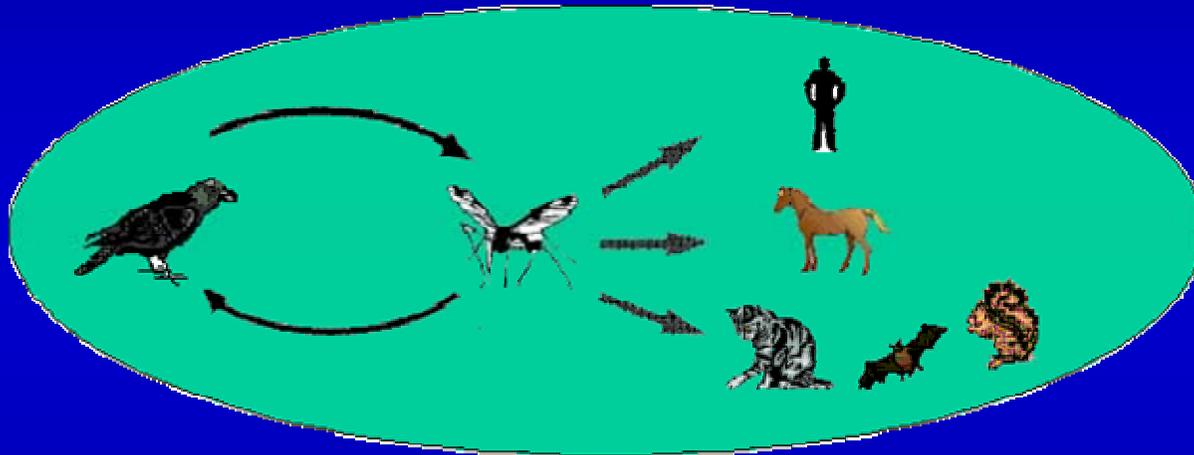


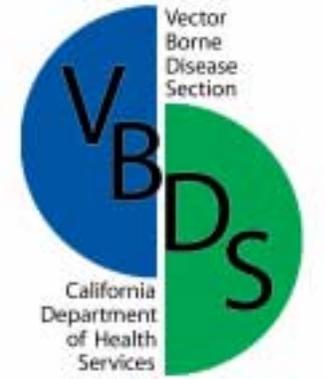
West Nile Virus Activity in California in 2004



Vicki Kramer, Ph.D.

