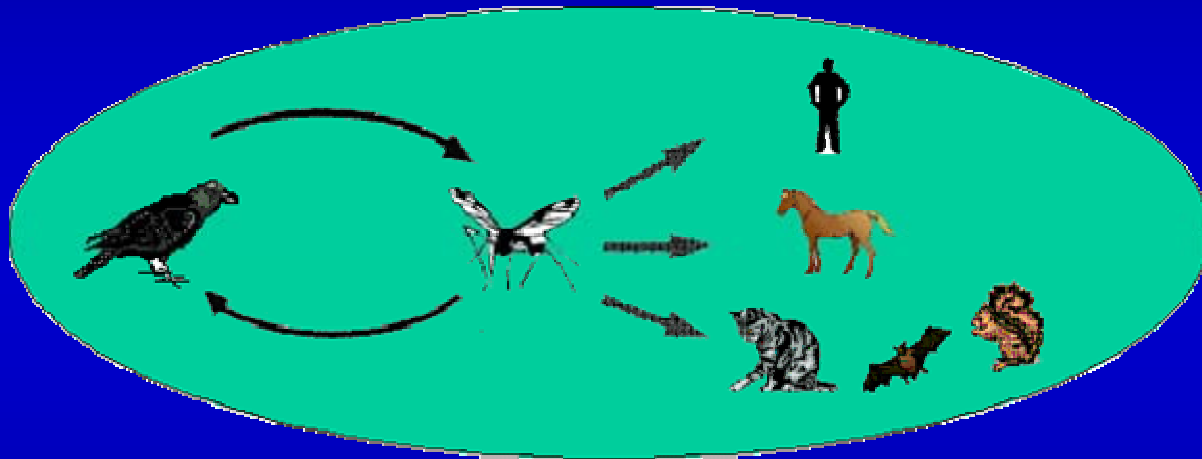
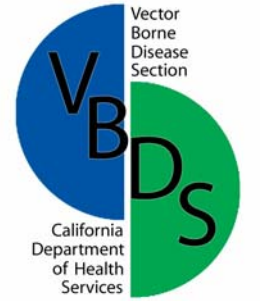


# West Nile Virus Activity in California in 2004



**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**

# WNV in California, 2004



**Humans**

**828 (27 deaths)**



**Equines**

**536**



**Dead birds**

**3,232**



**Mosquito pools**

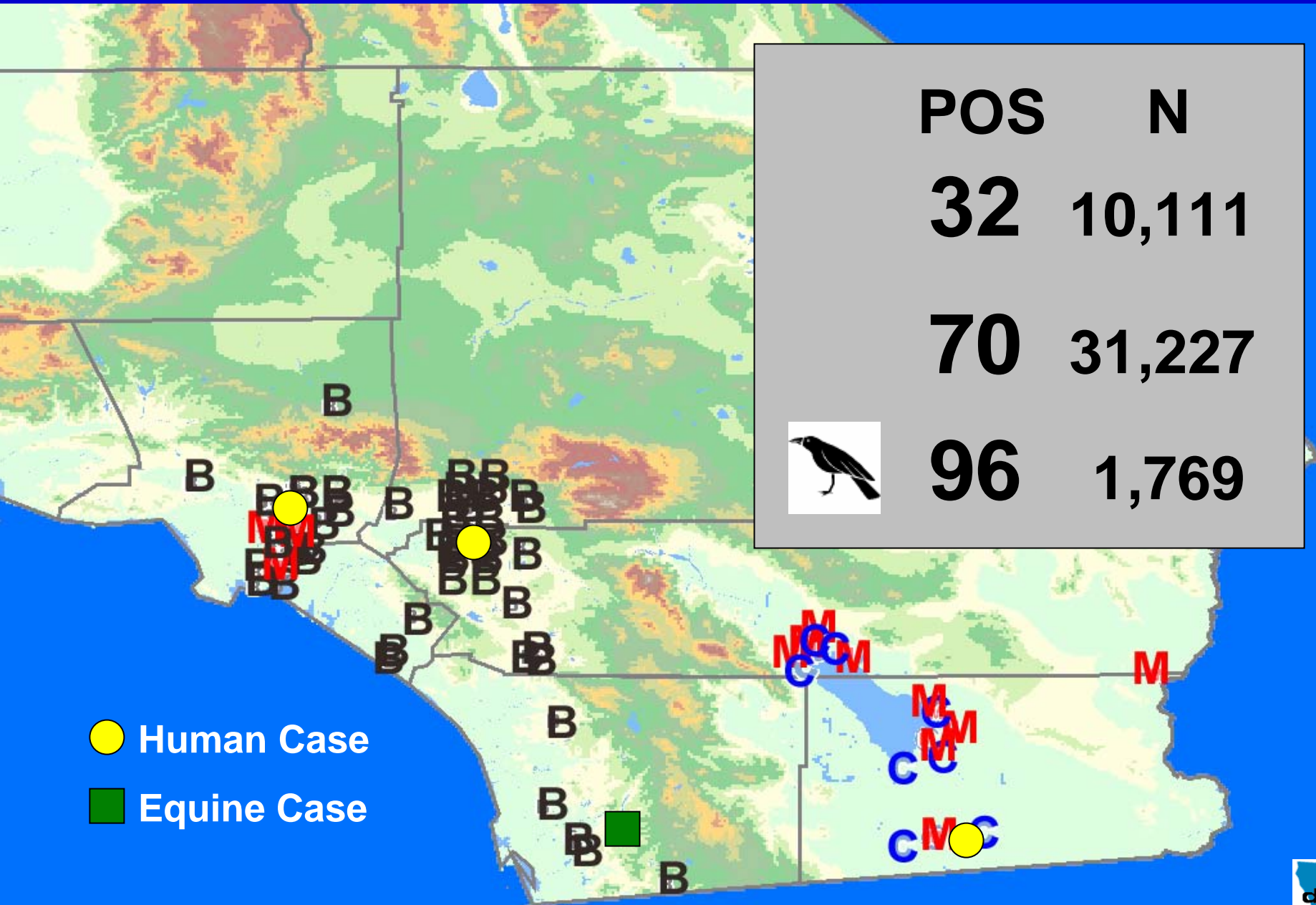
**1,136**



**Sentinel chickens**

**809**

# WNV in California, 2003



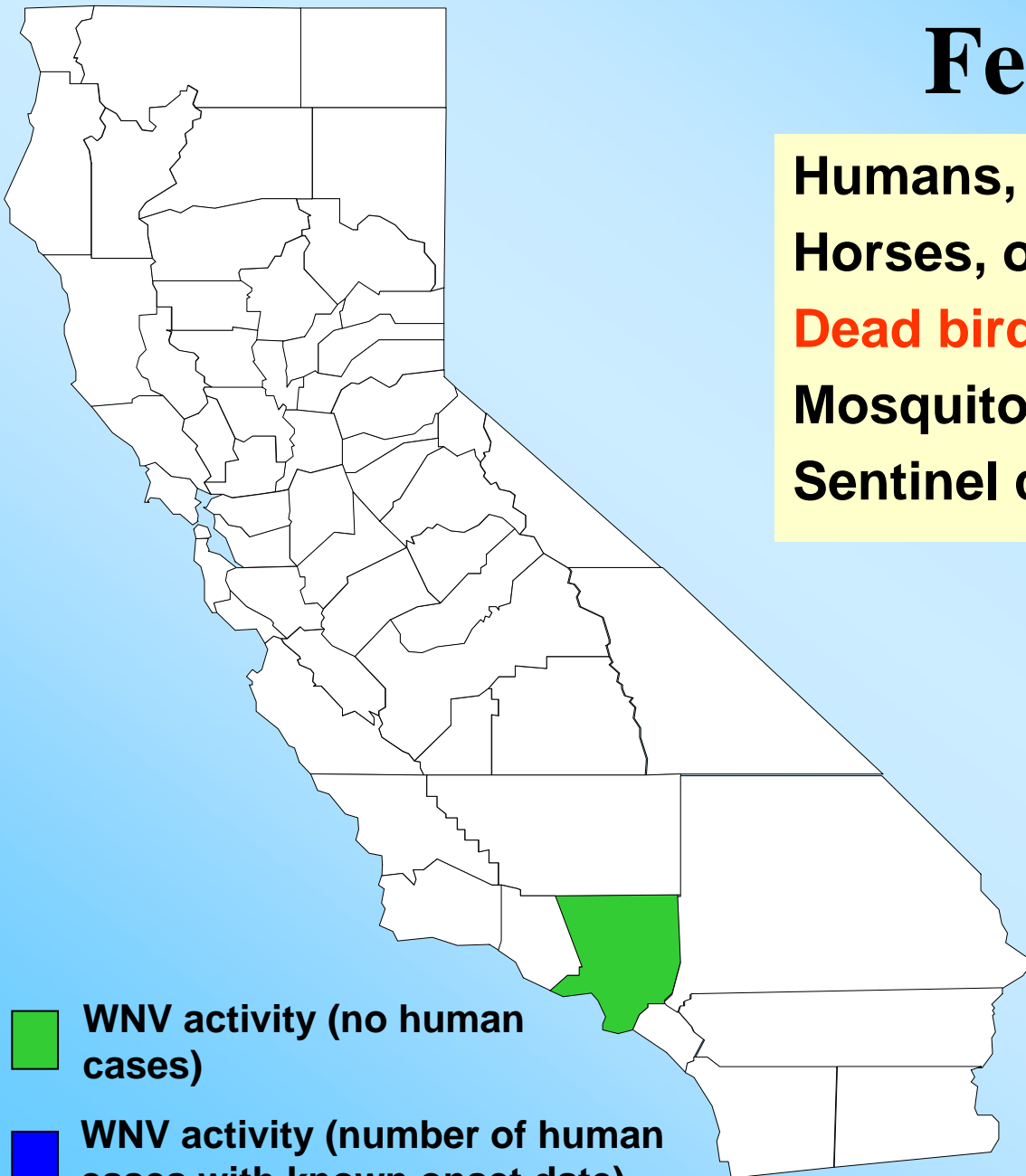
- Human Case
- Equine Case





# February 2004

Humans, onset / reported	0
Horses, onset / reported	0
<b>Dead birds</b>	<b>1</b>
Mosquito pools	0
Sentinel chickens	0

1 county

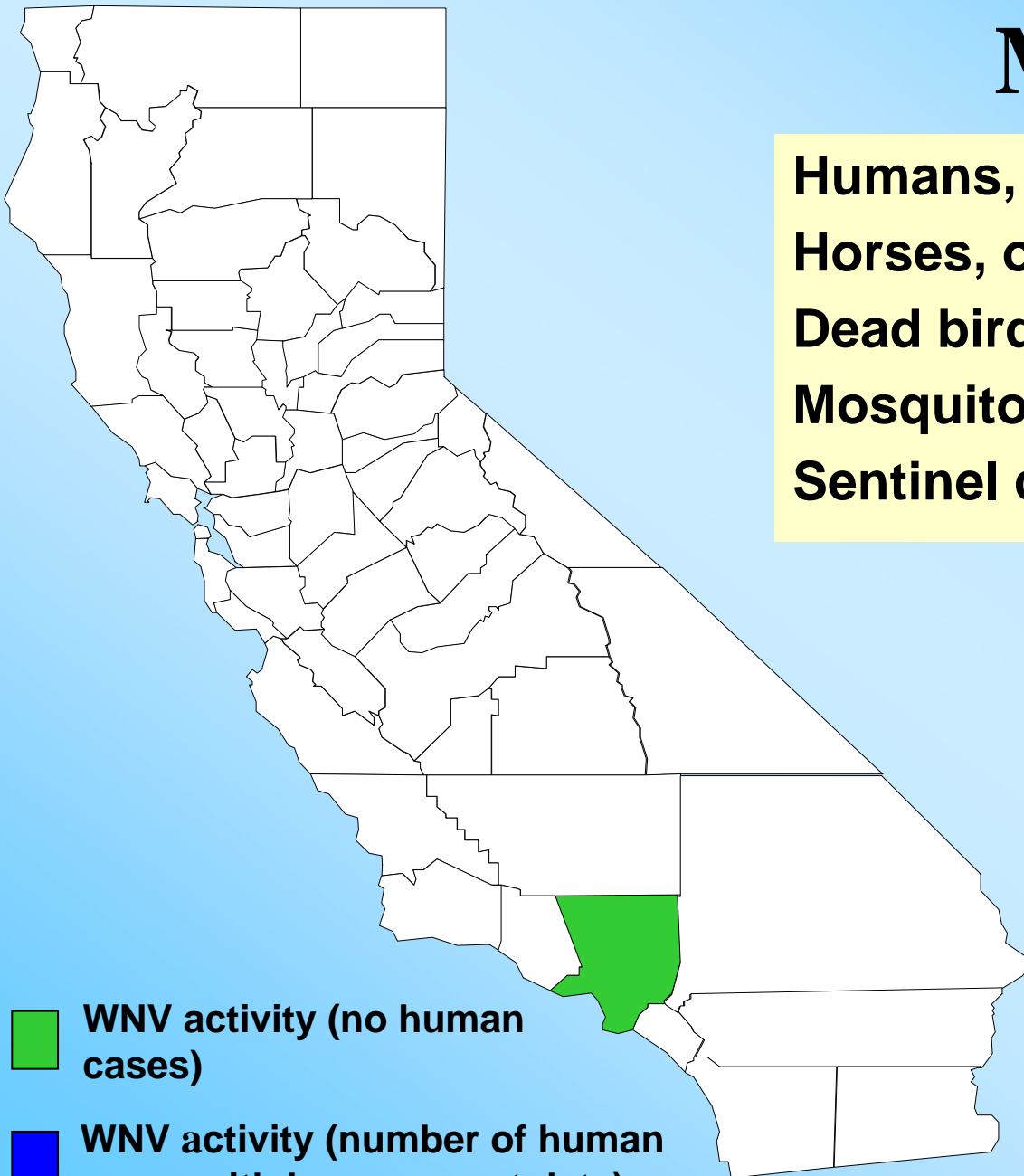


-  WNV activity (no human cases)
-  WNV activity (number of human cases with known onset date)

