West Nile Virus Activity in California in 2004

Division of Communicable Disease Control
California Department of Health Services
WNV Team at DHS

- **VBDS**
  - Vicki Kramer
  - Stan Husted
  - Al Hom
  - Ryan Carney
  - Kerry Padgett
  - Lauren Marcus
  - Anne Kjemtrup
  - Mark Novak
  - Renjie Hu

- **DIS**
  - Jon Rosenberg

- **VPHS**
  - Ben Sun
  - Jason Stull

- **VRDL**
  - Carol Glaser
  - Cynthia Jean
  - Cindi Cossen
  - Liz Baylis

- **OPA**
  - Rosanna Westmoreland
Collaborators

- Local Health Departments
- Local Public Health Laboratories
- Environmental Health Departments
<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>Humans</td>
<td>828</td>
<td>(27 deaths)</td>
</tr>
<tr>
<td>Equines</td>
<td>536</td>
<td></td>
</tr>
<tr>
<td>Dead birds</td>
<td>3,232</td>
<td></td>
</tr>
<tr>
<td>Mosquito pools</td>
<td>1,136</td>
<td></td>
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<tr>
<td>Sentinel chickens</td>
<td>809</td>
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Data as of 1/27/05
February 2004

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
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<tbody>
<tr>
<td>Humans, onset / reported</td>
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<tr>
<td>Horses, onset / reported</td>
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</tr>
<tr>
<td>Dead birds</td>
<td>1</td>
</tr>
<tr>
<td>Mosquito pools</td>
<td>0</td>
</tr>
<tr>
<td>Sentinel chickens</td>
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</tr>
</tbody>
</table>

1 county

- WNV activity (no human cases)
- WNV activity (number of human cases with known onset date)
### April 2004

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
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<tbody>
<tr>
<td>Humans, onset / reported</td>
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<tr>
<td>Horses, onset / reported</td>
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<tr>
<td>Dead birds</td>
<td>14</td>
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<tr>
<td>Mosquito pools</td>
<td>8</td>
</tr>
<tr>
<td>Sentinel chickens</td>
<td>0</td>
</tr>
</tbody>
</table>

### 5 counties

- WNV activity (no human cases)
- WNV activity (number of human cases with known onset date)
May 2004

- **Humans, onset / reported**: 5 / 0
- **Horses, onset / reported**: 0
- **Dead birds**: 391
- **Mosquito pools**: 41
- **Sentinel chickens**: 6

6 counties

- **WNV activity (no human cases)**
- **WNV activity (number of human cases with known onset date)**
June 2004

Humans, onset / reported  50 / 4
Horses, onset / reported  15 / 4
Dead birds  874
Mosquito pools  180
Sentinel chickens  113
July 15, 2004

- Humans, onset / reported: 111 / 24
- Horses, onset / reported: 40 / 26
- Dead birds: 1073
- Mosquito pools: 364
- Sentinel chickens: 166

21 counties

- WNV activity (no human cases)
- WNV activity (number of human cases with known onset date)
July 31, 2004

- Humans, onset / reported: 261 / 54
- Horses, onset / reported: 94 / 44
- Dead birds: 1447
- Mosquito pools: 526
- Sentinel chickens: 257

39 counties

- WNV activity (no human cases)
- WNV activity (number of human cases with known onset date)
August 15, 2004

Humans, onset / reported 422 / 168
Horses, onset / reported 162 / 87
Dead birds 1942
Mosquito pools 688
Sentinel chickens 326

52 counties

- WNV activity (no human cases)
- WNV activity (number of human cases with known onset date)
August 31, 2004

56 counties

Humans, onset / reported  529 / 430
Horses, onset / reported  264 / 199
Dead birds  2440
Mosquito pools  858
Sentinel chickens  474
September, 2004

Humans, onset / reported 621 / 654
Horses, onset / reported 387 / 419
Dead birds 3030
Mosquito pools 1091
Sentinel chickens 715

58 counties

WNV activity (no human cases)
WNV activity (number of human cases with known onset date)
October, 2004

58 counties

Humans, onset / reported  633 / 790
Horses, onset / reported  326 / 529
Dead birds  3192
Mosquito pools  1135
Sentinel chickens  779
November, 2004

Humans, onset / reported  633 / 817
Horses, onset / reported  426 / 536
Dead birds  3225
Mosquito pools  1136
Sentinel chickens  802

58 counties
December, 2004

58 counties

Humans, onset / reported 633 / 828
Horses, onset / reported 426 / 536
Dead birds 3232
Mosquito pools 1136
Sentinel chickens 805
Sequence of WNV detection events in California relative to human case onset, 2004

- Onset dates not available for all patients
- Birds, mosquitoes: date of collection; testing conducted at UC Davis, bird necropsy at CAHFS
- Chickens: date of probable seroconversion; testing conducted at DHS
- Equines: testing conducted at CAHFS; CDFA lead agency
Dead Bird
Surveillance
# Dead Bird Surveillance Program
## 2000 - 2004