Vector-Borne Disease Section

California Department of Health Services



WNV Team at DHS



- **VBDS**

- 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



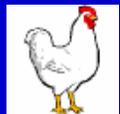
Dead birds

3,232



Mosquito pools

1,136

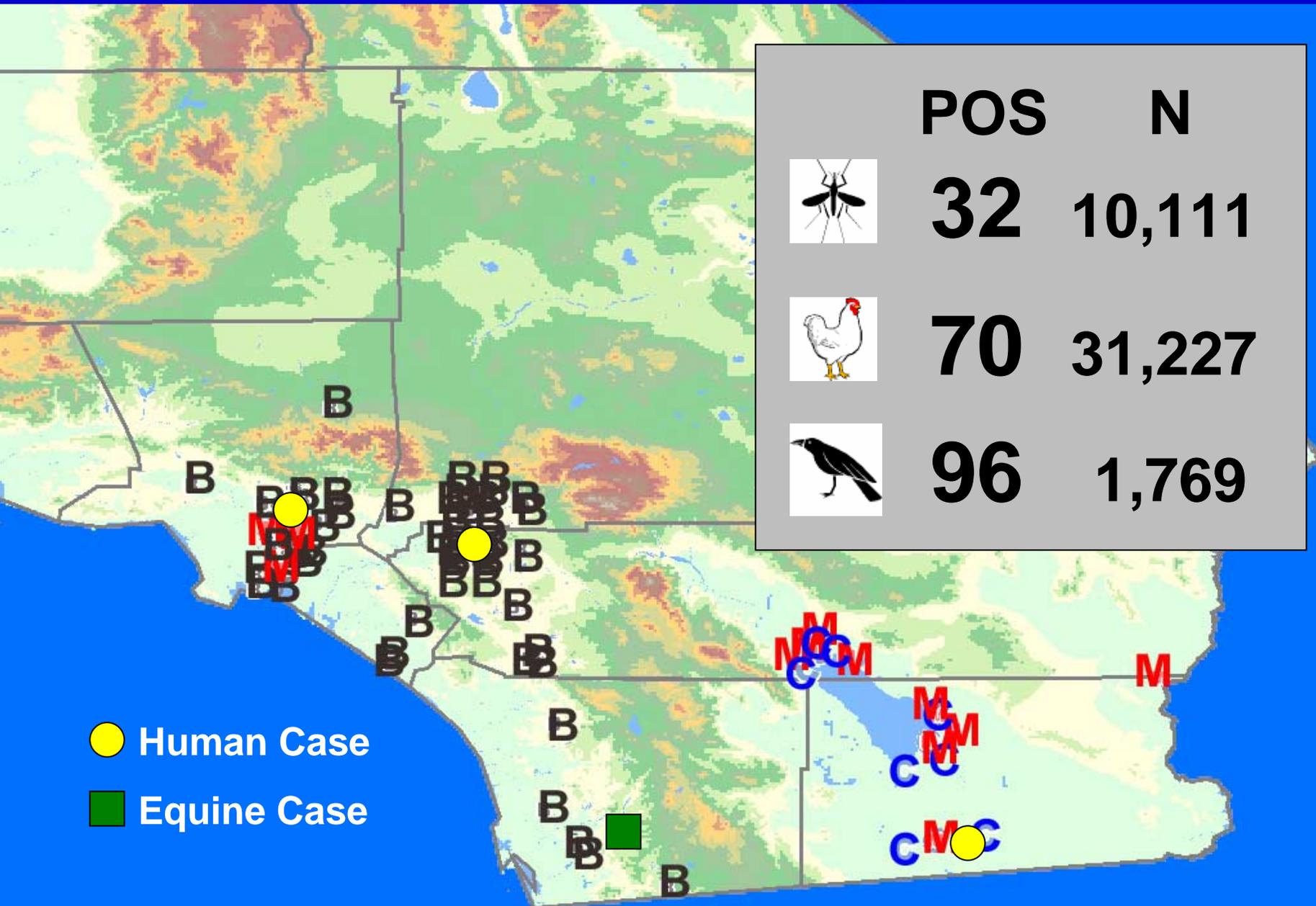


Sentinel chickens

809

<http://www.westnile.ca.gov>

WNV in California, 2003



Crows at staging area Whittier Narrows Wildlife Area

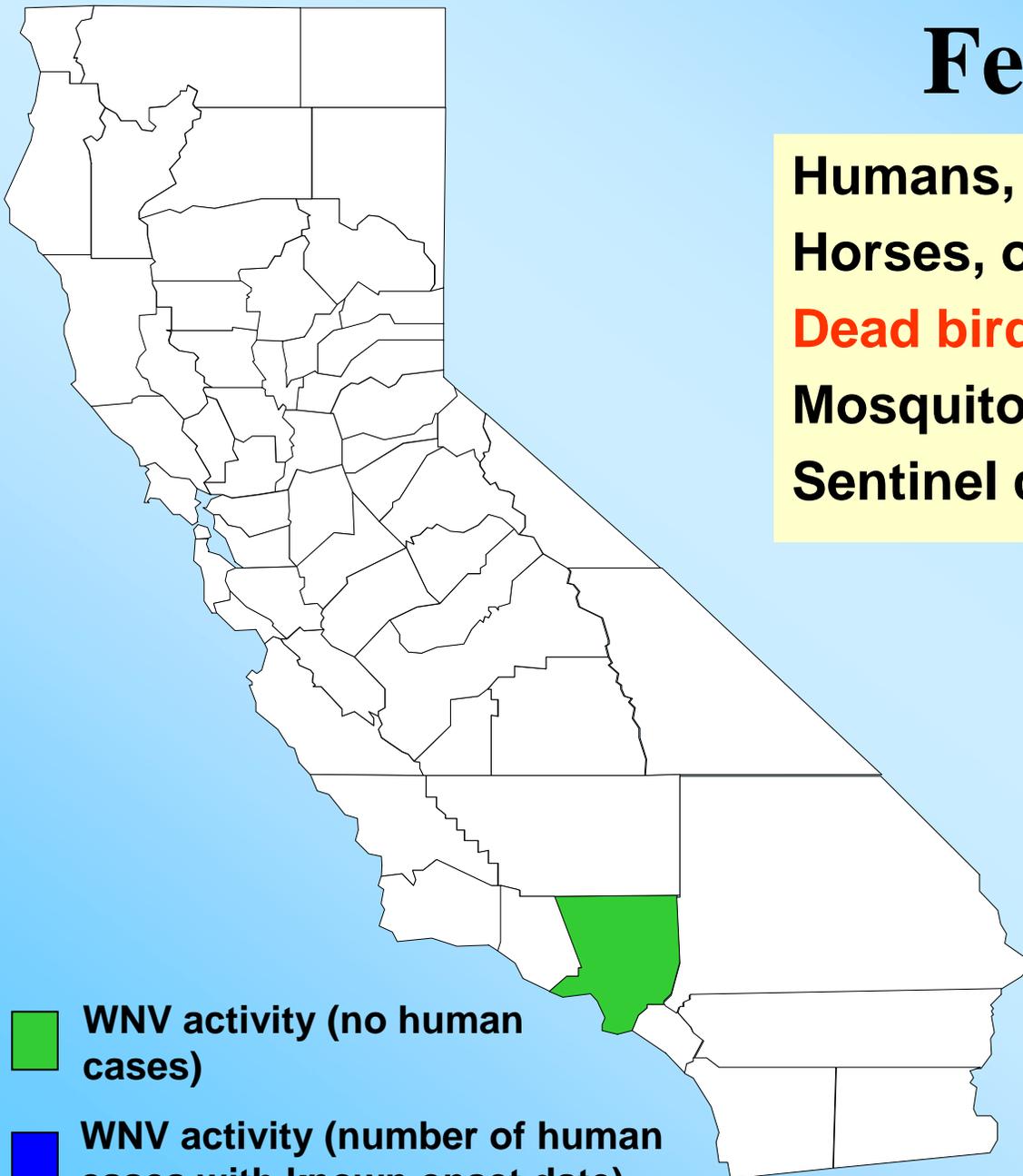


Photo by Bill Reisen, UCD

February 2004