# March 2004

<b>Humans, onset / reported</b>	<b>0</b>
<b>Horses, onset / reported</b>	<b>0</b>
<b>Dead birds</b>	<b>2</b>
<b>Mosquito pools</b>	<b>0</b>
<b>Sentinel chickens</b>	<b>0</b>

**1 county**



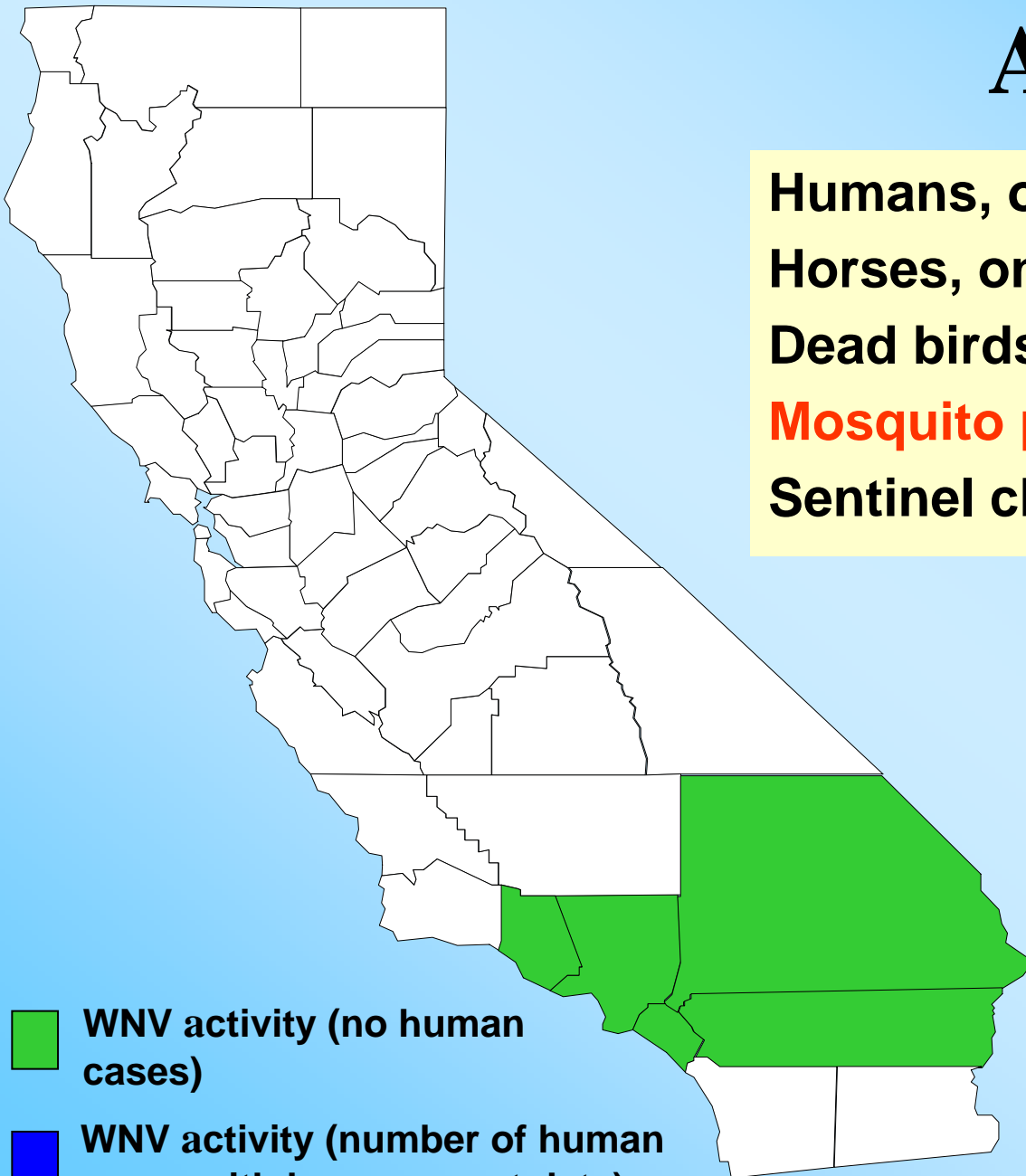
**WNV activity (no human cases)**

**WNV activity (number of human cases with known onset date)**

# April 2004

Humans, onset / reported	0
Horses, onset / reported	0
Dead birds	14
<b>Mosquito pools</b>	<b>8</b>
Sentinel chickens	0

**5 counties**



WNV activity (no human cases)

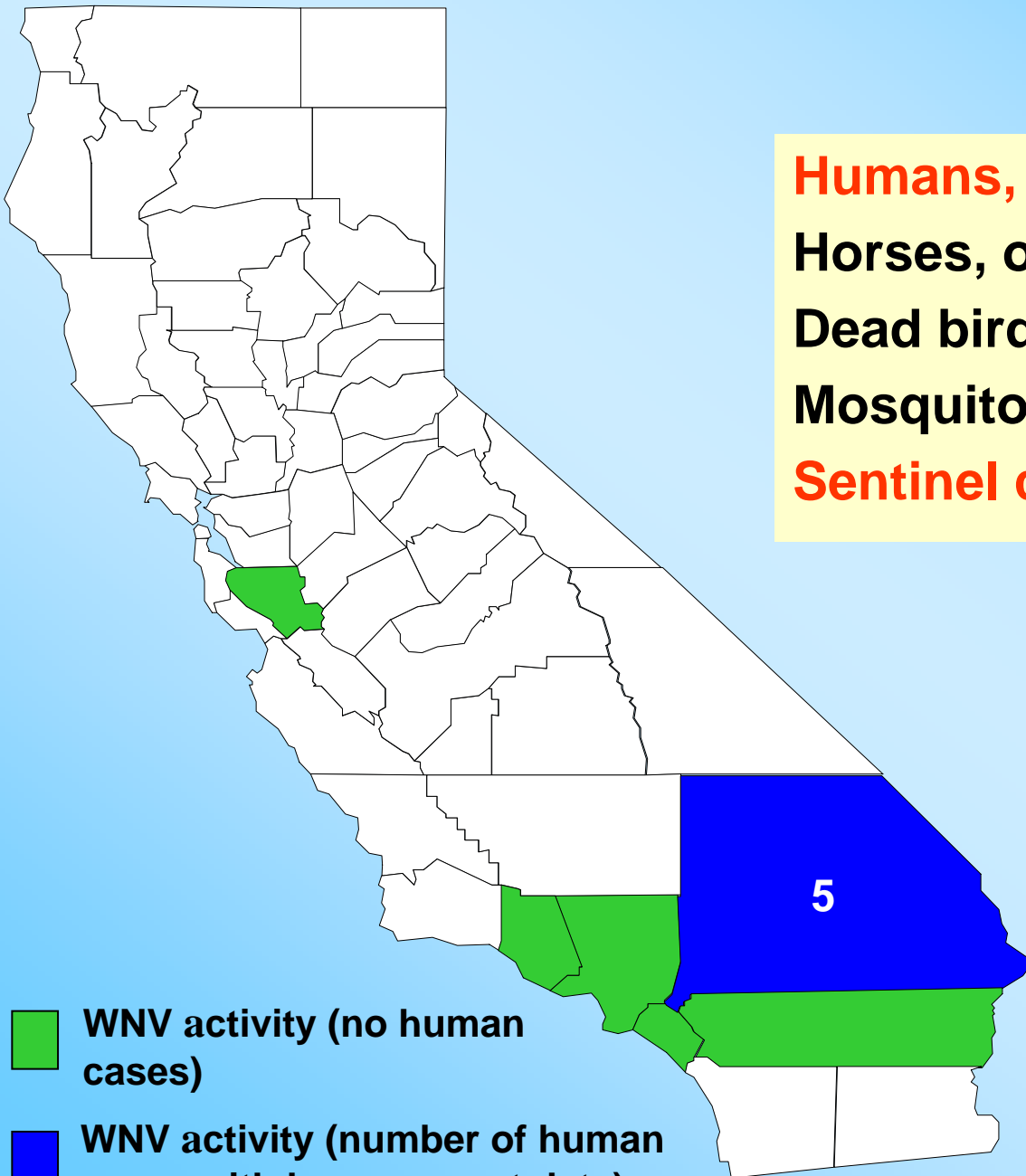
WNV activity (number of human cases with known onset date)





# May 2004

<b>Humans, onset / reported</b>	<b>5 / 0</b>
<b>Horses, onset / reported</b>	<b>0</b>
<b>Dead birds</b>	<b>391</b>
<b>Mosquito pools</b>	<b>41</b>
<b>Sentinel chickens</b>	<b>6</b>

**6 counties**



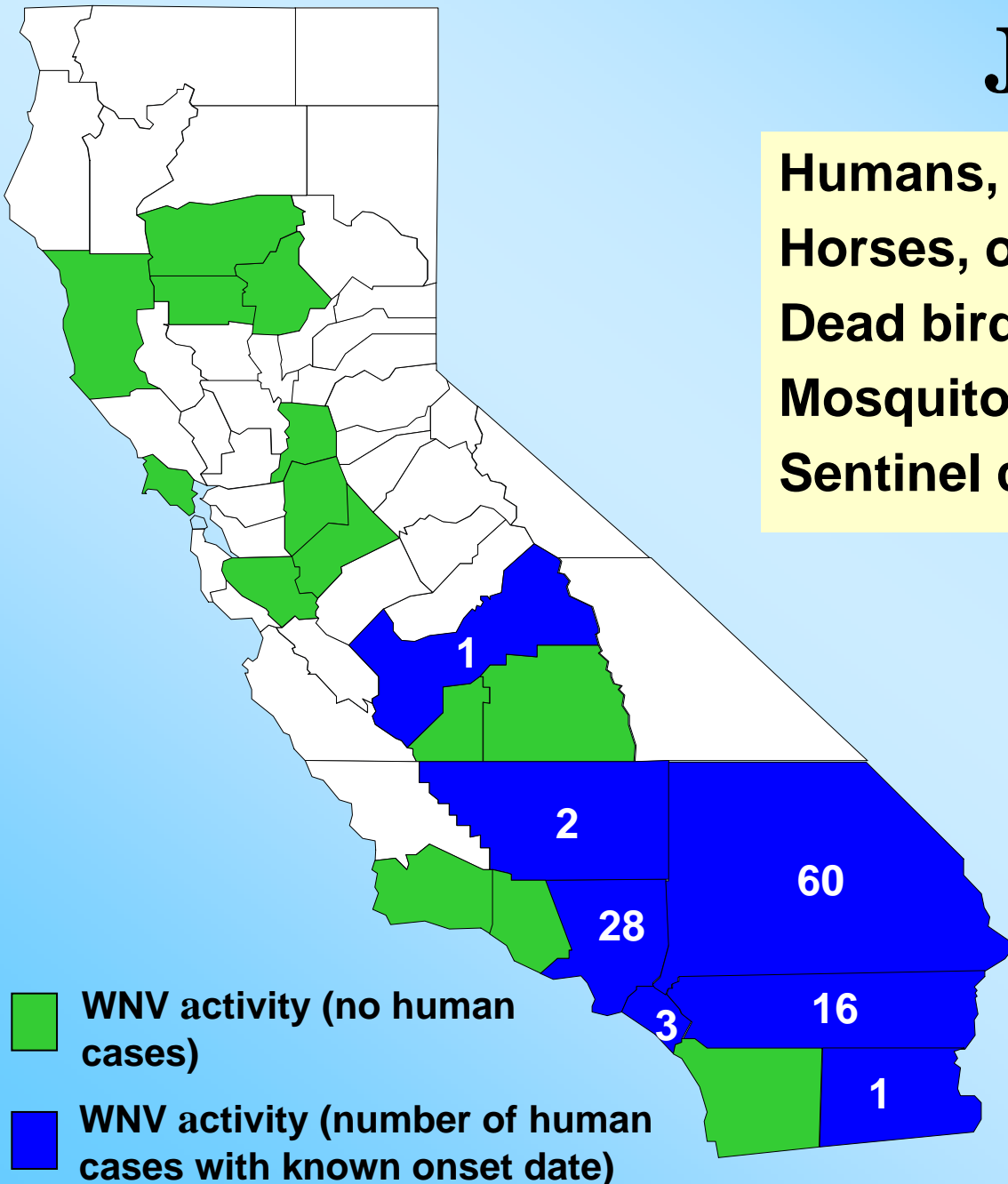
-  WNV activity (no human cases)
-  WNV activity (number of human cases with known onset date)