<table>
<thead>
<tr>
<th>Year</th>
<th>Reported</th>
<th>Tested</th>
<th>Positive</th>
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<tbody>
<tr>
<td>2000</td>
<td>40</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>2001</td>
<td>68</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>2002</td>
<td>3,666</td>
<td>653</td>
<td>0</td>
</tr>
<tr>
<td>2003</td>
<td>8,650</td>
<td>1,765</td>
<td>96</td>
</tr>
<tr>
<td>2004</td>
<td>93,057</td>
<td>5,728</td>
<td>3,232</td>
</tr>
</tbody>
</table>
Prevalence of WNV in Tested Dead Birds*, 2004

* Prevalence = (# pos birds/# tested birds) X 100

10 – 19 %
20 – 39 %
40 – 59 %
60 – 79 %
80 – 100 %
Importance of WNV Dead Bird Surveillance Program in 2004

• Early season WNV detection
  ➢ Earliest indication of WNV activity in 53 / 58 California counties

• Only surveillance element that covered ALL 58 counties
  – Mosquito and sentinel chicken testing limited to regions with vector control agencies

• In 22 counties, dead birds were the only evidence of WNV activity
92 species of WNV positive dead birds

- **American Crow**: 53%
- **Western Scrub Jay**: 19%
- **Yellow-billed Magpie**: 9%
- **Other corvids (85 spp.)**: 16%
- **Non-corvids (85 spp.)**: 16%

Positive dead birds = 3,232
Number tested = 5,728: 75% corvids (48% crow)
## Non-corvid WNV positive species

<table>
<thead>
<tr>
<th>Species</th>
<th>Number positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>House Finch</td>
<td>70</td>
</tr>
<tr>
<td>House Sparrow</td>
<td>34</td>
</tr>
<tr>
<td>Cooper’s Hawk</td>
<td>31</td>
</tr>
<tr>
<td>Barn Owl</td>
<td>28</td>
</tr>
<tr>
<td>Red-tailed Hawk</td>
<td>27</td>
</tr>
<tr>
<td>American Robin</td>
<td>20</td>
</tr>
<tr>
<td>Brewer’s Blackbird</td>
<td>19</td>
</tr>
<tr>
<td>Lesser Goldfinch</td>
<td>18</td>
</tr>
<tr>
<td>Sharp-shinned Hawk</td>
<td>17</td>
</tr>
<tr>
<td>American Kestrel</td>
<td>16</td>
</tr>
</tbody>
</table>
WNV in Squirrels

• 65% (50/77) of tree squirrels tested were WNV positive
  – Prevalence is comparable to WNV in dead birds (57%).

• Four tree squirrel species tested positive
  – Fox, western gray, eastern gray, and northern flying squirrel

• First report of WNV infection in northern flying and western gray squirrels
WNV Activity in Mosquitoes in 2004
House Mosquito
*Culex pipiens*

*Cx. quinquefasciatus*

Encephalitis Mosquito
*Culex tarsalis*

Polluted water; residential and commercial sources

Agricultural, commercial, man-made or natural sources
Number of WNV Positive Mosquito Pools, 2004

- Positive pools = 1,136 (14,602 tested)
- 20 counties
- 9 species (3 genera: Cx., Oc., An.)

Map showing the distribution of positive mosquito pools by county.
WNV Positive Mosquito Species
1136 pos. pools / 14,602 mosquitoes tested

CULEX

- *quinquefasciatus* 741 (65%)
- *tarsalis* 315 (28%)
- *stigmatosoma* 41 (4%)
- *erythrothorax* 19 (2%)
- *pipiens* 13 (1%)
- *thriambus* 3 (<1%)

Plus *Oc. melanimon* (2), *Oc. squamiger* (1)
*An. hermsi* (1),
Minimum Infection Rates (per 1,000) by Species July - September 2004

MIRs are calculated using the bias-corrected MLE methods in Pooled Infection Rate version 2.0 add-in for Microsoft Excel created by Dr. Brad Biggerstaff at CDC-DVBD.
### Minimum Infection Rate (MIR)*

#### Counties Submitting Mosquitoes 2004

<table>
<thead>
<tr>
<th>Counties</th>
<th>MIR</th>
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<tbody>
<tr>
<td>San Bernardino</td>
<td>8.5</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>6.9</td>
</tr>
<tr>
<td>Orange</td>
<td>6.1</td>
</tr>
<tr>
<td>Kern</td>
<td>5.7</td>
</tr>
<tr>
<td>Imperial</td>
<td>4.0</td>
</tr>
<tr>
<td>Lake</td>
<td>2.8</td>
</tr>
<tr>
<td>Fresno</td>
<td>2.0</td>
</tr>
<tr>
<td>Tulare</td>
<td>2.0</td>
</tr>
<tr>
<td>Shasta</td>
<td>1.7</td>
</tr>
<tr>
<td>Sacramento</td>
<td>1.6</td>
</tr>
<tr>
<td>Sutter</td>
<td>1.2</td>
</tr>
<tr>
<td>Riverside</td>
<td>1.6</td>
</tr>
<tr>
<td>Butte</td>
<td>1.3</td>
</tr>
<tr>
<td>Placer</td>
<td>1.0</td>
</tr>
<tr>
<td>San Luis Obispo</td>
<td>0.3</td>
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<tr>
<td>Merced</td>
<td>0.1</td>
</tr>
<tr>
<td>San Joaquin</td>
<td>0.1</td>
</tr>
<tr>
<td>Stanislaus</td>
<td>0.1</td>
</tr>
<tr>
<td>No positive pools</td>
<td>0</td>
</tr>
<tr>
<td>No mosquitoes collected</td>
<td></td>
</tr>
</tbody>
</table>