Humans, onset / reported	0
Horses, onset / reported	0
Dead birds	1
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

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

1 county



WNV activity (no human cases)

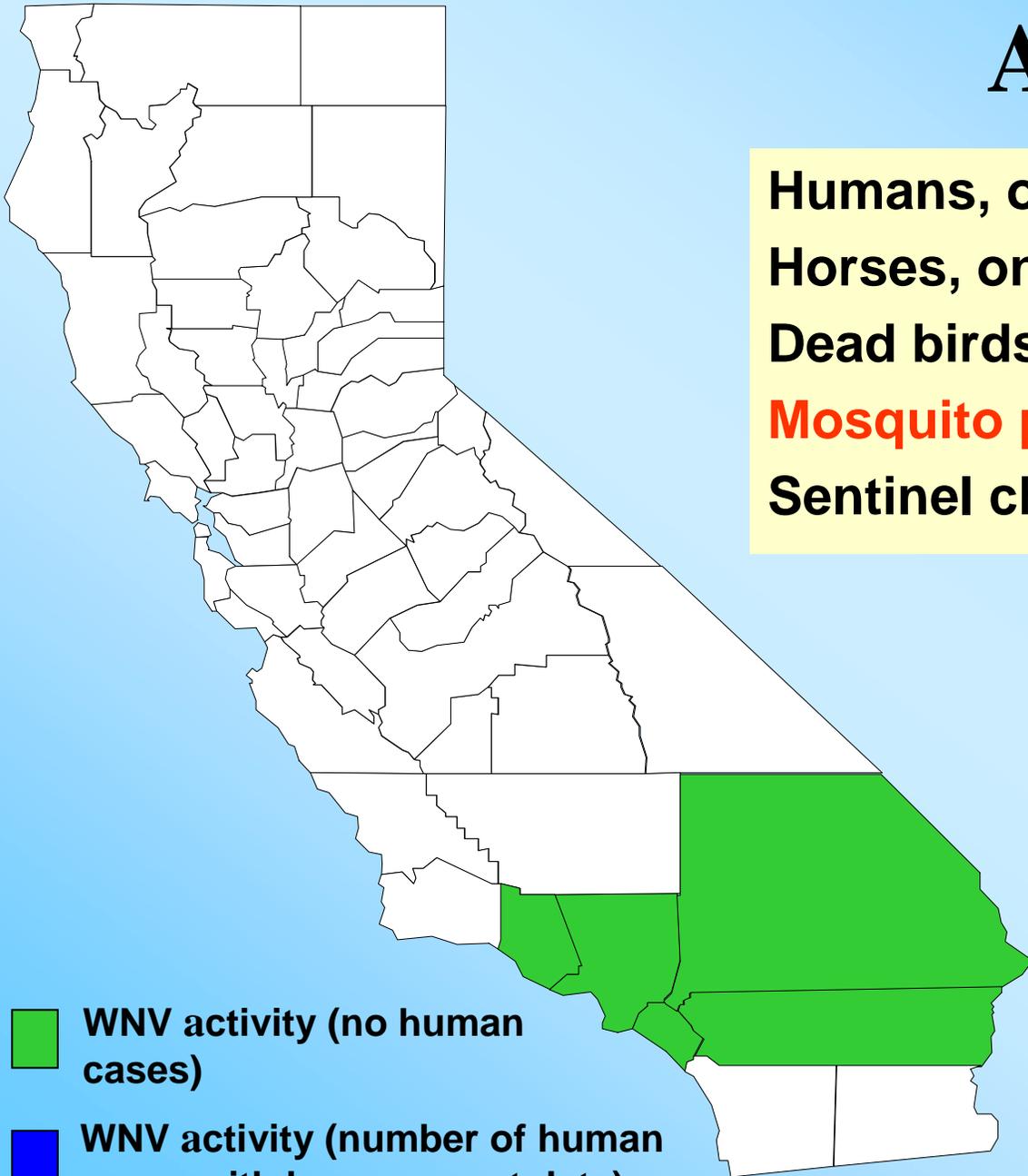
WNV activity (number of human cases with known onset date)

April 2004

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

5 counties

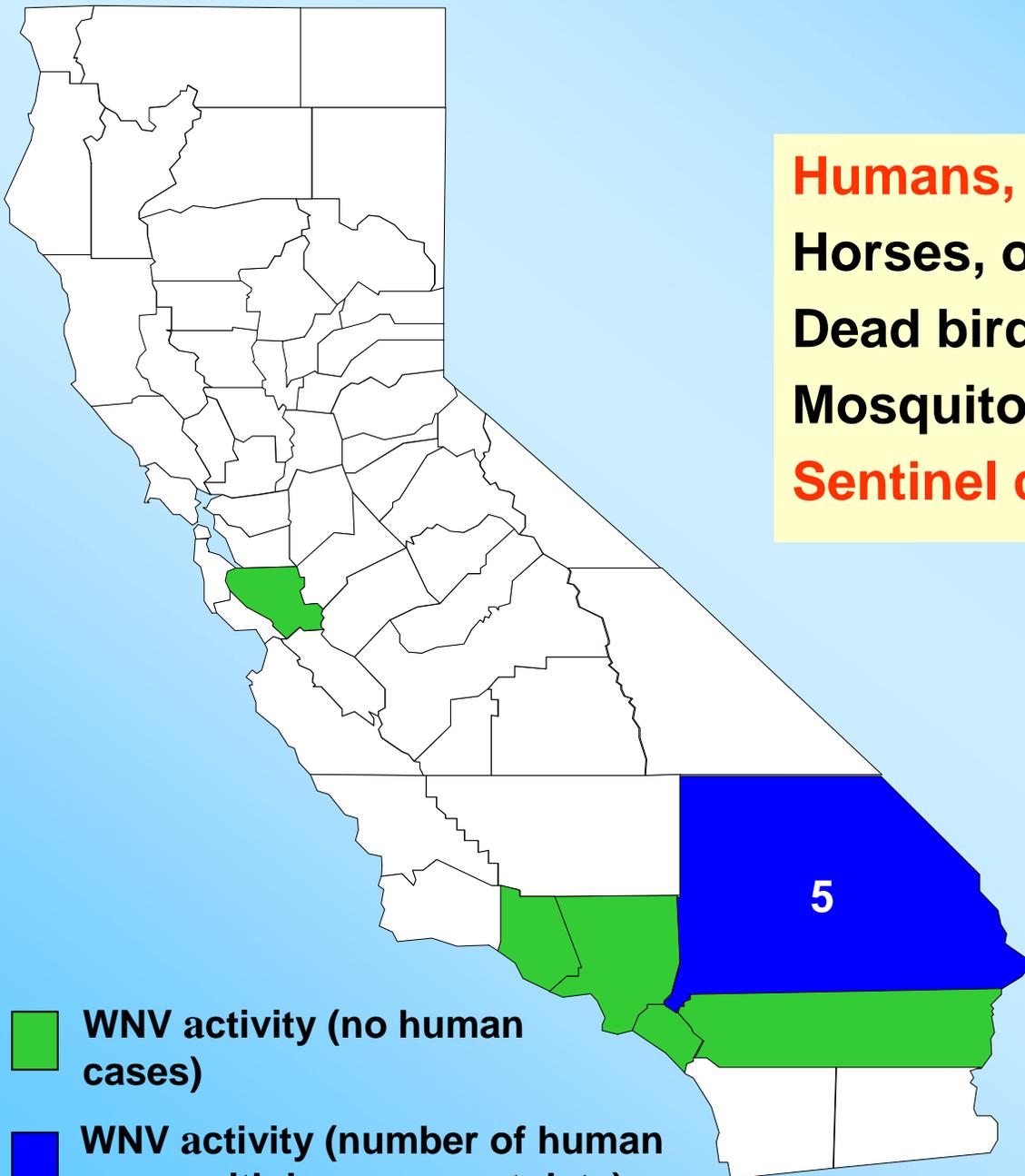
-  WNV activity (no human cases)
-  WNV activity (number of human cases with known onset date)



