |
| Coos | 1 | 0 |
| Crook | 4 | 0 |
| Curry | 1 | 0 |
| Deschutes | 16 | 0 |
| Douglas | 6 | 0 |
| Harney | 0 | 0 |
| Hood River | 1 | 0 |
| **Jackson** | **28** | **9** |
| Jefferson | 1 | 0 |
| **Josephine** | **9** | **1** |
| **Klamath** | **3** | **2** |
| **Lake** | **1** | **1** |
| **Lane** | **38** | **1** |
| Lincoln | 11 | 0 |
| Multnomah | 62 | 0 |
| Polk | 5 | 0 |
| Tillamook | 6 | 0 |
| Umatilla | 8 | 0 |
| Union | 4 | 0 |
| Wasco | 0 | 0 |
| Washington | 17 | 0 |
| Yamhill | 3 | 0 |
| Total | 298 | 15(5%) |

Table 4. WNV positive birds by species, Oregon 2005

| Avian Species | Number of positive test results |
|---|---|
| Crow | 5 |
| Scrub Jay | 9 |
| Red-tailed Hawk | 1 |
| Total | 15 |

## Mosquito Surveillance

In 2005, adult mosquitoes were collected by various methods including CDC, New Jersey, and Gravid traps. Mosquitoes were separated by species, sex and were pooled into clusters of 25-50 mosquitoes to be tested for the presence of WNV using RT-PCR conducted by OSPHL. A total of 139,420 individual mosquitoes were collected statewide with representation from at least 21 mosquito species. In 2005, the most commonly collected mosquito were *Culex tarsalis* and *Culex.pipiens,* which are both competent vectors of WNV. Table 5 displays the number of individual adult mosquitoes collected and tested, by county, and by species. Table 6 displays the species of adult mosquitoes that tested positive for WNV.

**Table 5. Adult mosquitoes collected and tested for WNV, by County and by species, Oregon 2005.**

| **Vector Control Districts/ County** | *Aedes cinereus* | *Aedes. vexans* | *Aedes. sp.* | *Anopheles freeborni* | *Anopheles. punctipennis* | *Coquillettidia perturbans* | *Culex erythrothorax* | *Culex. pipiens* | *Culex. stigmatosoma* | *Culex. tarsalis* | *Culiseta impatiens* | *Culiseta. incidens* | *Culiseta. inornata* | *Culiseta. minnesotae* | *Culiseta. particeps* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Baker | | 201 | | | | | | 65 | | 5502 | | 10 | 41 | | |
| Clackamas | 3 | 59 | 3 | | 53 | | | 180 | 9 | 115 | | 146 | 23 | | 93 |
| Columbia | | 9197 | | | 58 | 278 | | 160 | | 2446 | | | 40 | | 173 |
| Deschutes (Four Rivers) | | 220 | | | | | | | | 663 | | | 1183 | | |
| Jackson | | 3983 | | | | 3412 | 5634 | 2833 | 165 | 5802 | | | | | |
| Jefferson | | | 1750 | | | | | | | 227 | | | | | |
| Klamath | | | | | | | | 769 | | 2194 | | | 2440 | | |
| Lane | | 3333 | | | | | | 5419 | | 3231 | | | | | |
| Morrow | | 1131 | | 1032 | | 130 | | 1533 | | 3221 | | | | | |
| Multnomah | | 6253 | | | 352 | 554 | | 13938 | 811 | 9132 | | 276 | 837 | 1365 | 22 |
| Umatilla | | 1721 | | | | 425 | | 12314 | | 12677 | 95 | | 107 | | |
| Union | | 554 | | | | | | | | 1376 | | | 60 | | |
| Washington | | 20 | | | | | | 1211 | 12 | 337 | | | 15 | 78 | |
| TOTAL | 3 | 26672 | 1753 | 1032 | 463 | 4799 | 5634 | 38422 | 997 | 46923 | 95 | 432 | 4746 | 1413 | 288 |

**Table 5(continued) Adult mosquitoes collected and tested for WNV, by County, by species in 2005.**

| Vector Control Districts/ County | *Ochlerotatus dorsalis* | *Ochlerotatus. increpitus* | *Ochlerotatus. nigromaculis* | *Ochlerotatus. sierrensis* | *Ochlerotatus. sticticus* | *Ochlerotatus .washinoi* |
|---|---|---|---|---|---|---|
| Baker | 301 | | 579 | | | |
| Clackamas | | 7 | | 14 | | |
| Columbia | | | | | | |
| Deschutes (Four Rivers) | | 121 | | | | |
| Jackson | | | | | | |
| Jefferson | | | | | | |
| Klamath | 613 | | 1484 | | | |
| Lane | | | | | | |
| Morrow | 167 | 28 | | | | |
| Multnomah | | | | 46 | 1739 | 634 |
| Umatilla | 15 | | | | | |
| Union | | | | | | |
| Washington | | | | | | |
| TOTAL | 1096 | 156 | 2063 | 60 | 1739 | 634 |

**Table 6 Positive mosquitoes collected by Oregon VCDs in 2005.**

| Vector Control District | Number of WNV Positive Tests* |
|---|---|
| Jackson Co Vector District | 11 mosquito pools were positive |
| | *Culex tarsalis*<br>*Culex stigmatosoma*<br>*Culex pipiens* |

Table 7 Potential Oregon vectors of WNV based on laboratory vector competence studies (Turell et al 2005) "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.

## Sentinel Chicken Surveillance

Seven of the Oregon local public health departments and or VCD conducted WNV surveillance with strategically located sentinel chicken flocks in 2005. Seventeen individual chickens; all located in Jackson County tested positive by the Oregon State Public Health Laboratory (OPHL) for WNV. Also four individual chickens additionally screened by OPHL, tested positive for St. Louis Encephalitis (SLE) in Jackson County. This is the first record of WNV detection, by sentinel chicken surveillance in Oregon. Numbers of sentinel chickens found positive for WNV, by county, are summarized in Table 7.

**Table 8 Sentinel chickens found positive for WNV, by county, in 2005.**

| Vector Control District | Number tested | Number of positive test results | Summarized date range of collection for positive results |
|---|---|---|---|
| Columbia | 74 | 0 | -- |
| Clackamas | 191 | 0 | -- |
| Jackson | 560 | 17 | 08/22/2005-10/03/2005 |
| Klamath | 301 | 0 | -- |
| Multnomah | 389 | 0 | -- |
| North Morrow | 428 | 0 | -- |
| Union | 61 | 0 | -- |
| West Umatilla | 264 | 0 | -- |
| Total | 2268 | 17 | -- |

# References

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)