# July 15, 2004

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

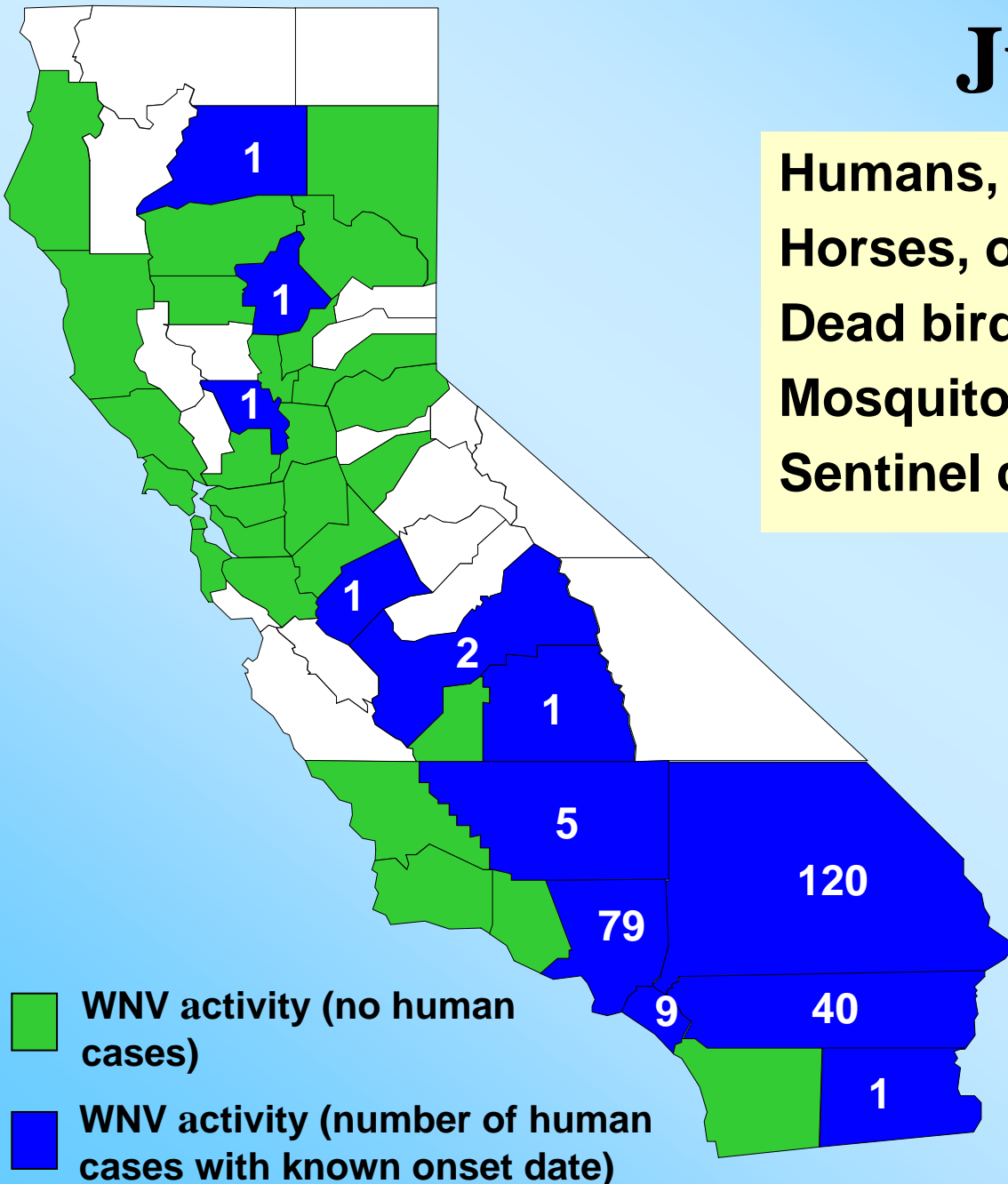
21 counties



# July 31, 2004

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

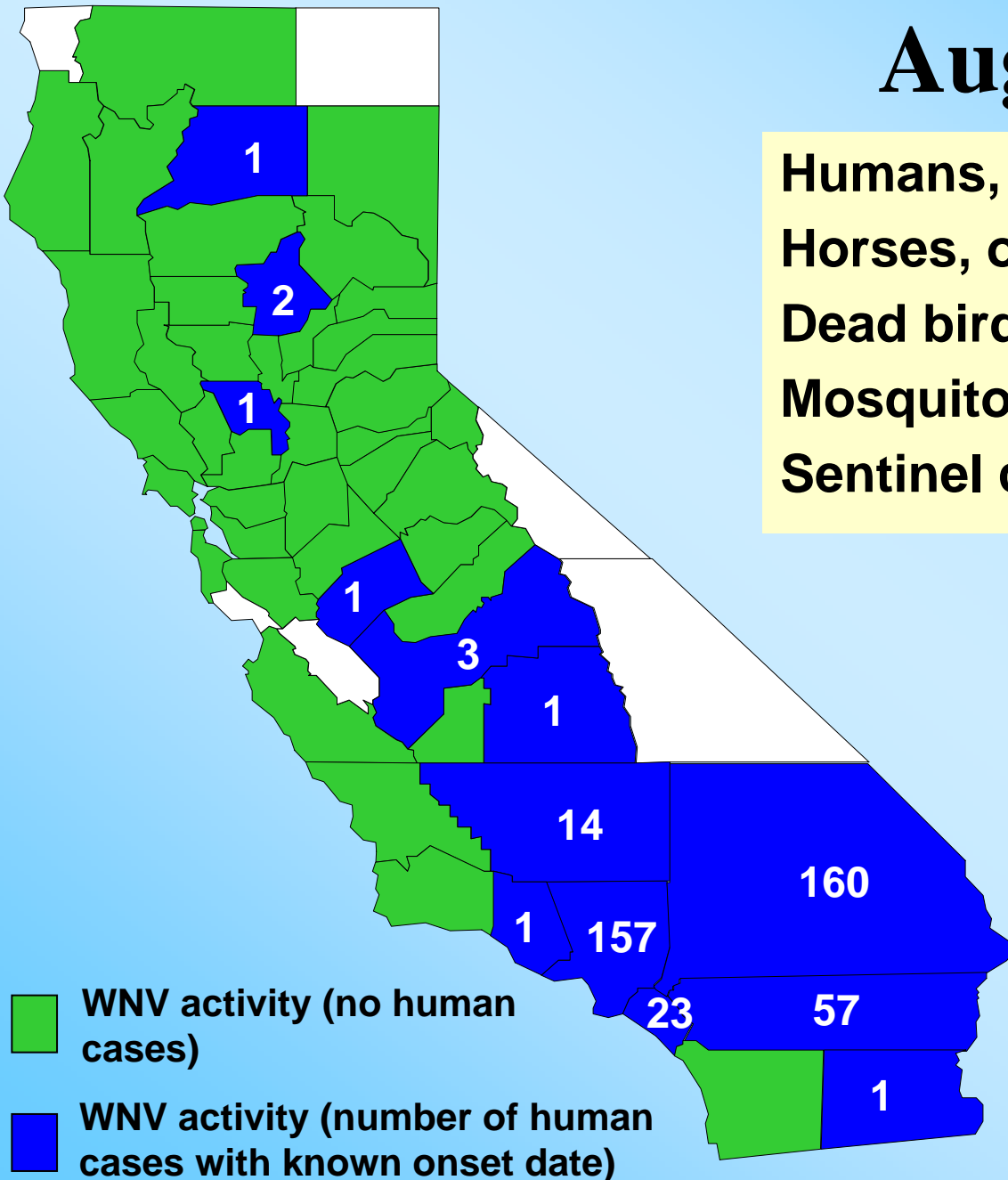
**39 counties**



# August 15, 2004

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

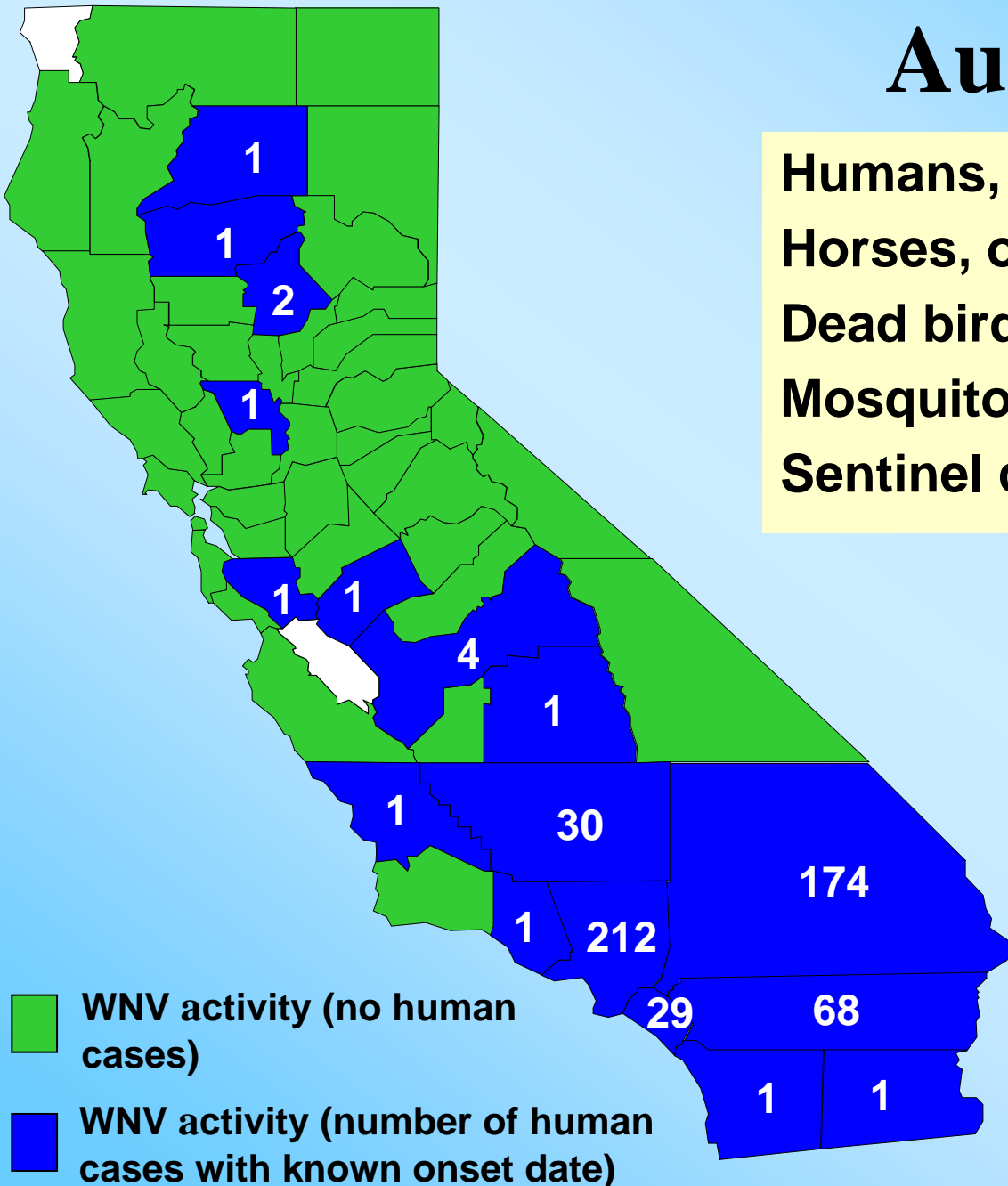
52 counties



# August 31, 2004

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

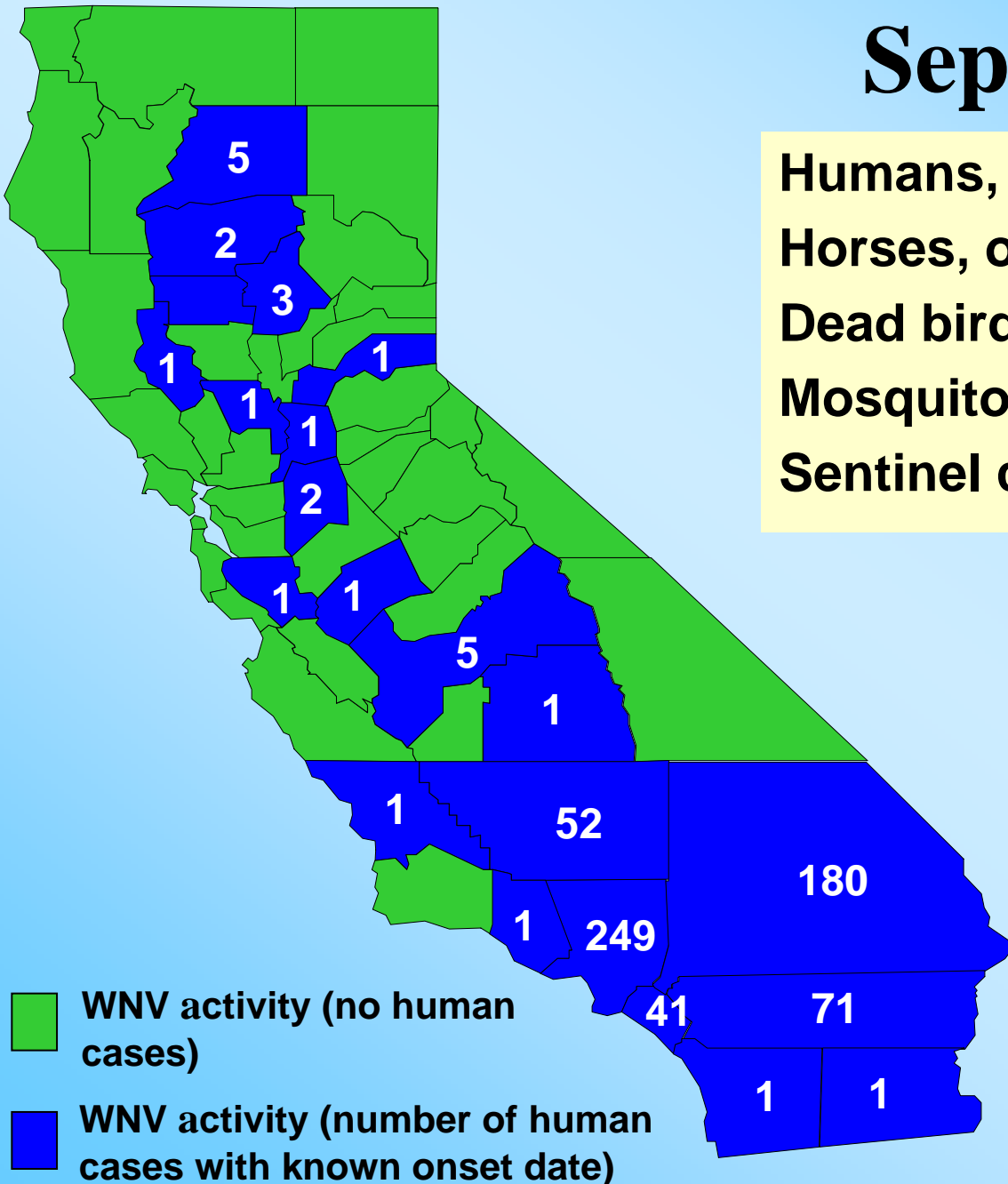
56 counties



# September, 2004

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