May 2004

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

6 counties



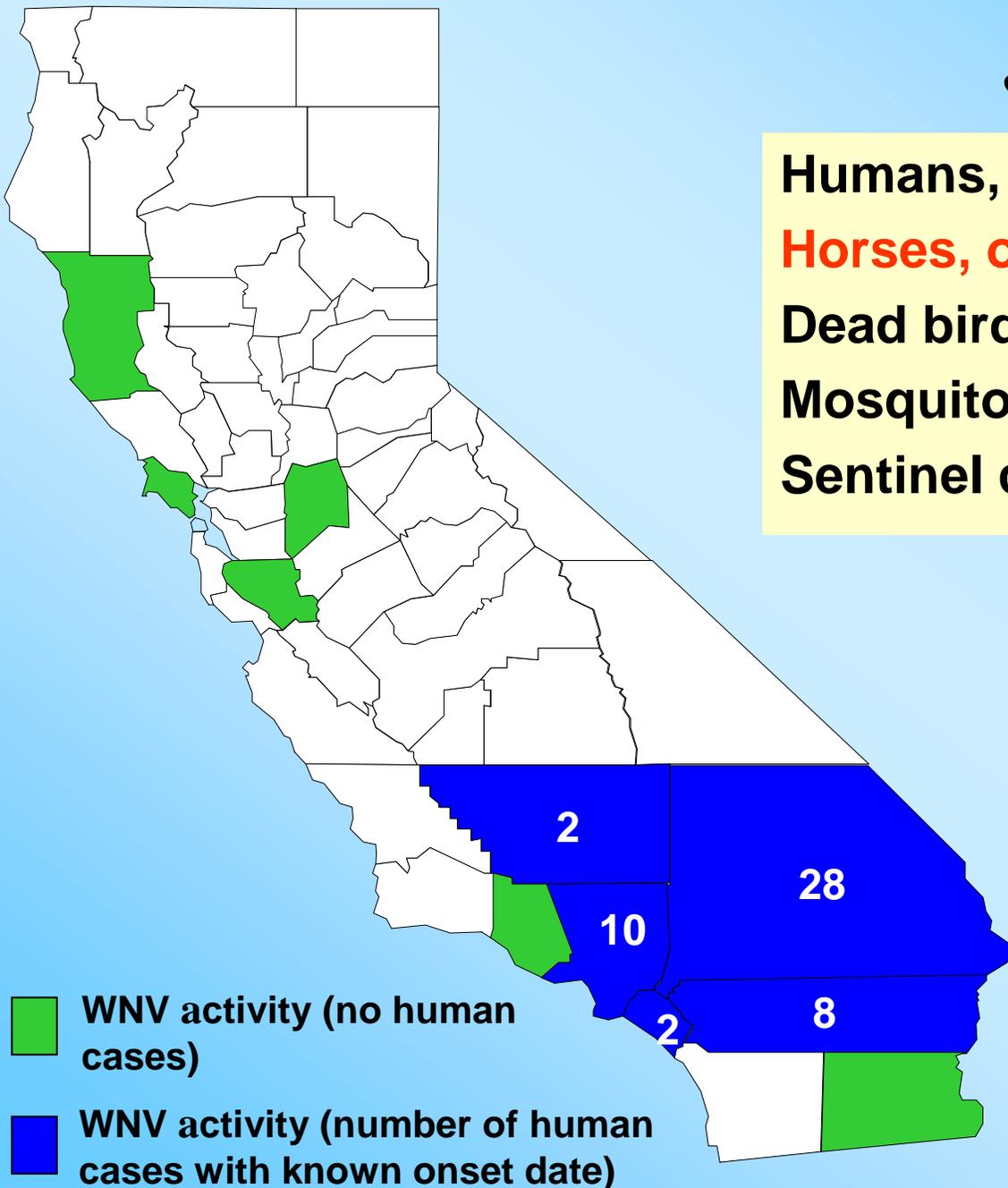
WNV activity (no human cases)

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

June 2004

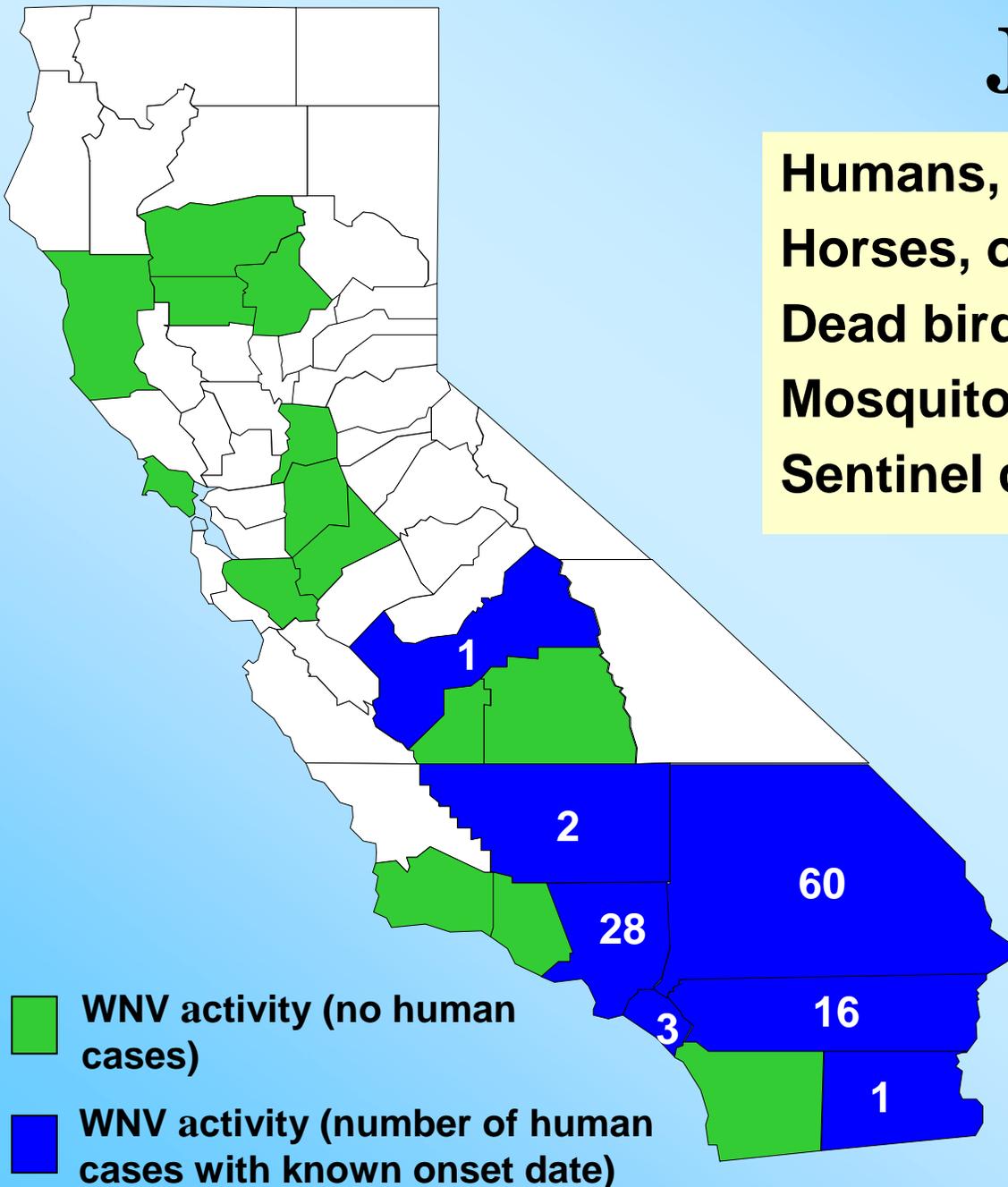
Humans, onset / reported	50 / 4
Horses, onset / reported	15 / 4
Dead birds	874
Mosquito pools	180
Sentinel chickens	113