*MIR = (# positive mosquito pools/total number of mosquitoes tested) x 1,000

Includes all species of mosquitoes.
MIR in mosquitoes collected from four southern California vector control agencies*

2004

*San Gabriel MVCD
Greater LA VCD
Northwest MVCD
San Bernardino VCP

Cx. tarsalis  Cx. quinquefasciatus
WNV Activity in Sentinel Chickens in 2004
Sentinel Chicken Surveillance Program
2004

Positive flock
Negative flock

55 agencies
231 flocks
WNV Seroconversions in 2004

- 805 seroconversions
- 22 counties with seroconversions
- 143 / 231 flocks seroconverted
Human WNV Infections, 2004*

- 828 human infections from 23 counties
  - 66 from blood banks → 15 (22.7%) developed symptoms

- 777 symptomatic cases
  - 684 with known clinical presentation
    - 395 (58%) West Nile fever (WNF)
    - 289 (42%) West Nile neuroinvasive disease (WNND)
    - 93 unknown clinical presentation

- 27 fatalities

*As of 1/27/05
California Human Case Statistics

• 777 symptomatic cases:
  – Median age all cases = 52 yrs (range: 2-94)
  – Median age WNND = 58 yrs (range: 4 – 94)
  – Median age WNF = 50 yrs (range: 2 –91)
  – 62% male

• 27 WNV-associated fatalities:
  – Median age = 76 yrs (range: 26-94)

• Known mosquito bite: 26.5%
Human WNV Incidence, by Age Group and Clinical Category
California, 2004

Incidence per 100,000

Age Group

WNF

WNND

0-9 10-19 20-29 30-39 40-49 50-59 60-69 70-79 80+
Week of Onset for Human WNV Cases
California 2004 (n=643)

Onset dates not available for 135 patients

Source: Viral & Rickettsial Disease Laboratory
California Department of Health Services

5/1/2004
5/8/2004
5/15/2004
5/22/2004
5/29/2004
6/5/2004
6/12/2004
6/19/2004
6/26/2004
7/3/2004
7/10/2004
7/17/2004
7/24/2004
7/31/2004
8/7/2004
8/14/2004
8/21/2004
8/28/2004
9/4/2004
9/11/2004
9/18/2004
9/25/2004
10/2/2004
10/9/2004
10/16/2004
10/23/2004
10/30/2004
11/6/2004
11/13/2004

Week of Onset
Number of Cases

WNND
WNF
UNK

7/31- 8/13
5/14
10/30
Reported WNV Human Cases by County, 2004

828 infections

- WNV activity (no human cases)
- WNV activity (number of reported human cases)
Reported WNV cases per 100,000 people

2004

Incidence in:
Arizona = 7.6
Nevada = 2.2
Oregon = 0.1
Colorado = 6.4

CO 2003 = 68.5

CA Total: 2.4

<table>
<thead>
<tr>
<th>County</th>
<th>Incidence</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tehama</td>
<td>17.8</td>
<td>&gt;15</td>
</tr>
<tr>
<td>San Bernardino</td>
<td>11.5</td>
<td></td>
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<tr>
<td>Glenn</td>
<td>11.3</td>
<td>&gt;10</td>
</tr>
<tr>
<td>Kern</td>
<td>9.0</td>
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<tr>
<td>Riverside</td>
<td>7.2</td>
<td>&gt;5</td>
</tr>
<tr>
<td>Shasta</td>
<td>3.7</td>
<td></td>
</tr>
<tr>
<td>Butte</td>
<td>3.4</td>
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</tr>
<tr>
<td>Los Angeles</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>Lassen</td>
<td>2.9</td>
<td>&gt;1</td>
</tr>
<tr>
<td>Orange</td>
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</tr>
<tr>
<td>Fresno</td>
<td>1.8</td>
<td></td>
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<tr>
<td>Lake</td>
<td>1.7</td>
<td></td>
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<tr>
<td>Others</td>
<td>&gt;0</td>
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CO 2003 = 68.5
2004 Equine WNV Data

- 540 WNV infected horses (32 counties)
- 230 (42%) died / euthanized

Vaccination status
- 22 properly vaccinated
- 145 improperly vaccinated
- 356 unvaccinated
- 17 unknown

First positive finding of WNV in 2 counties
Week of Onset for Equine WNV Cases
California, 2004

Date of onset (week ending)

Number of cases

- June 12
- Aug 15 – Sept 4
- Nov 3

Week of Onset:
- 5-Jun to 2-Oct
- 2-Oct to 13-Nov