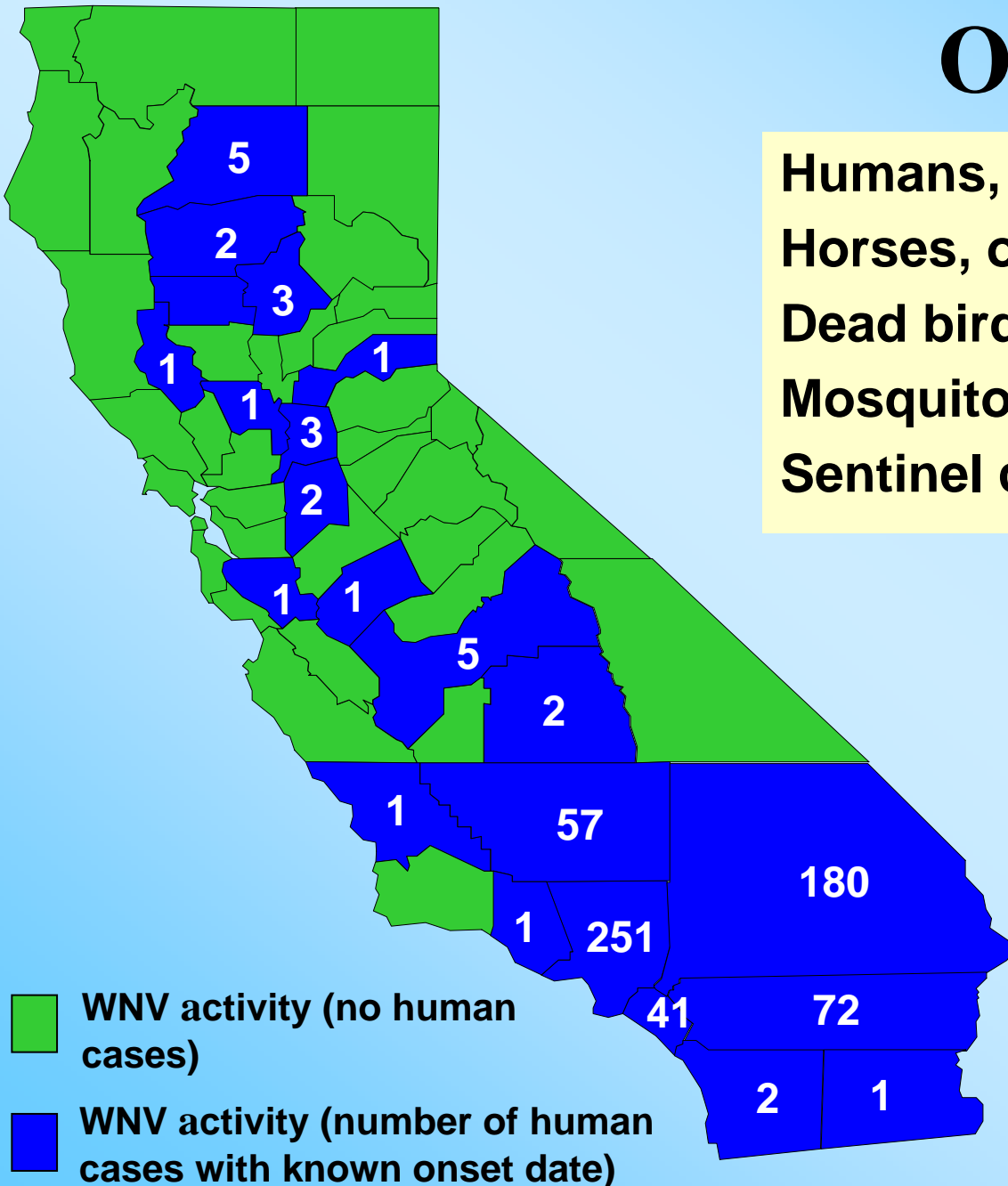
58 counties



# October, 2004

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

58 counties

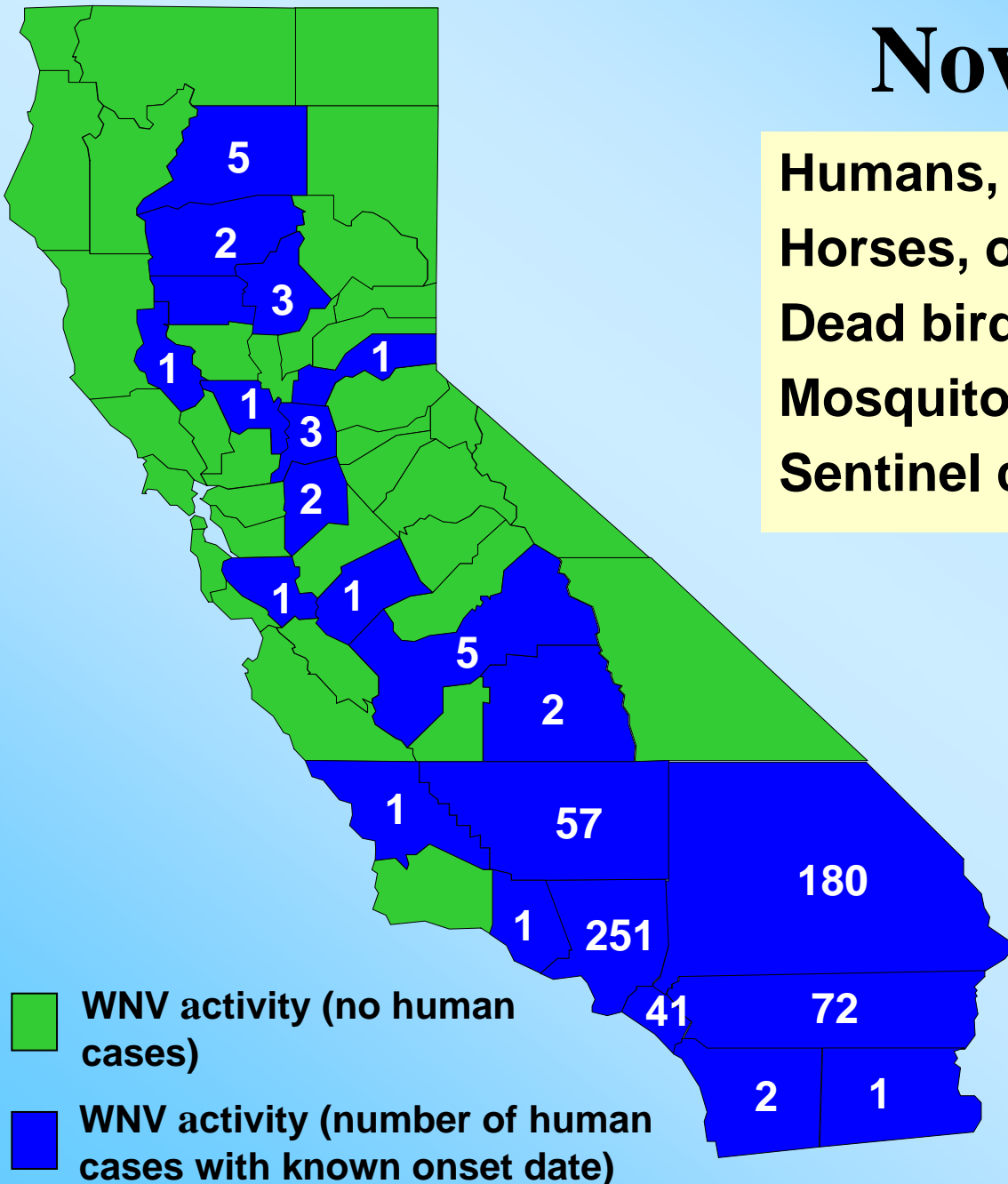




# November, 2004

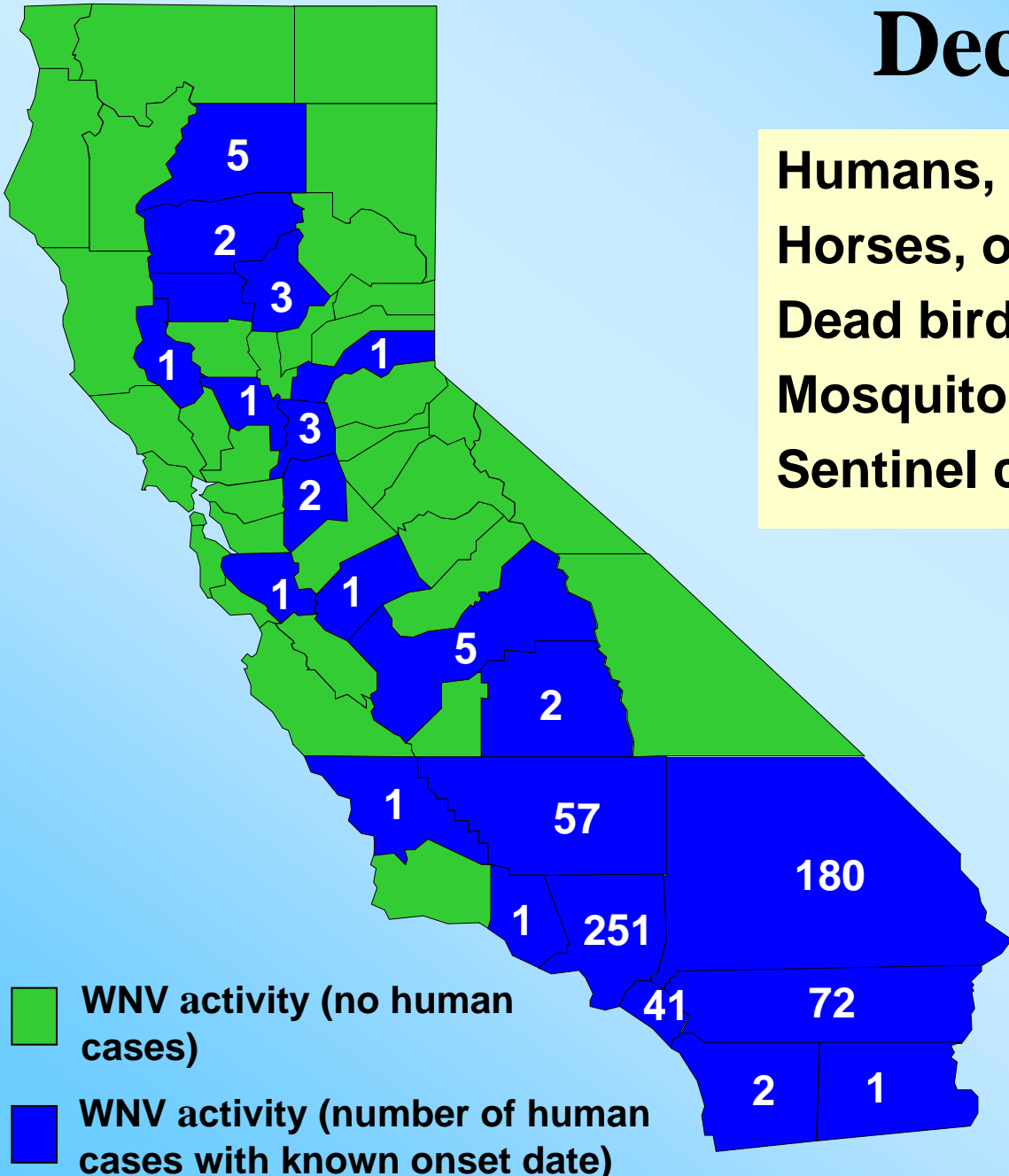
Humans, onset / reported	633 / 817
Horses, onset / reported	426 / 536
Dead birds	3225
Mosquito pools	1136
Sentinel chickens	802

58 counties



# December, 2004

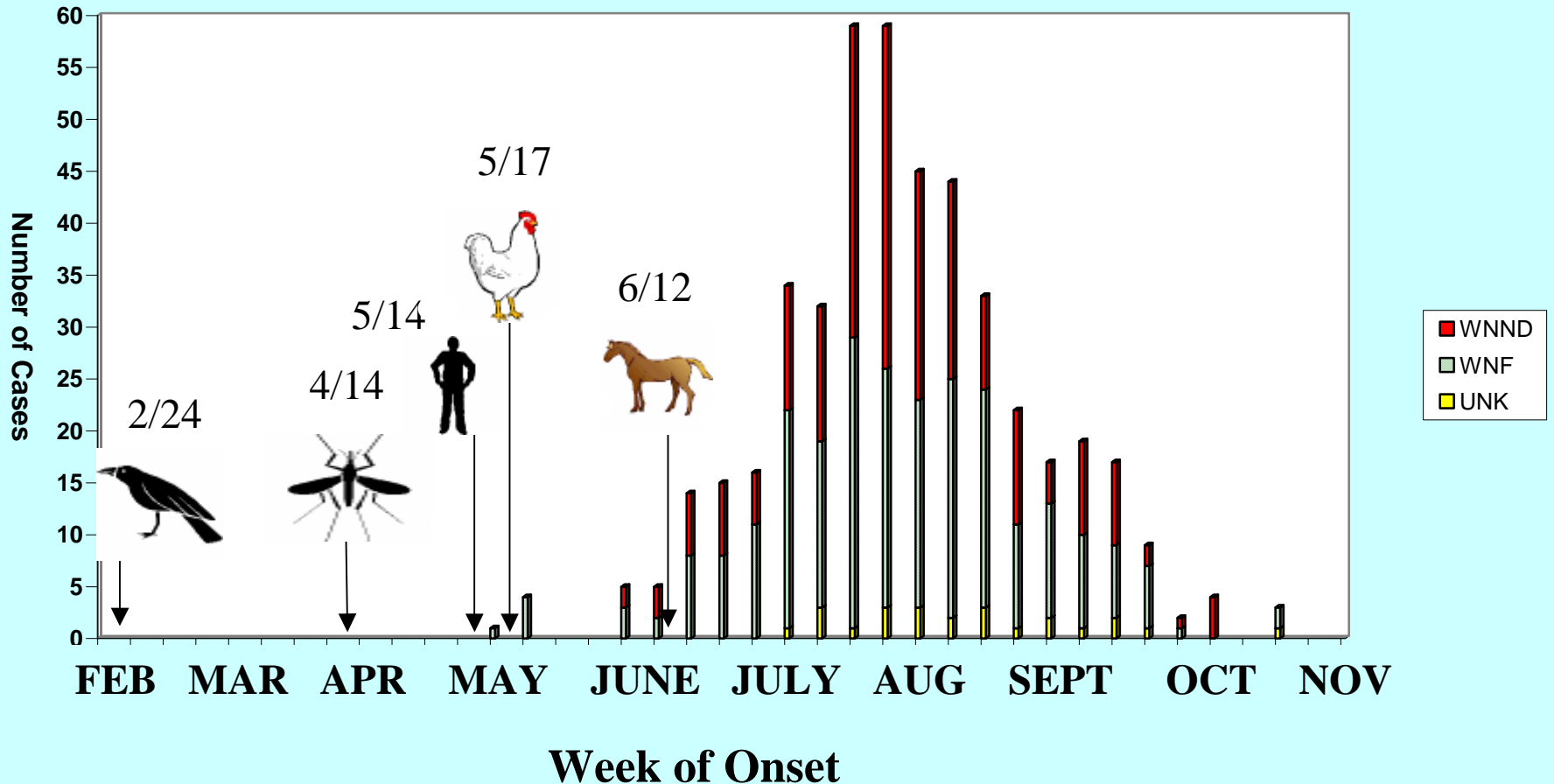
Humans, onset / reported	633 / 828
Horses, onset / reported	426 / 536
Dead birds	3232
Mosquito pools	1136
Sentinel chickens	805