11 counties



July 15, 2004

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

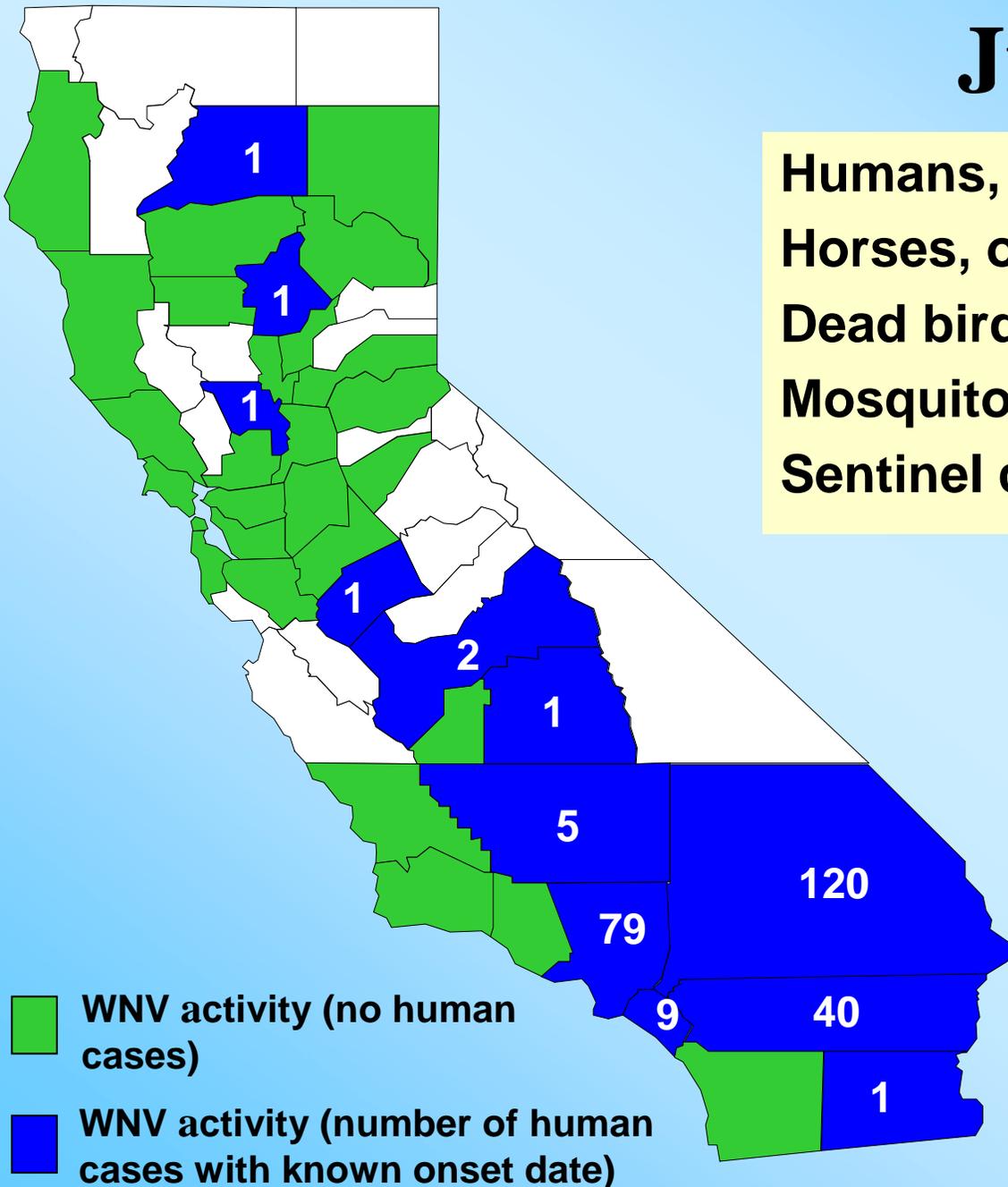


21 counties

July 31, 2004

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

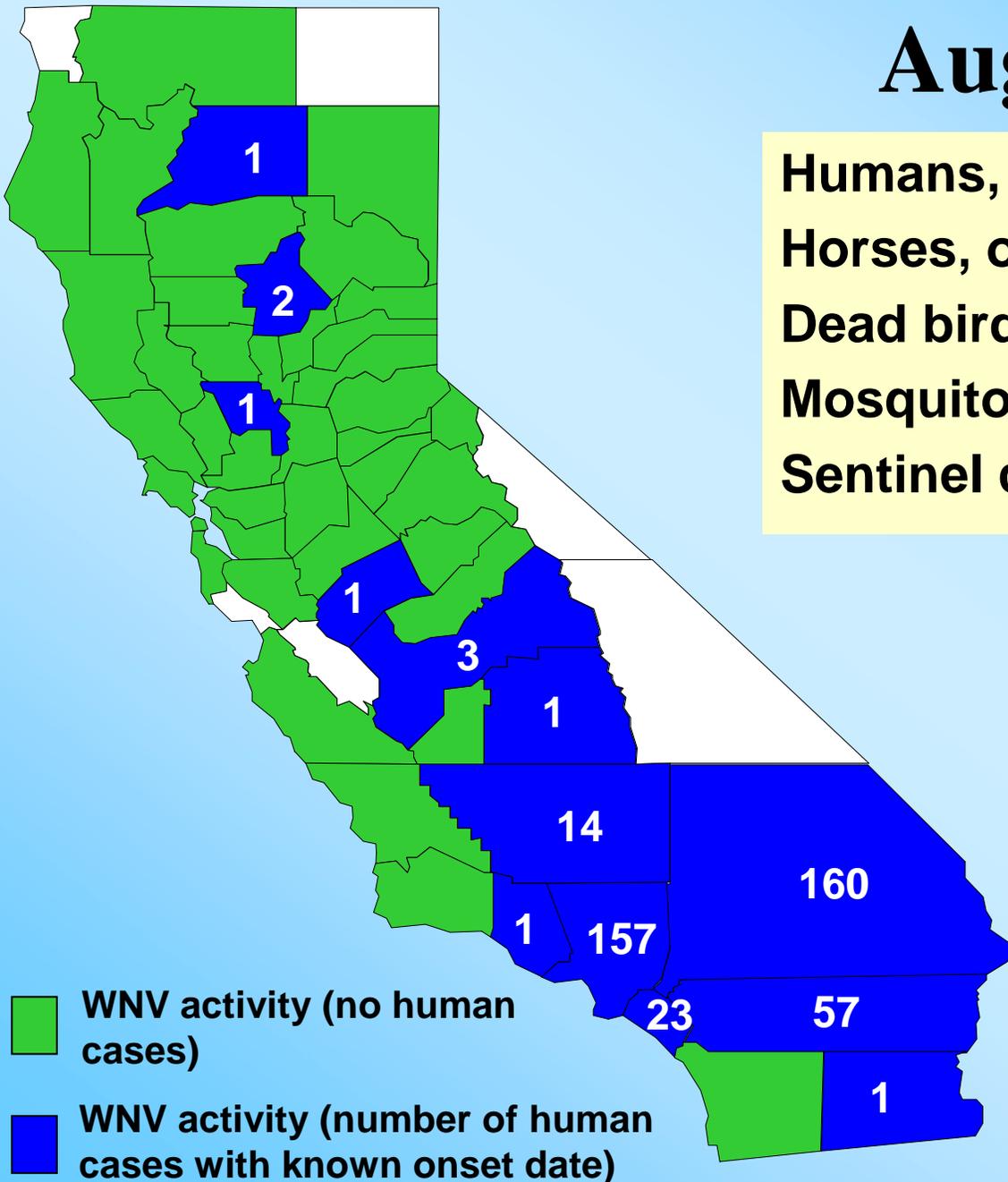
39 counties



August 15, 2004

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

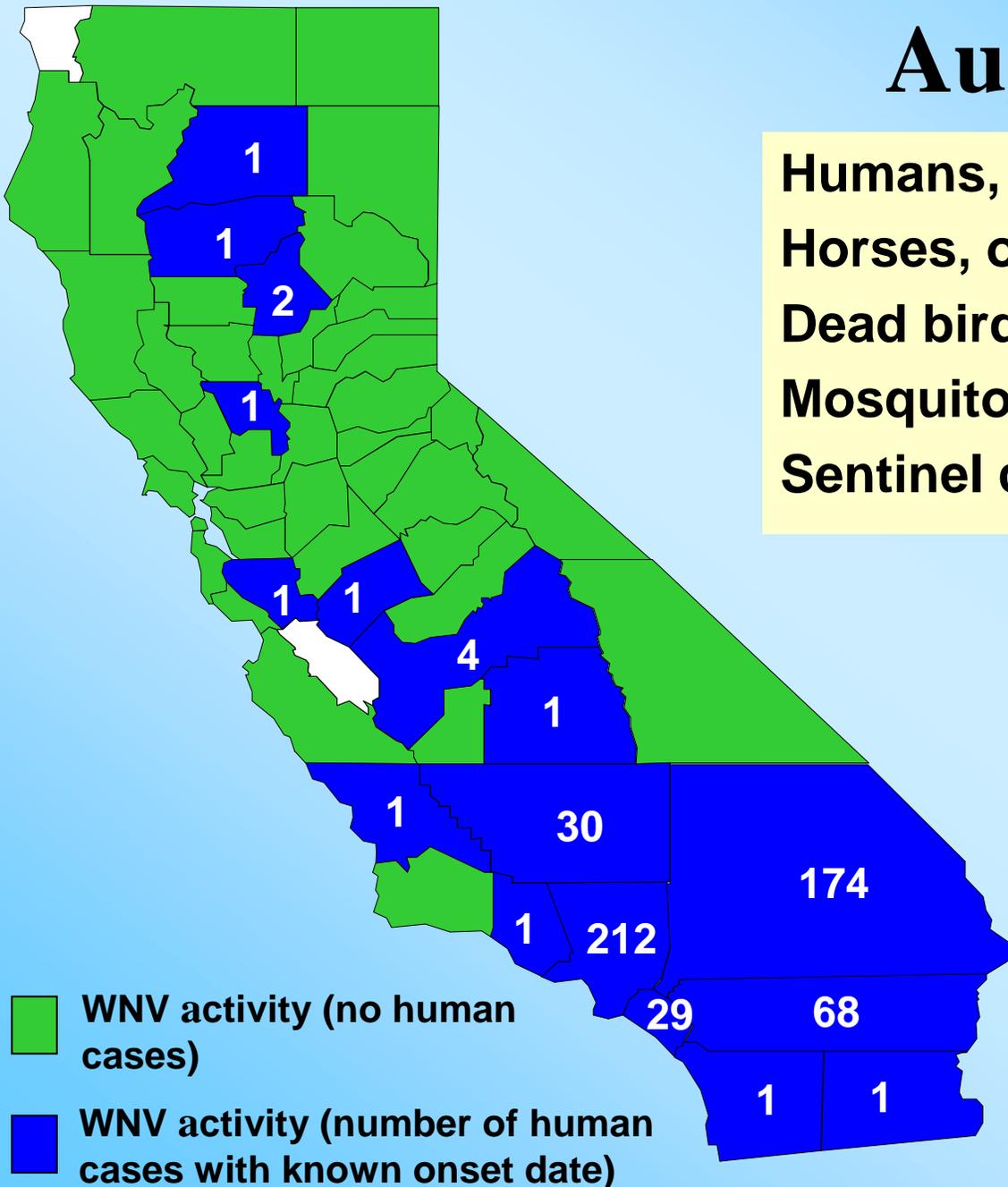
52 counties



August 31, 2004

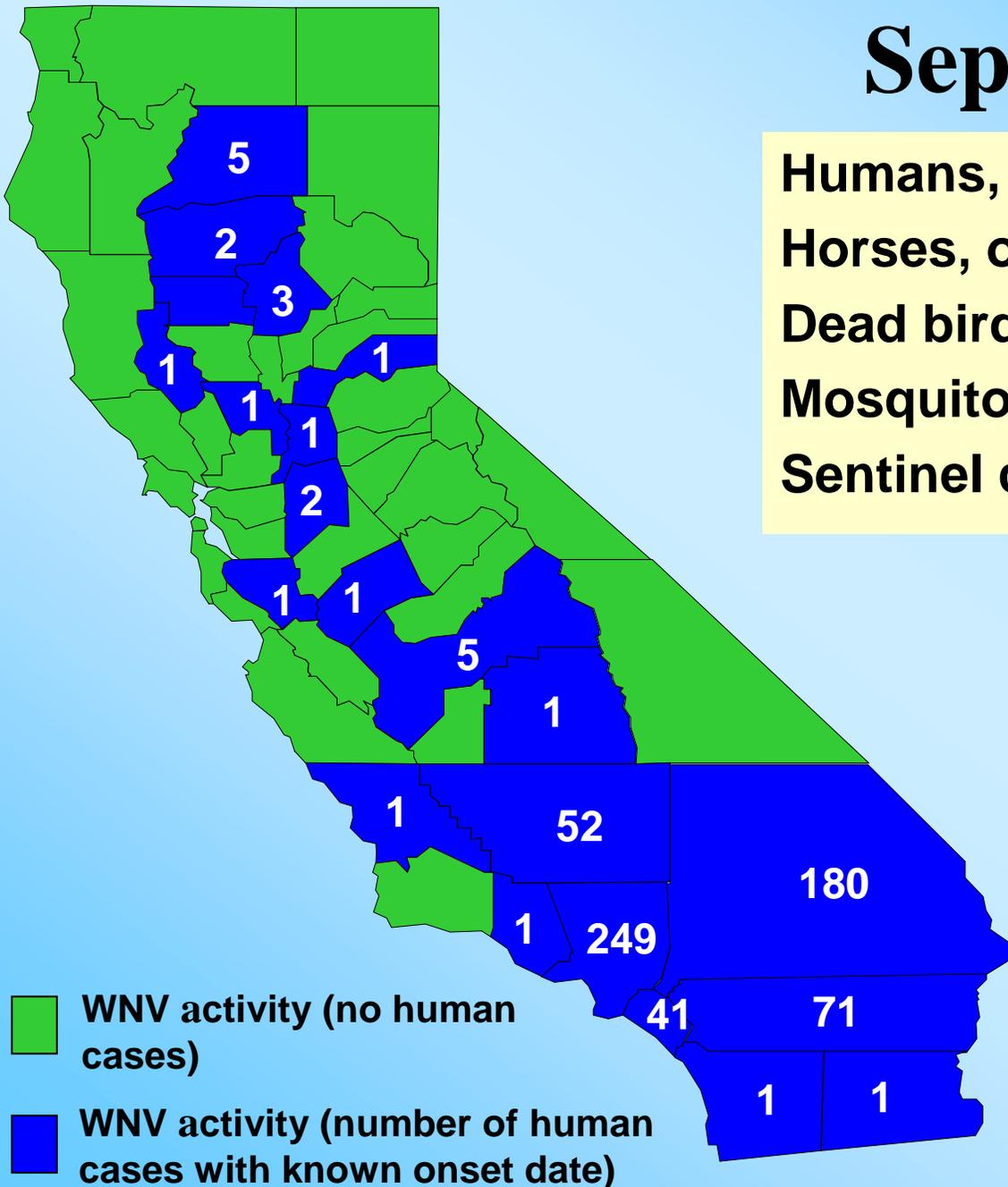
Humans, onset / reported	529 / 430
Horses, onset / reported	264 / 199
Dead birds	2440
Mosquito pools	858
Sentinel chickens	474