**58 counties**



## 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

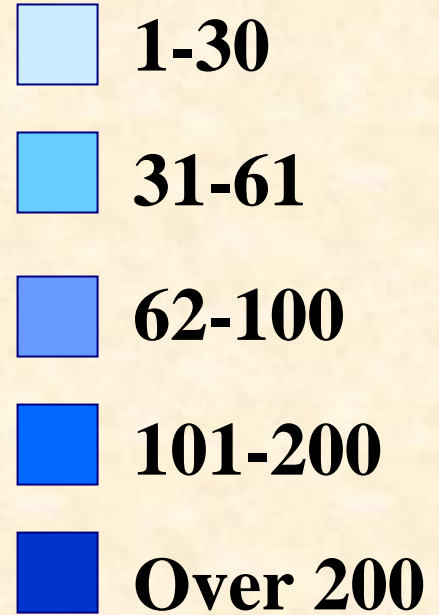
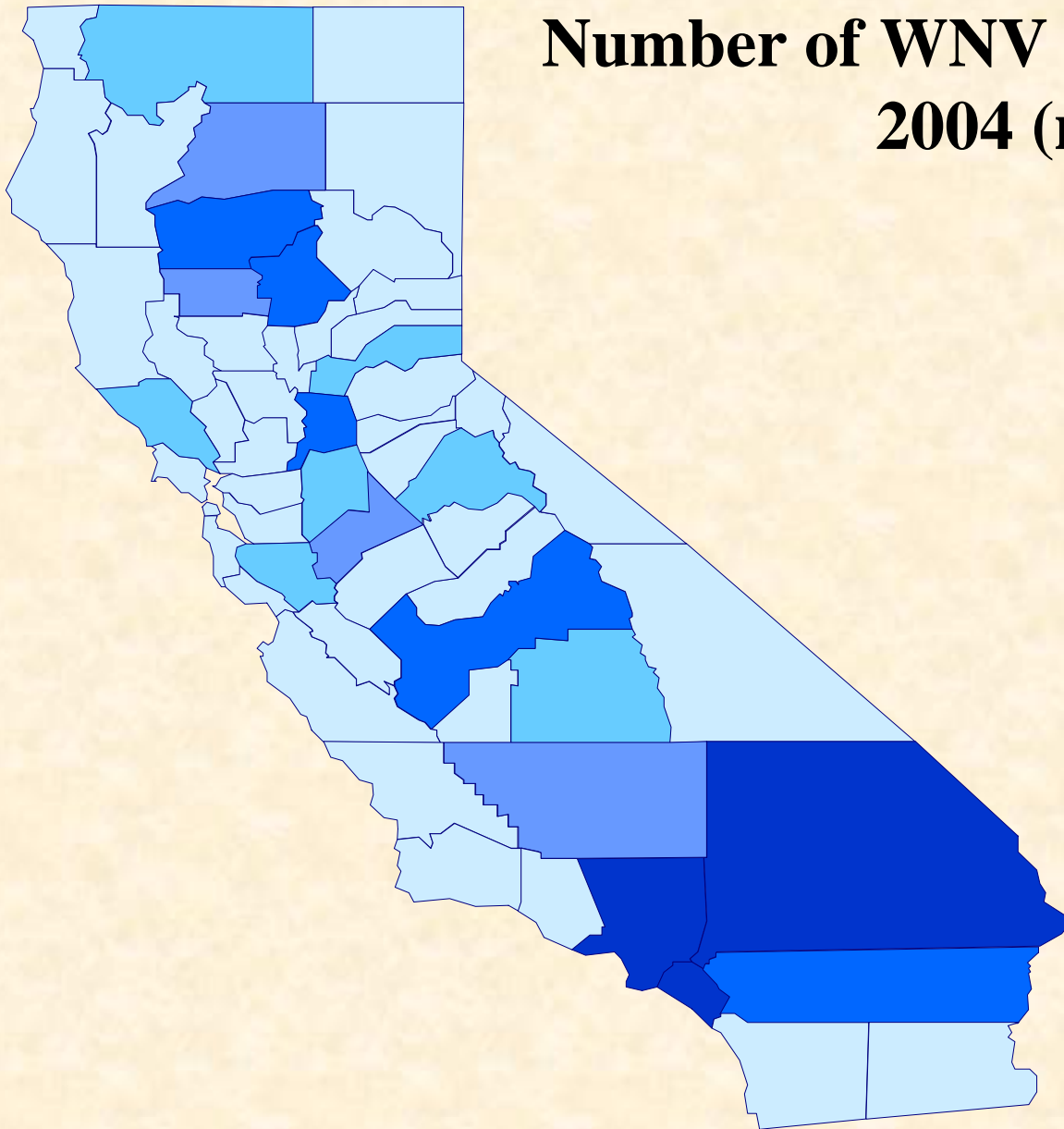


# Dead Bird Surveillance Program 2000 - 2004

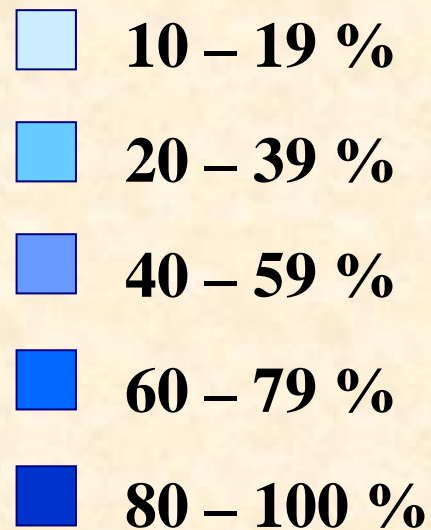
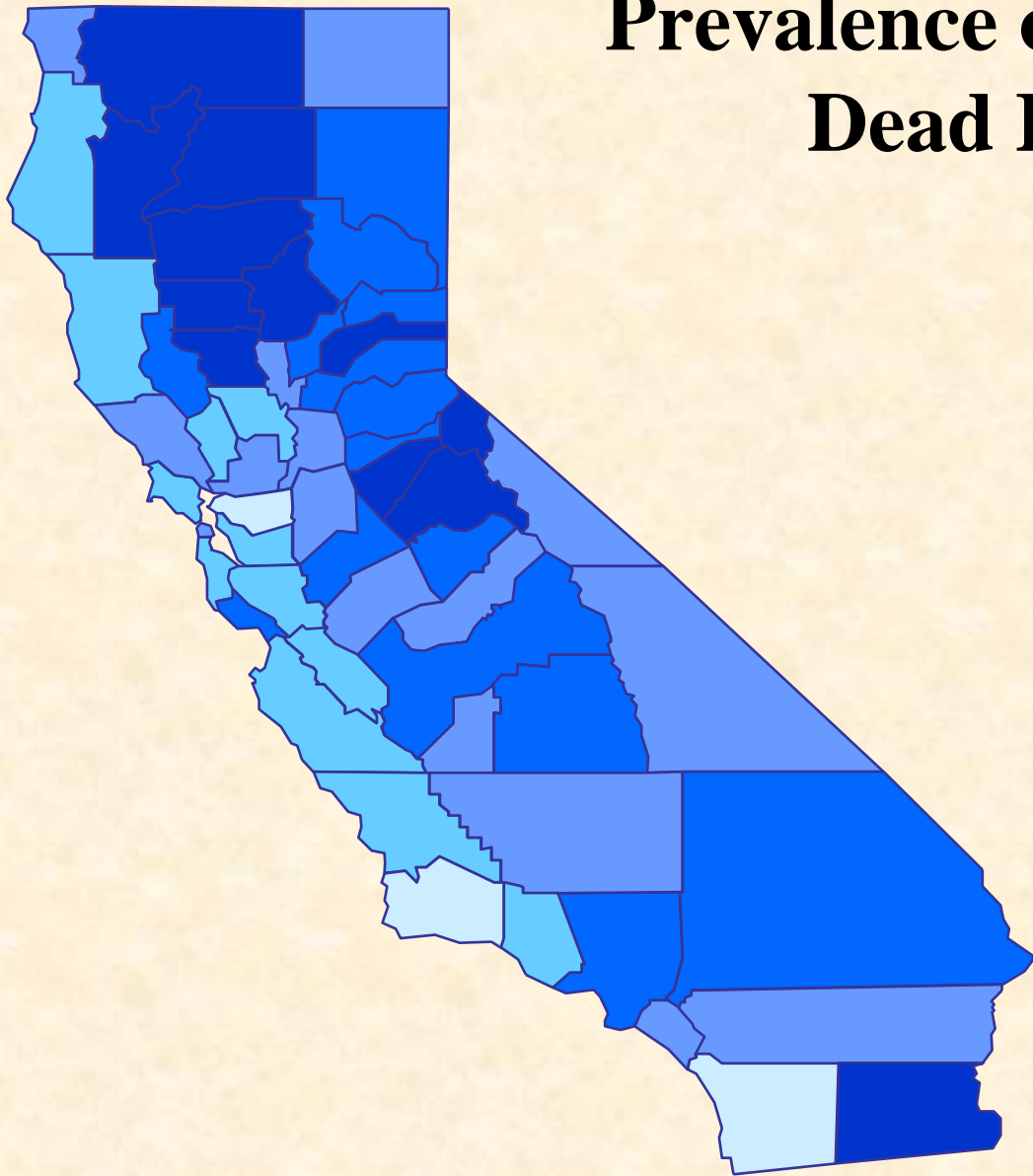
Year	Reported	Tested	Positive
2000	40	20	0
2001	68	18	0
2002	3,666	653	0
2003	8,650	1,765	96
2004	93,057	5,728	3,232



# Number of WNV Positive Dead Birds 2004 (n=3,232)



# Prevalence of WNV in Tested Dead Birds\*, 2004



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



**Other corvids  
(4 spp.): 3%**

**Non-corvids  
(85 spp.): 16%**

**Yellow-billed  
Magpie: 9%**

**Western  
Scrub Jay  
19%**

**American  
Crow  
53%**



**Positive dead birds = 3,232**

**Number tested = 5,728: 75% corvids (48% crow)**



# Non-corvid WNV positive species

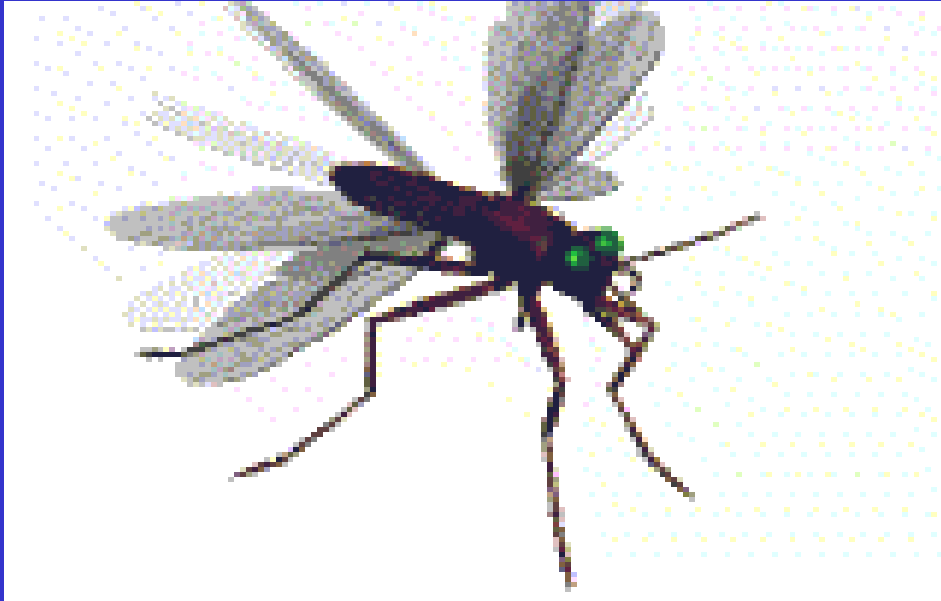
	Number positive
<b>House Finch</b>	<b>70</b>
<b>House Sparrow</b>	<b>34</b>
<b>Cooper's Hawk</b>	<b>31</b>
<b>Barn Owl</b>	<b>28</b>
<b>Red-tailed Hawk</b>	<b>27</b>
<b>American Robin</b>	<b>20</b>
<b>Brewer's Blackbird</b>	<b>19</b>
<b>Lesser Goldfinch</b>	<b>18</b>
<b>Sharp-shinned Hawk</b>	<b>17</b>
<b>American Kestrel</b>	<b>16</b>