56 counties



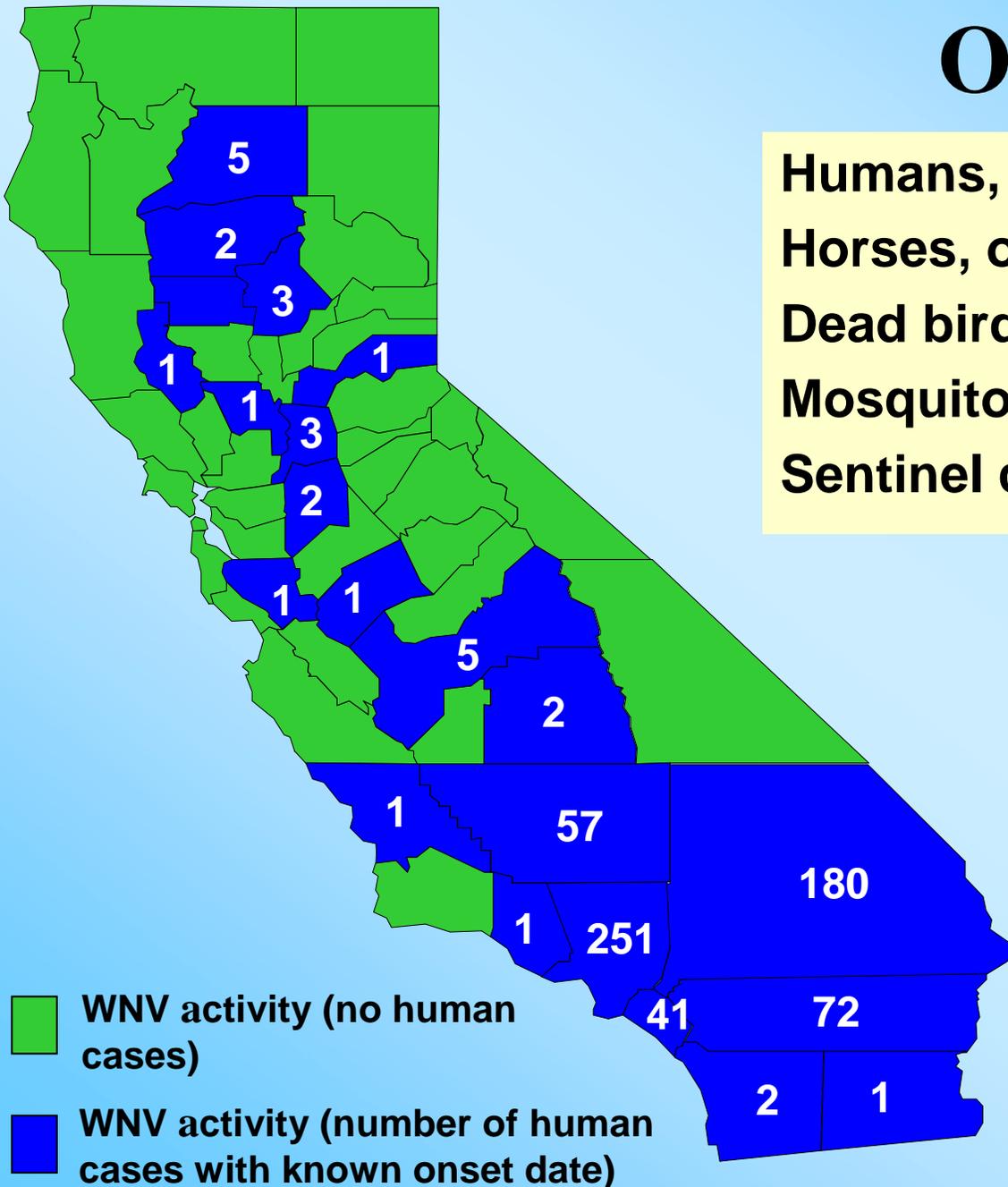
September, 2004

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



October, 2004

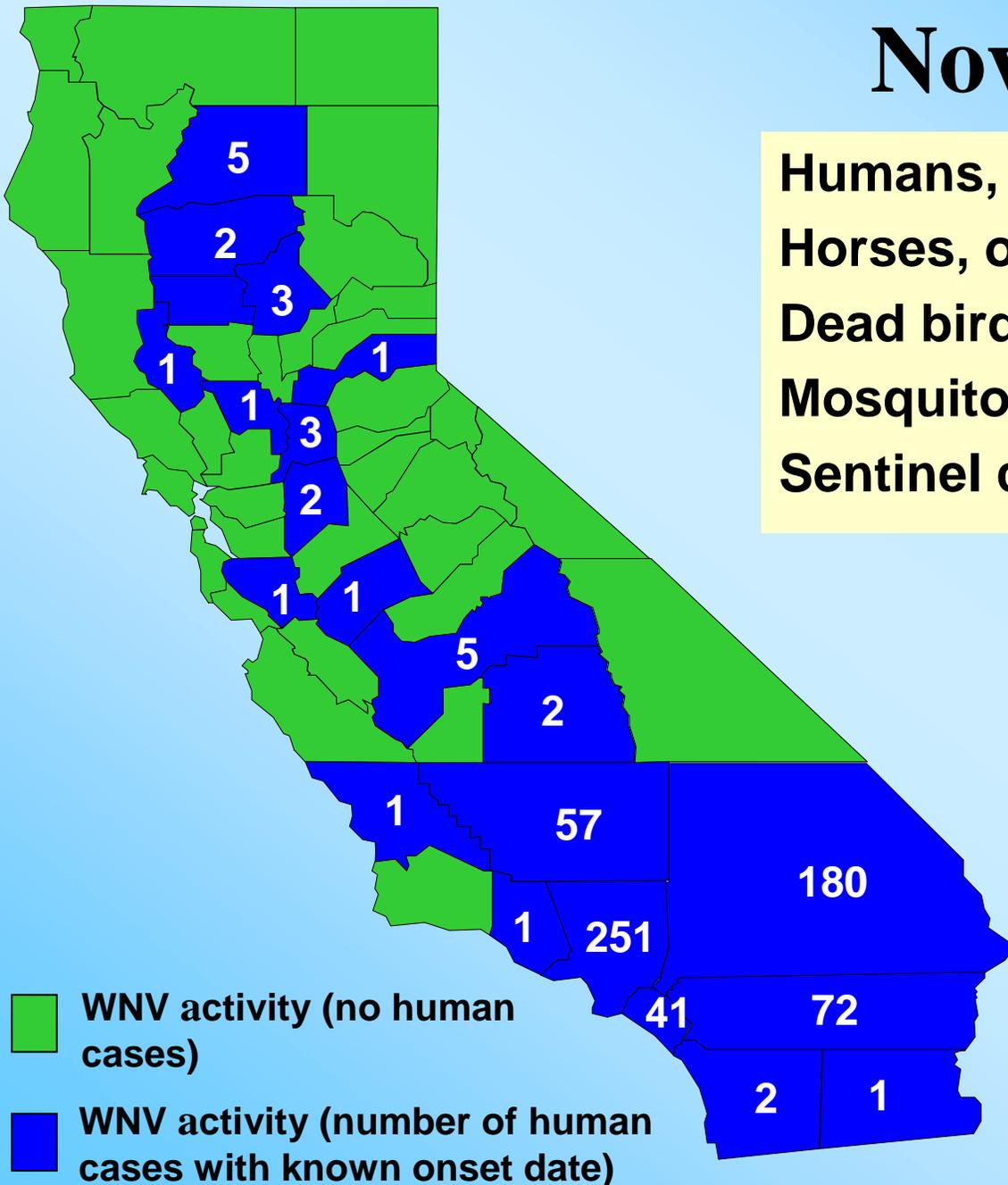
Humans, onset / reported	633 / 790
Horses, onset / reported	326 / 529
Dead birds	3192
Mosquito pools	1135
Sentinel chickens	779



58 counties

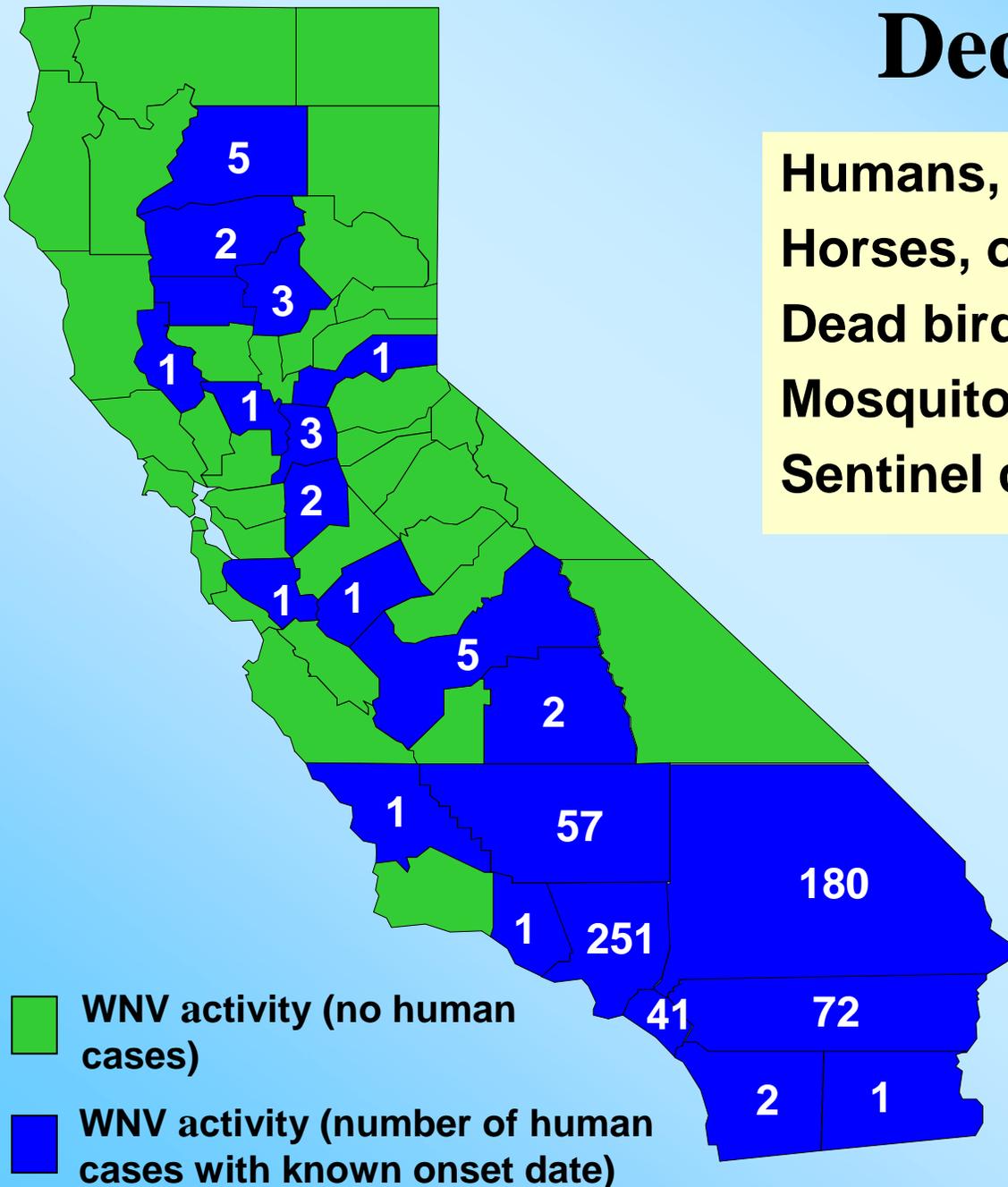
November, 2004

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



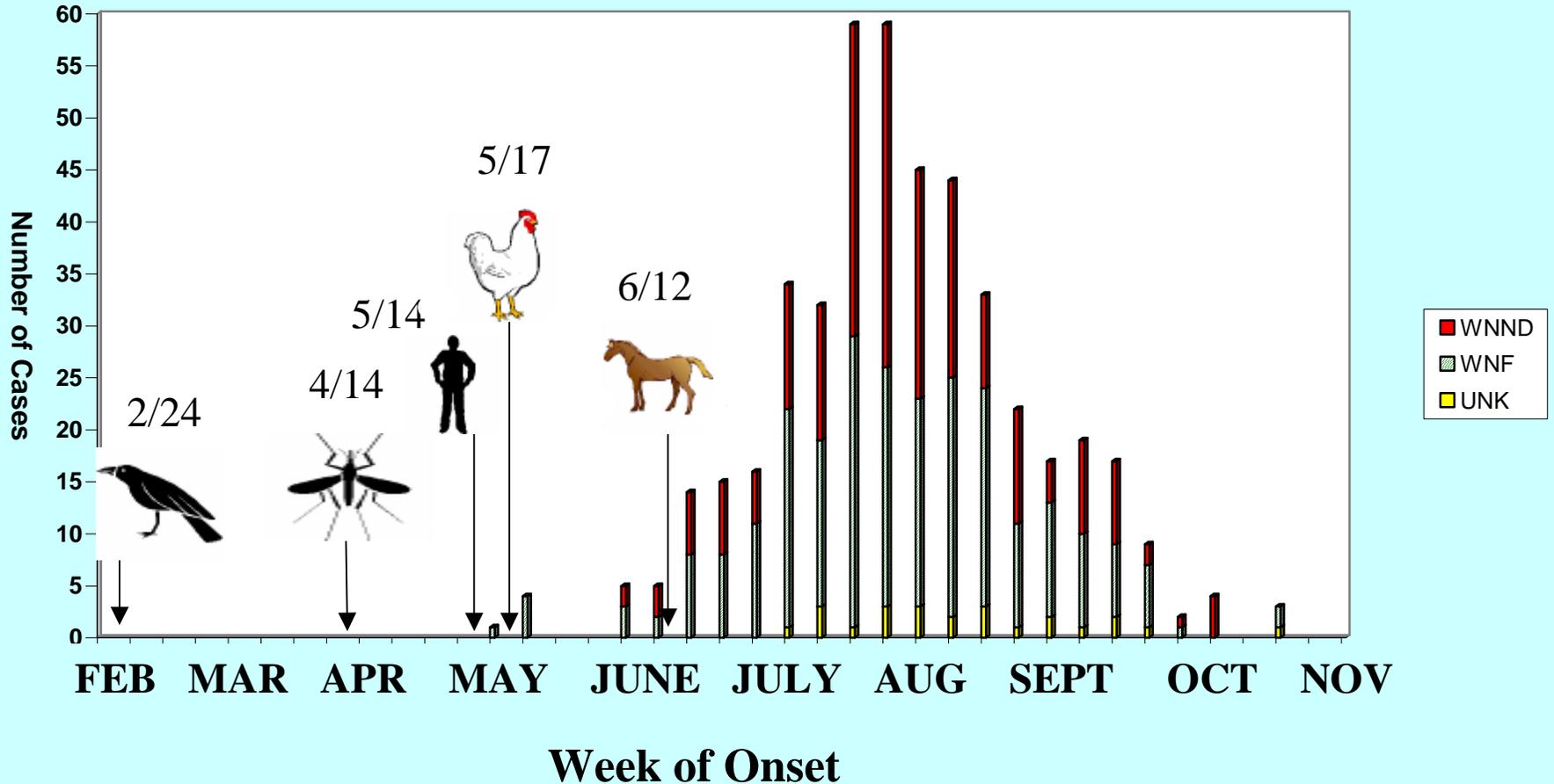
December, 2004

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
- Chickens: date of probable seroconversion

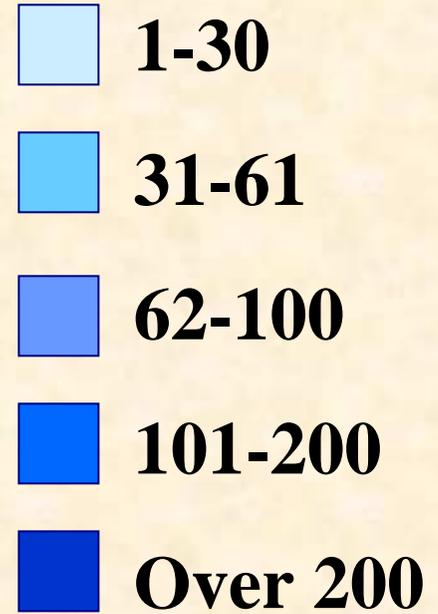
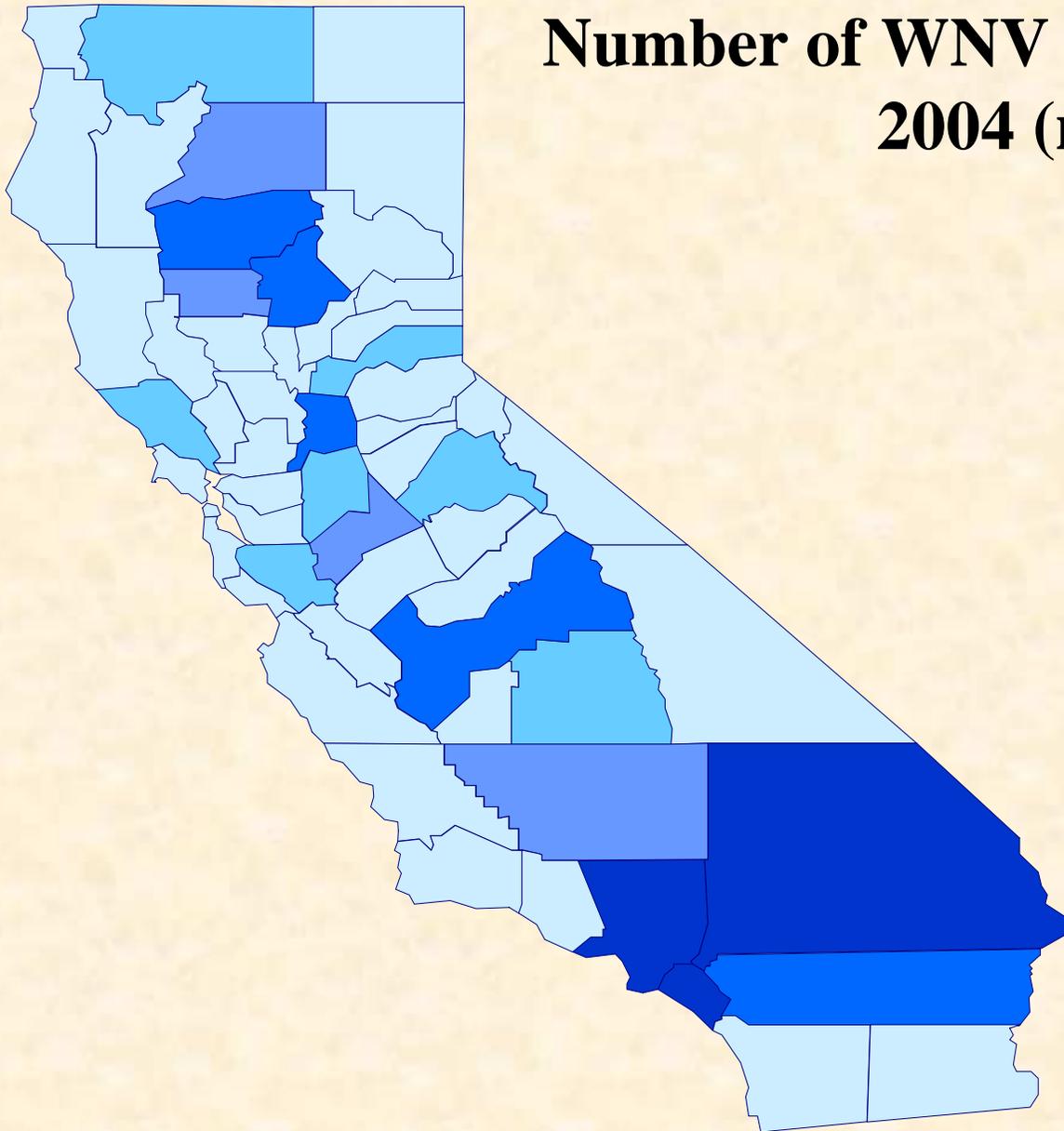
Dead Bird Surveillance