# 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**



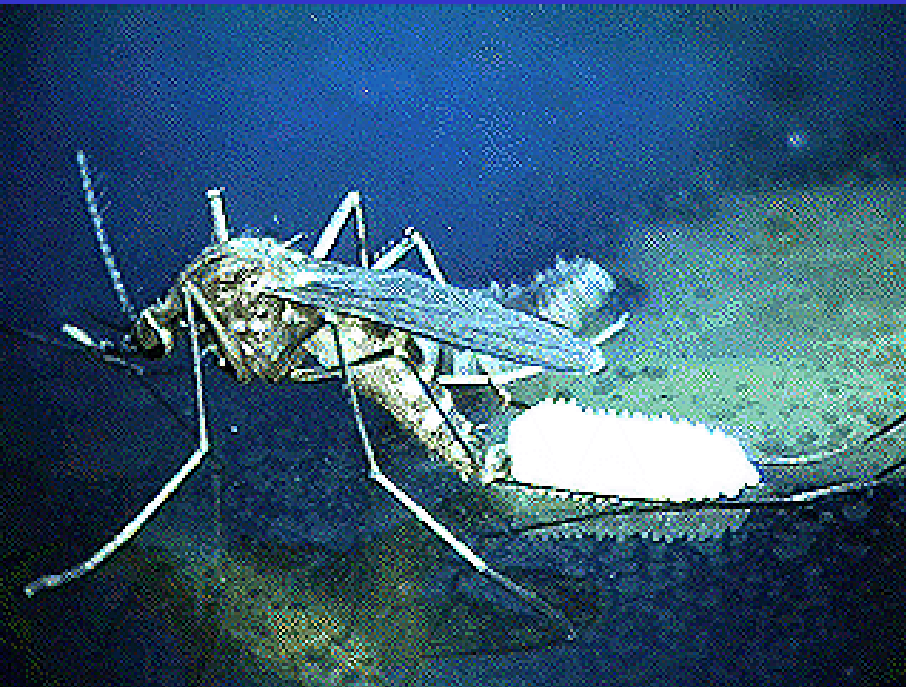
# WNV Activity in Mosquitoes in 2004



# House Mosquito

*Culex pipiens*

*Cx. quinquefasciatus*



Polluted water; residential and commercial sources

# Encephalitis Mosquito

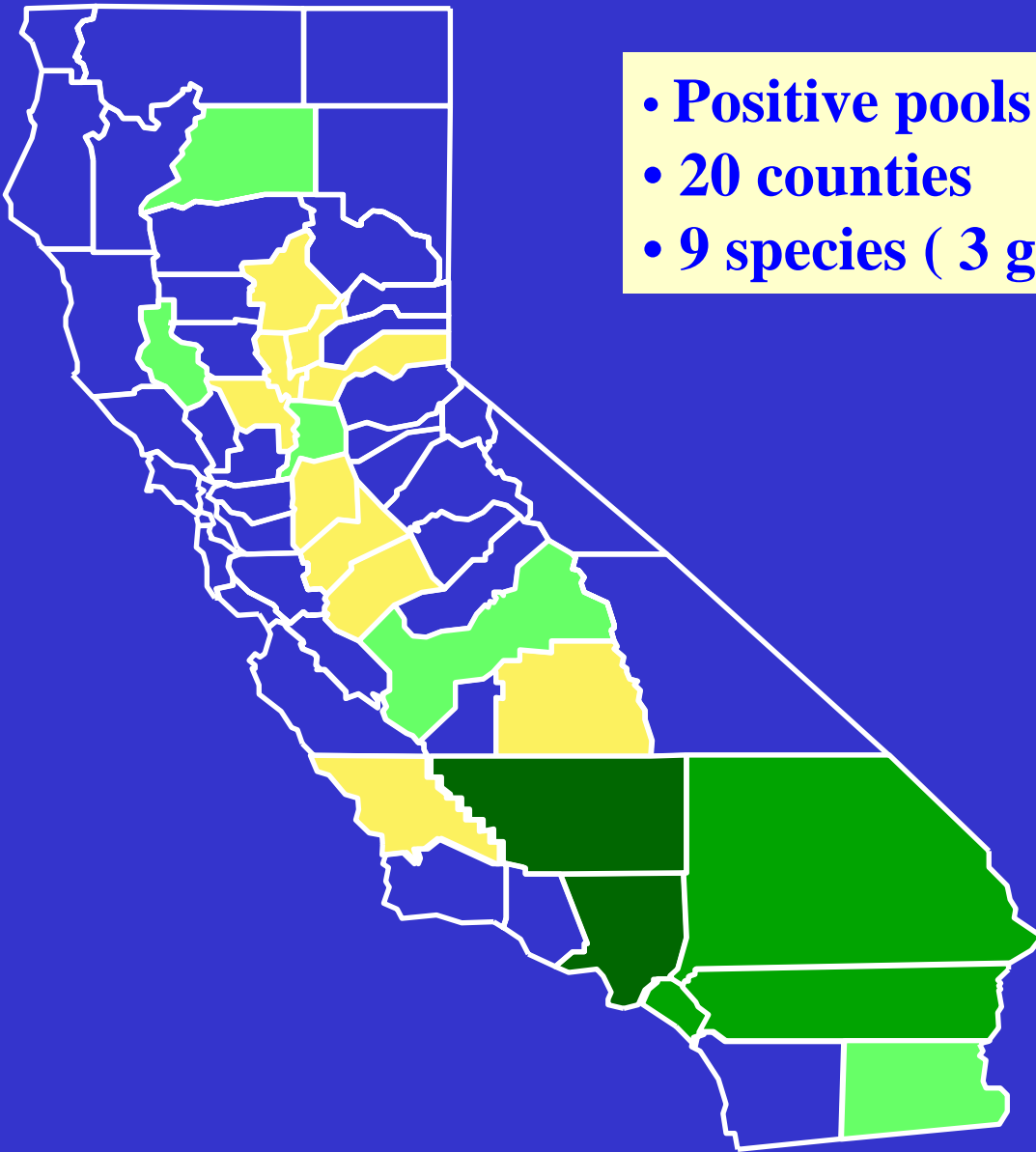
*Culex tarsalis*



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.*)

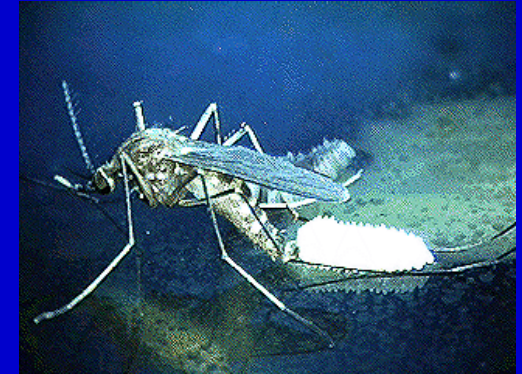


# WNV Positive Mosquito Species

1136 pos. pools / 14,602 mosquitoes tested

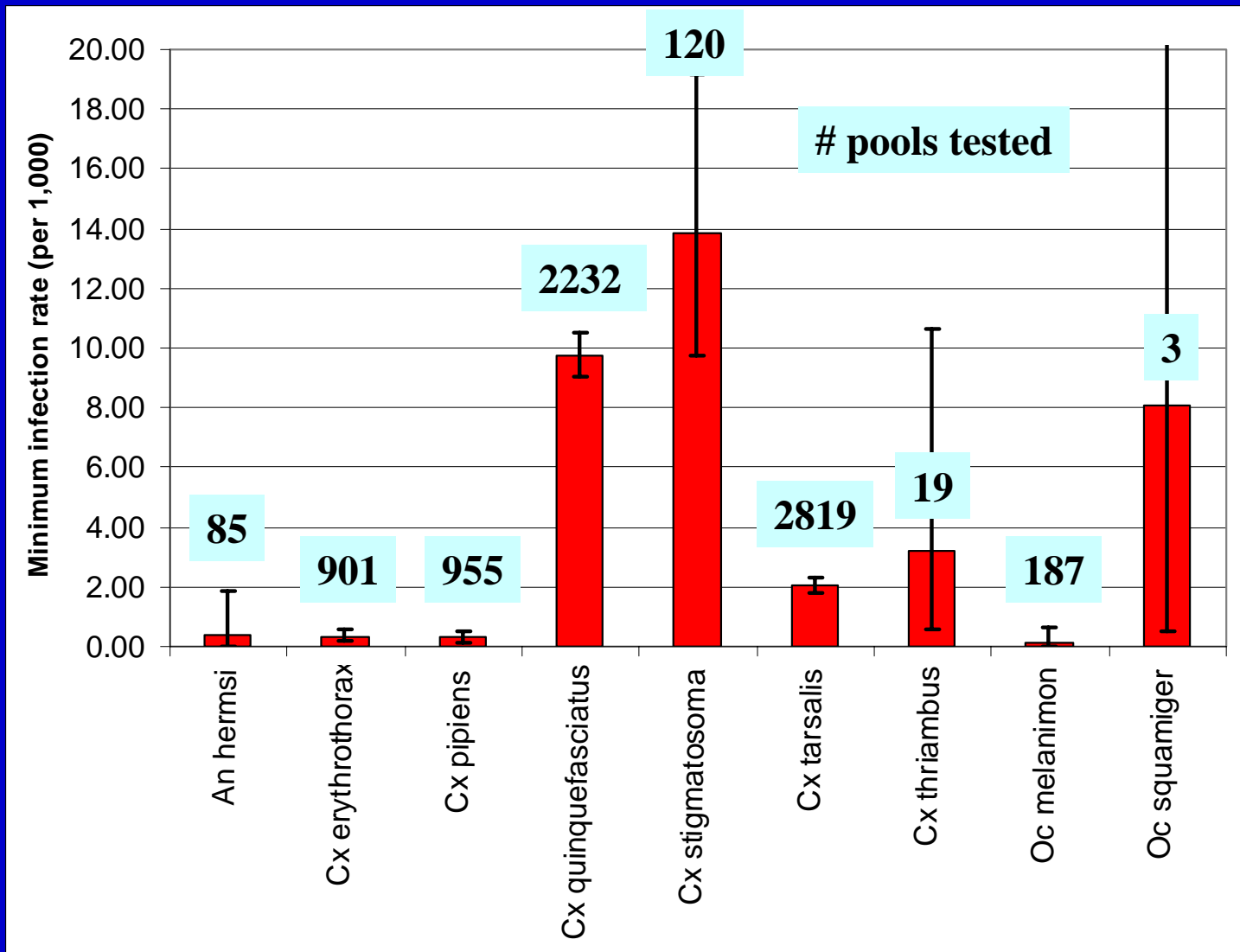
## *CULEX*

<i>quinquefasciatus</i>	741	(65%)
<i>tarsalis</i>	315	(28%)
<i>stigmatosoma</i>	41	(4%)
<i>erythrothorax</i>	19	(2%)
<i>pipiens</i>	13	(1%)
<i>thriambus</i>	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-DVBID.

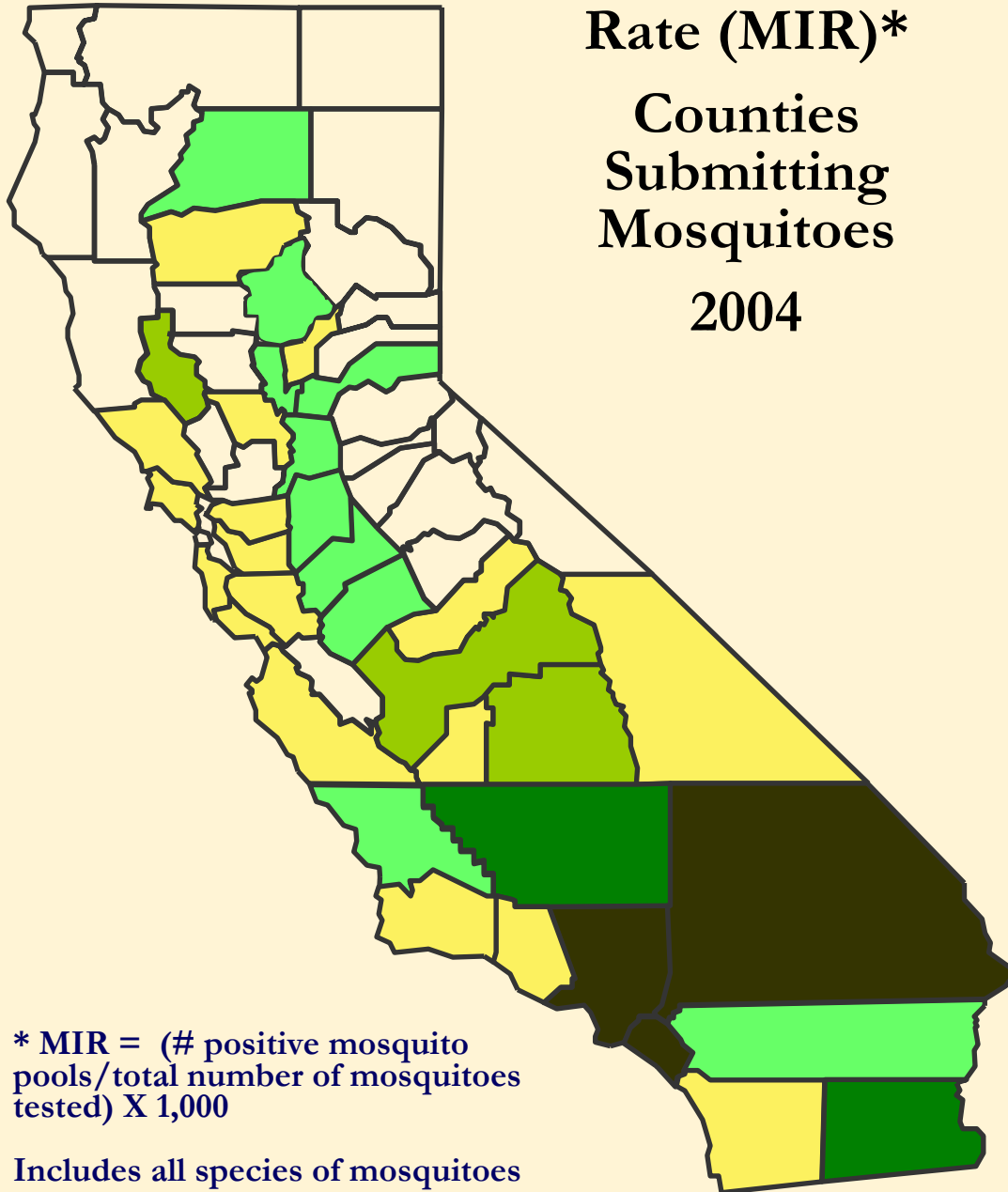




# Minimum Infection Rate (MIR)\*

## Counties Submitting Mosquitoes

2004



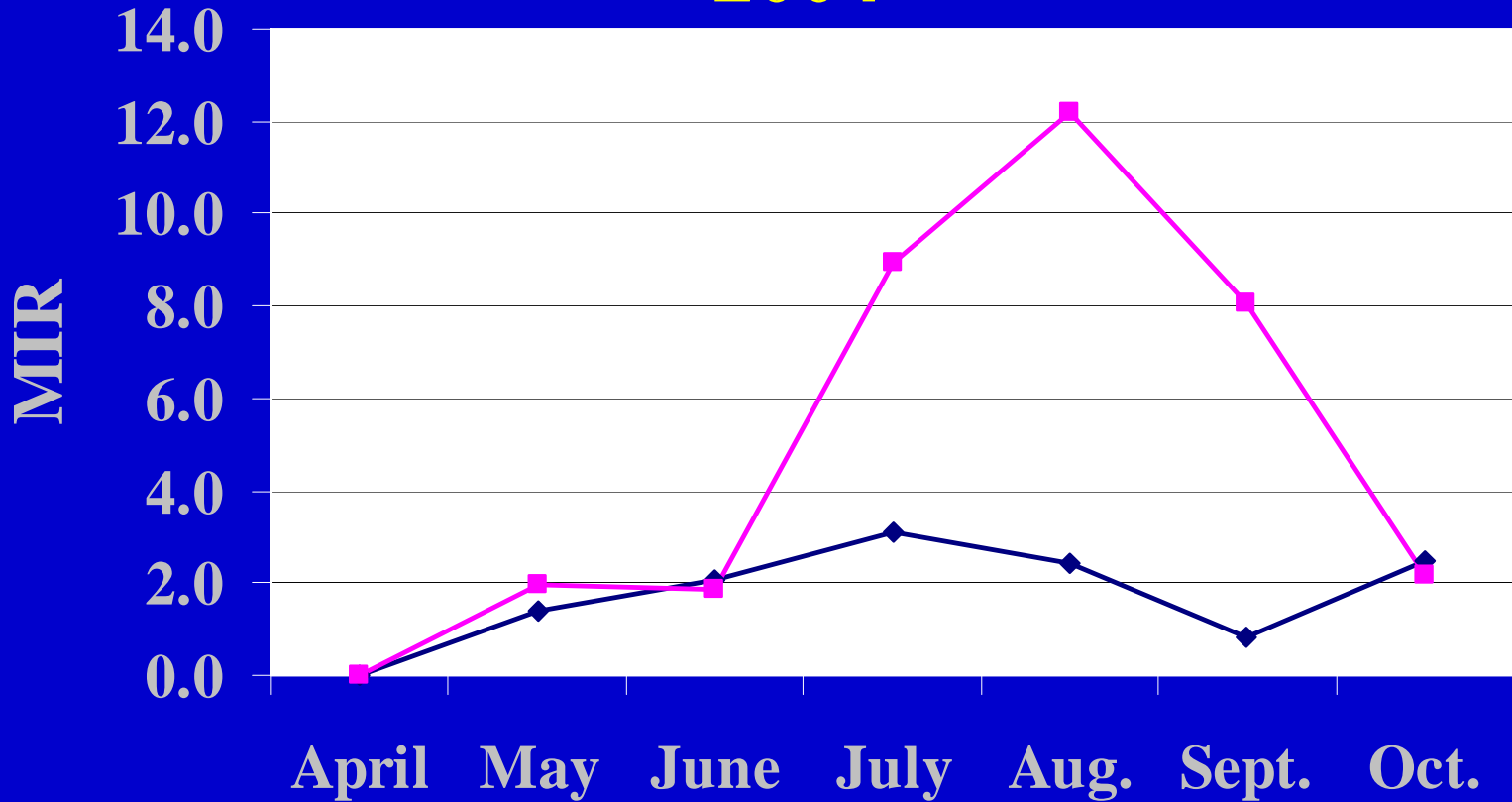
San Bernardino	8.5		
Los Angeles	6.9	≥ 6.0	■
Orange	6.1		
Kern	5.7	≥ 4.0	■
Imperial	4.0		
Lake	2.8		
Fresno	2.0	≥ 2.0	■
Tulare	2.0		
Shasta	1.7		
Sacramento	1.6		
Sutter	1.2		
Riverside	1.6	≥ 0.1	■
Butte	1.3		
Placer	1.0		
San Luis Obispo	0.3		
Merced	0.1		
San Joaquin	0.1		
Stanislaus	0.1		
No positive pools	0		■
No mosquitoes collected			■

\* 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

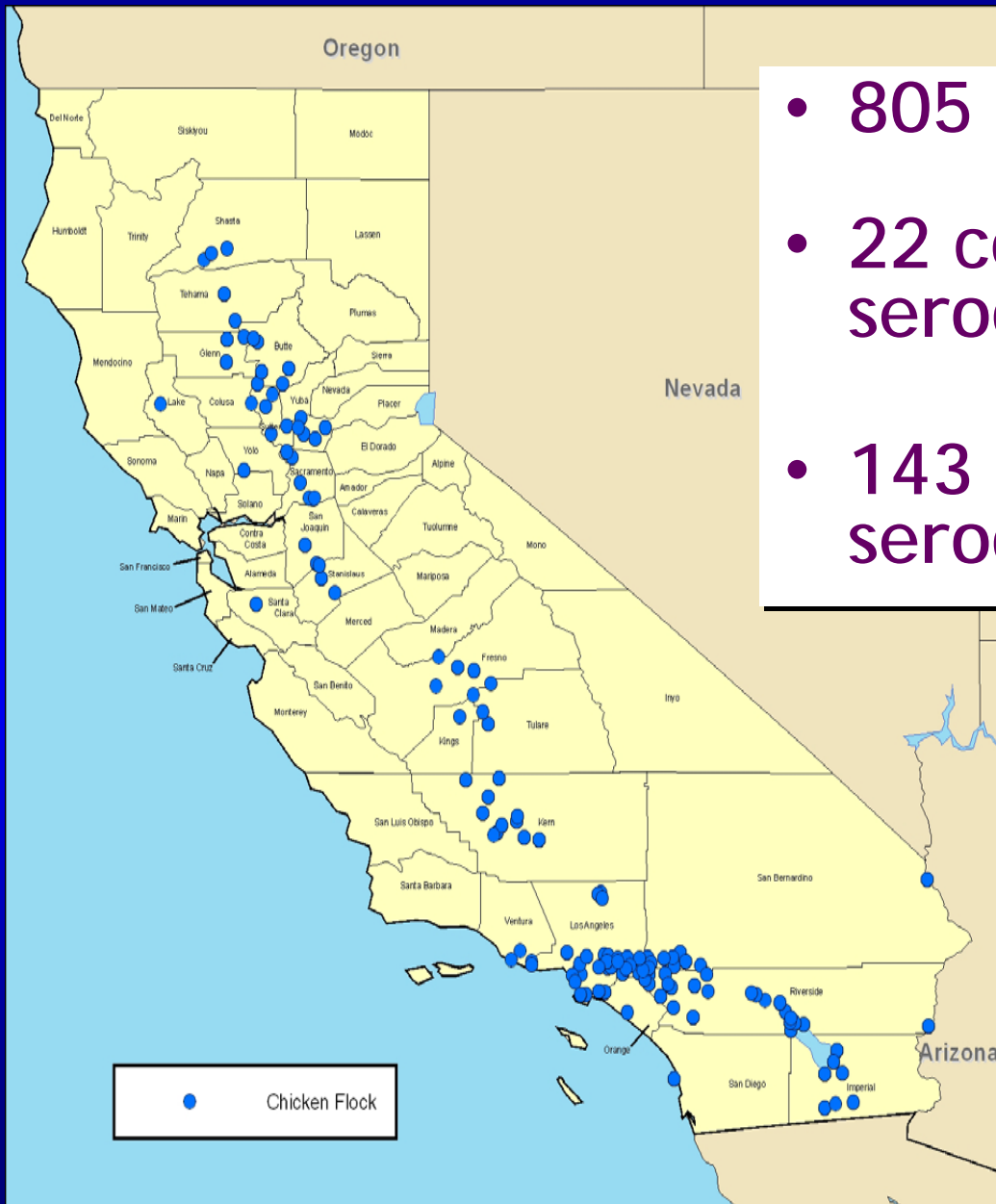
◆ *Cx. tarsalis*    ■ *Cx. quinquefasciatus*

# WNV Activity in Sentinel Chickens in 2004





# WNV Seroconversions in 2004



- 805 seroconversions
- 22 counties with seroconversions
- 143 / 231 flocks seroconverted

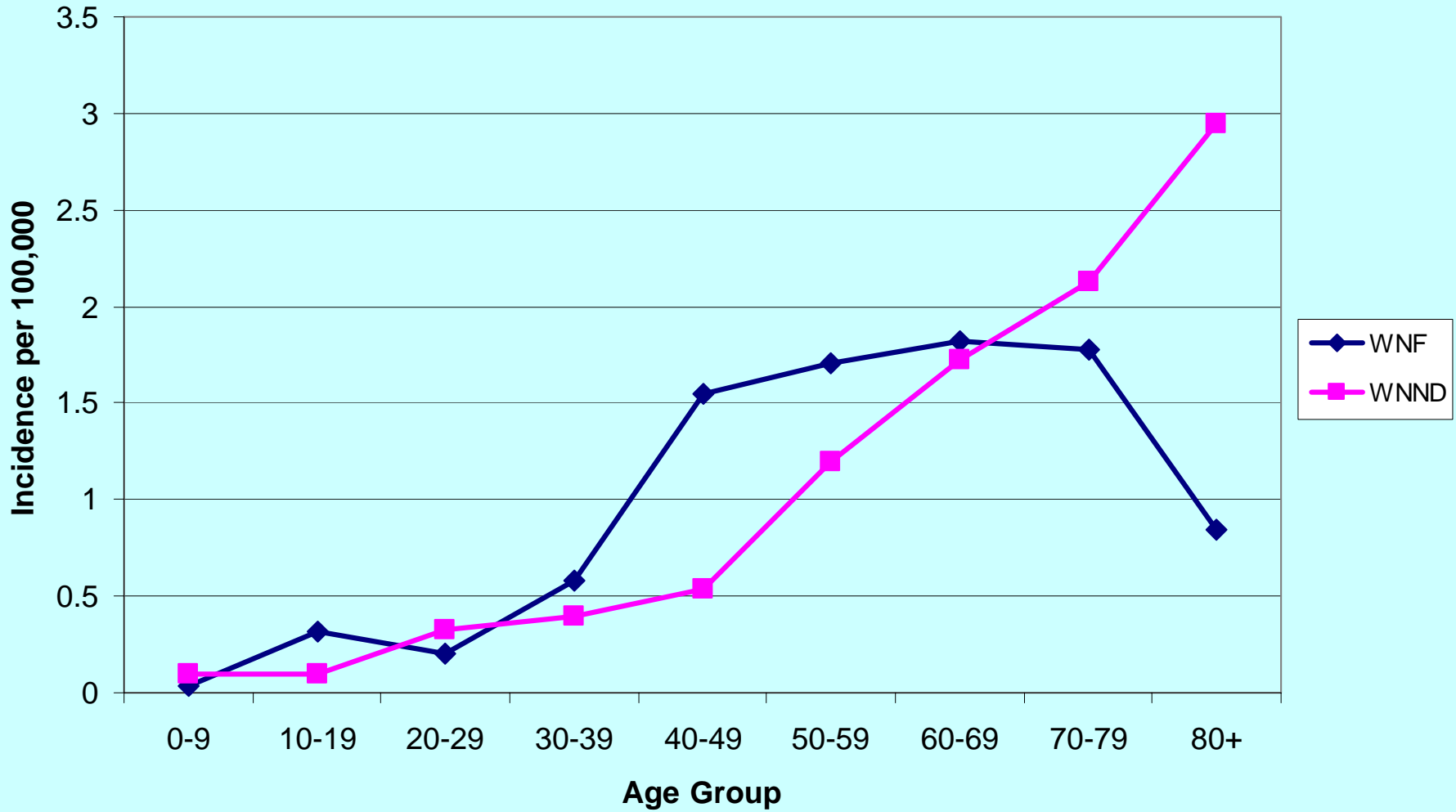
# Human WNV Infections, 2004\*

- 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

# California Human Case Statistics

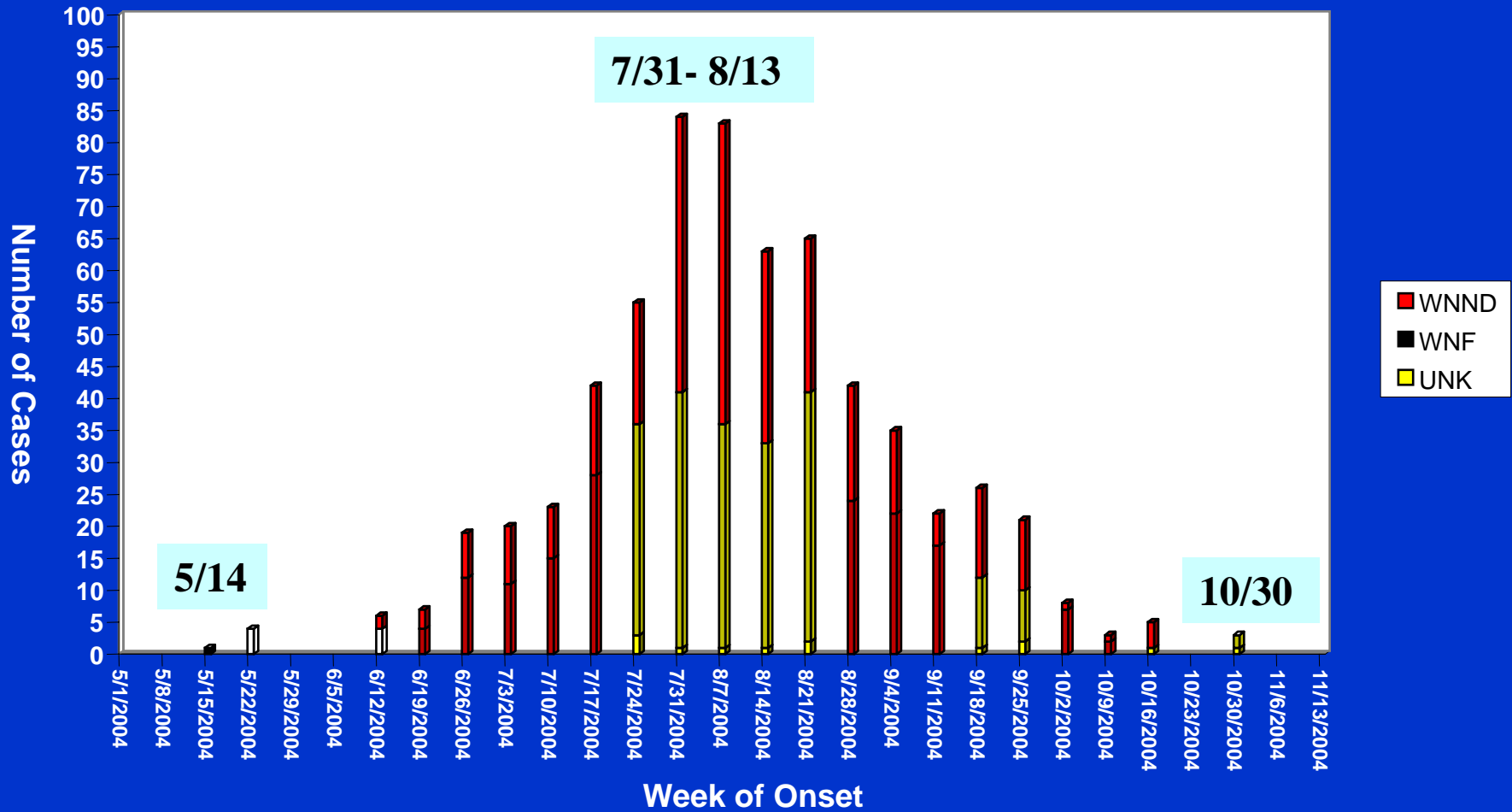
- **777 symptomatic cases:**
  - Median age all cases = 52 yrs (range: 2-94)
  - Median age WNND = 58 yrs (range: 4 – 94)
  - Median age WNF = 50 yrs (range: 2 –91)
  - 62% male
- **27 WNV-associated fatalities:**
  - Median age = 76 yrs (range: 26-94)
- **Known mosquito bite: 26.5%**

# Human WNV Incidence, by Age Group and Clinical Category California, 2004



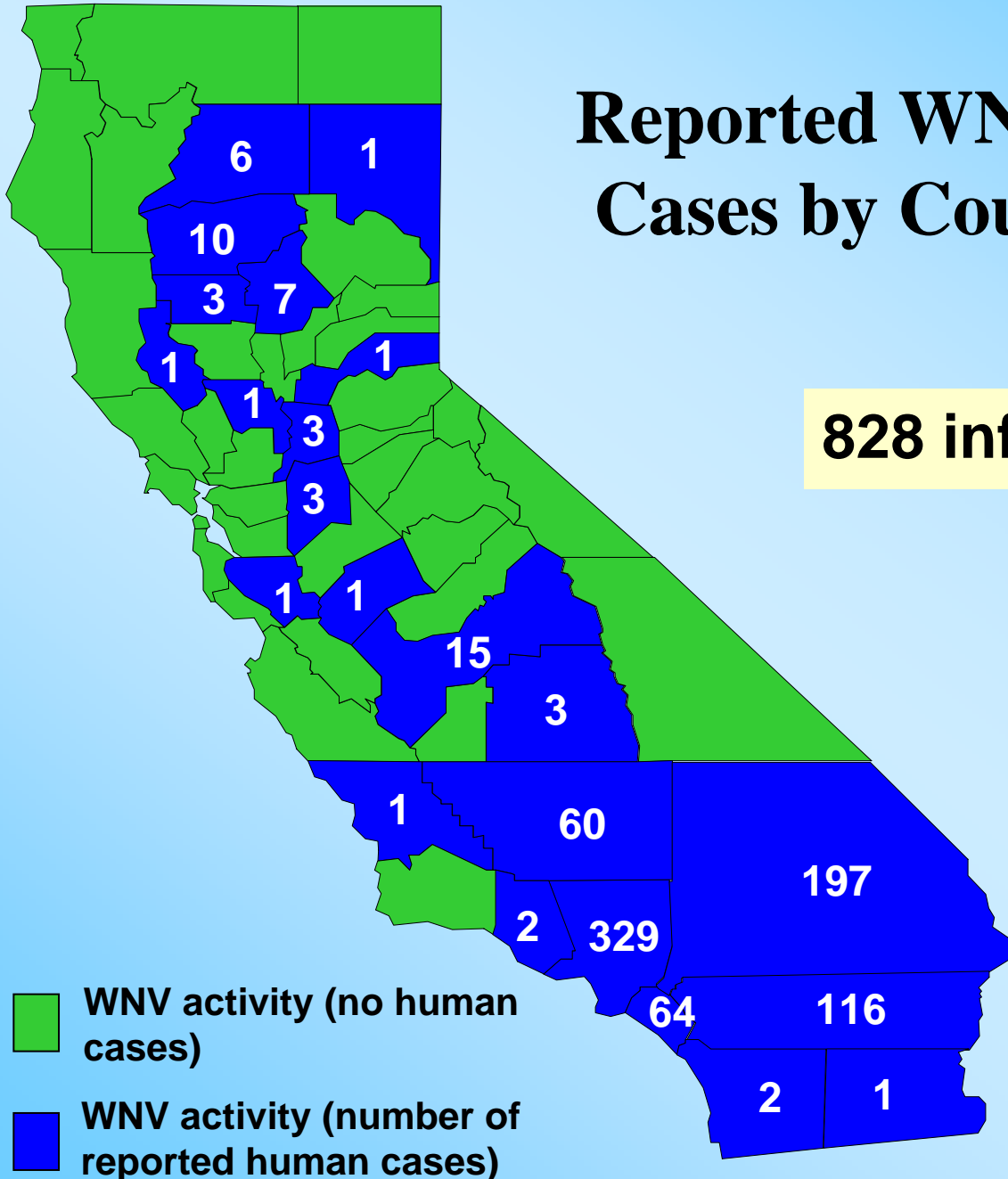


# Week of Onset for Human WNV Cases California 2004 (n=643)



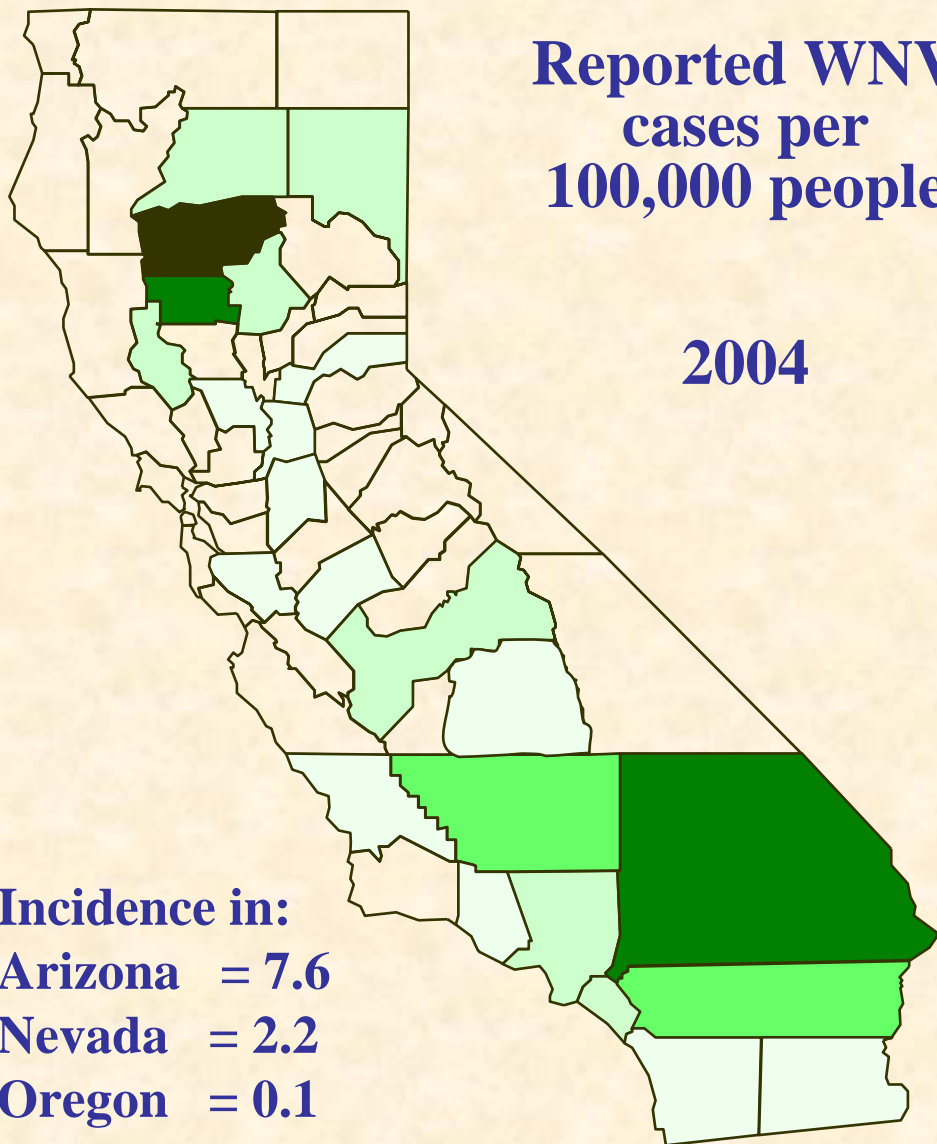
# Reported WNV Human Cases by County, 2004

828 infections








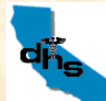
# Reported WNV cases per 100,000 people

2004



Incidence in:  
 Arizona = 7.6  
 Nevada = 2.2  
 Oregon = 0.1  
 Colorado = 6.4  
 CO 2003 = 68.5

<b>CA Total:</b>	<b>2.4</b>	
<b>Tehama</b>	<b>17.8</b>	<b>≥15</b> 
<b>San Bernardino</b>	<b>11.5</b>	
<b>Glenn</b>	<b>11.3</b>	<b>≥10</b> 
<b>Kern</b>	<b>9.0</b>	
<b>Riverside</b>	<b>7.2</b>	<b>≥5</b> 
<b>Shasta</b>	<b>3.7</b>	
<b>Butte</b>	<b>3.4</b>	
<b>Los Angeles</b>	<b>3.4</b>	
<b>Lassen</b>	<b>2.9</b>	<b>≥1</b> 
<b>Orange</b>	<b>2.2</b>	
<b>Fresno</b>	<b>1.8</b>	
<b>Lake</b>	<b>1.7</b>	
<b>Others</b>		<b>&gt;0</b> 

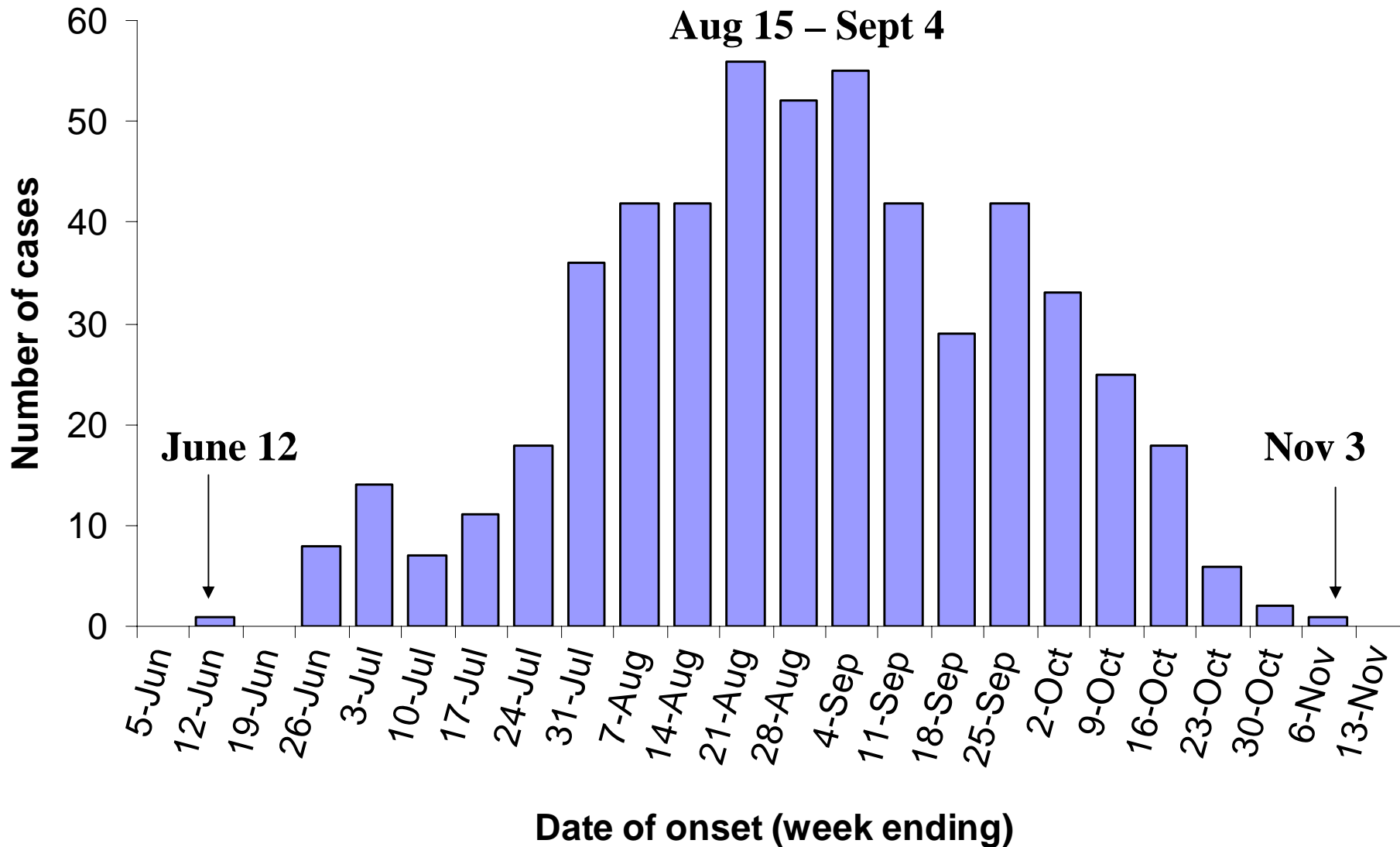


# 2004 Equine WNV Data

- **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



# Equine Cases