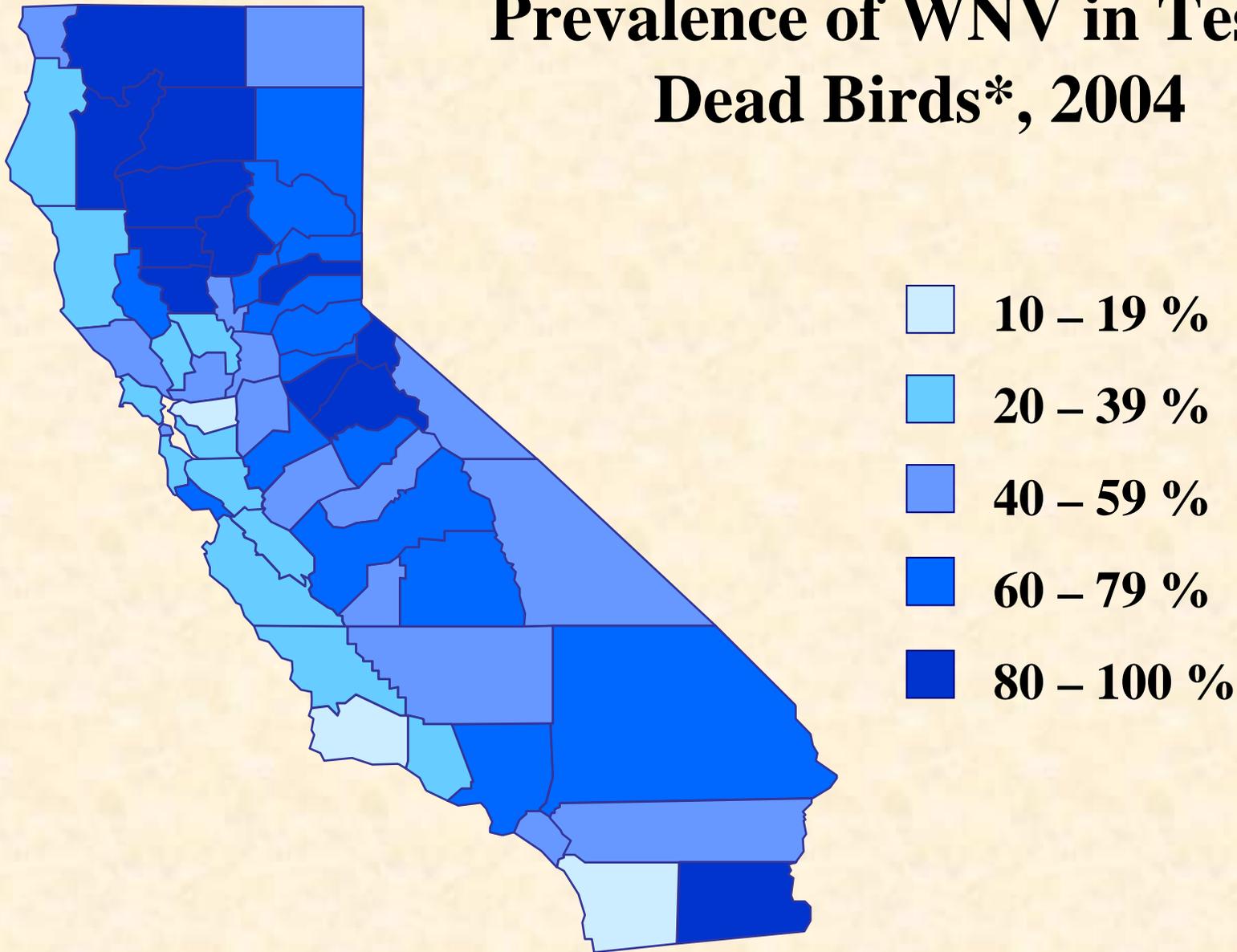
Dead Bird Surveillance Program 2000 - 2004

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**



WNV and Wildlife

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

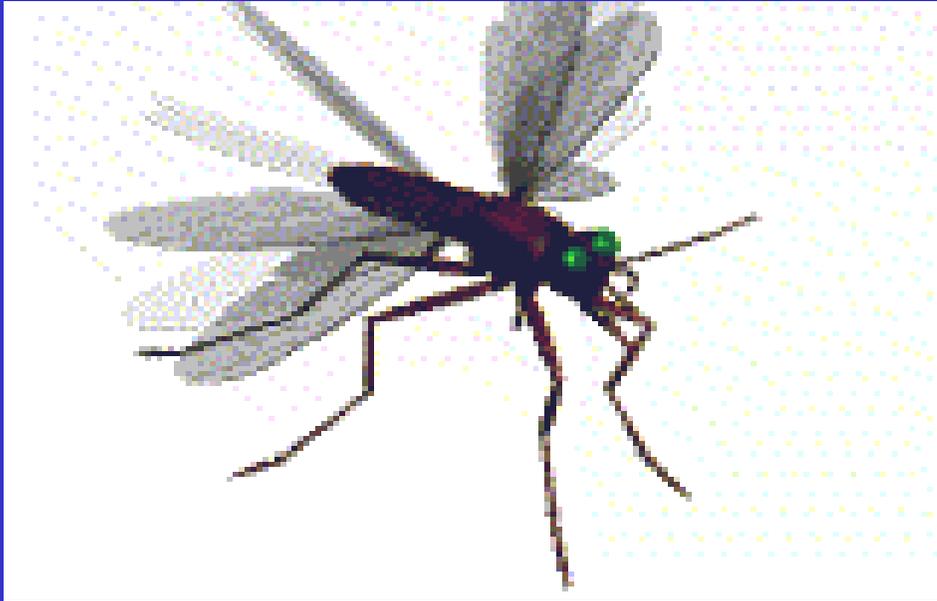
	Number positive
House Finch	70
House Sparrow	34
Cooper's Hawk	31
Barn Owl	28
Red-tailed Hawk	27
American Robin	20
Brewer's Blackbird	19
Lesser Goldfinch	18
Sharp-shinned Hawk	17
American Kestrel	16

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**

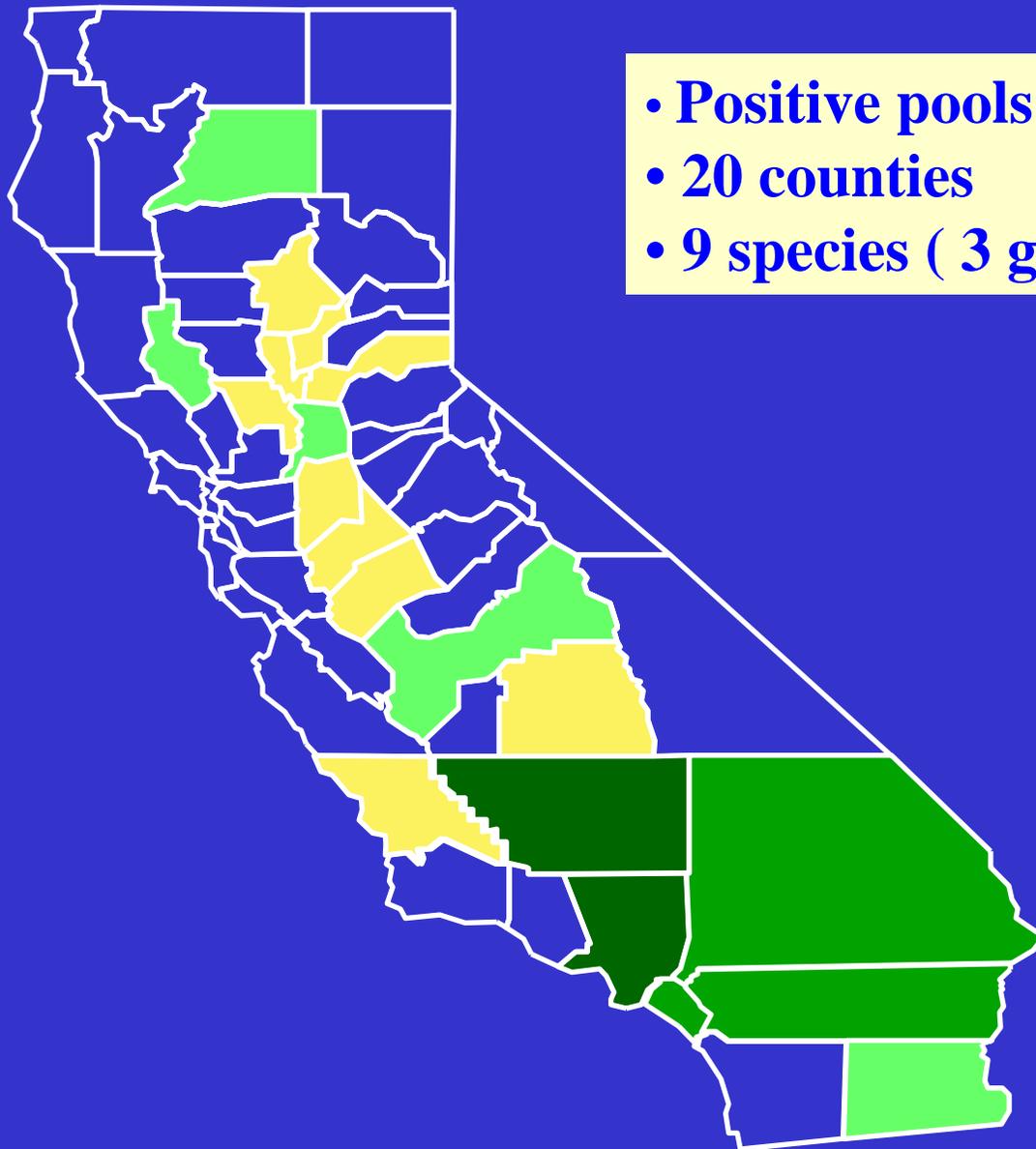


WNV Activity in Mosquitoes in 2004



Number of WNV Positive Mosquito Pools, 2004

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

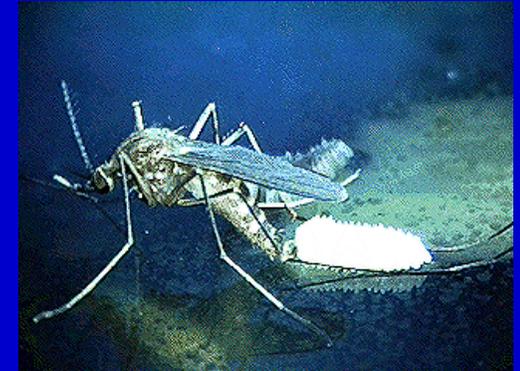


WNV Positive Mosquito Species

1136 pos. pools / 14,602 mosquitoes tested

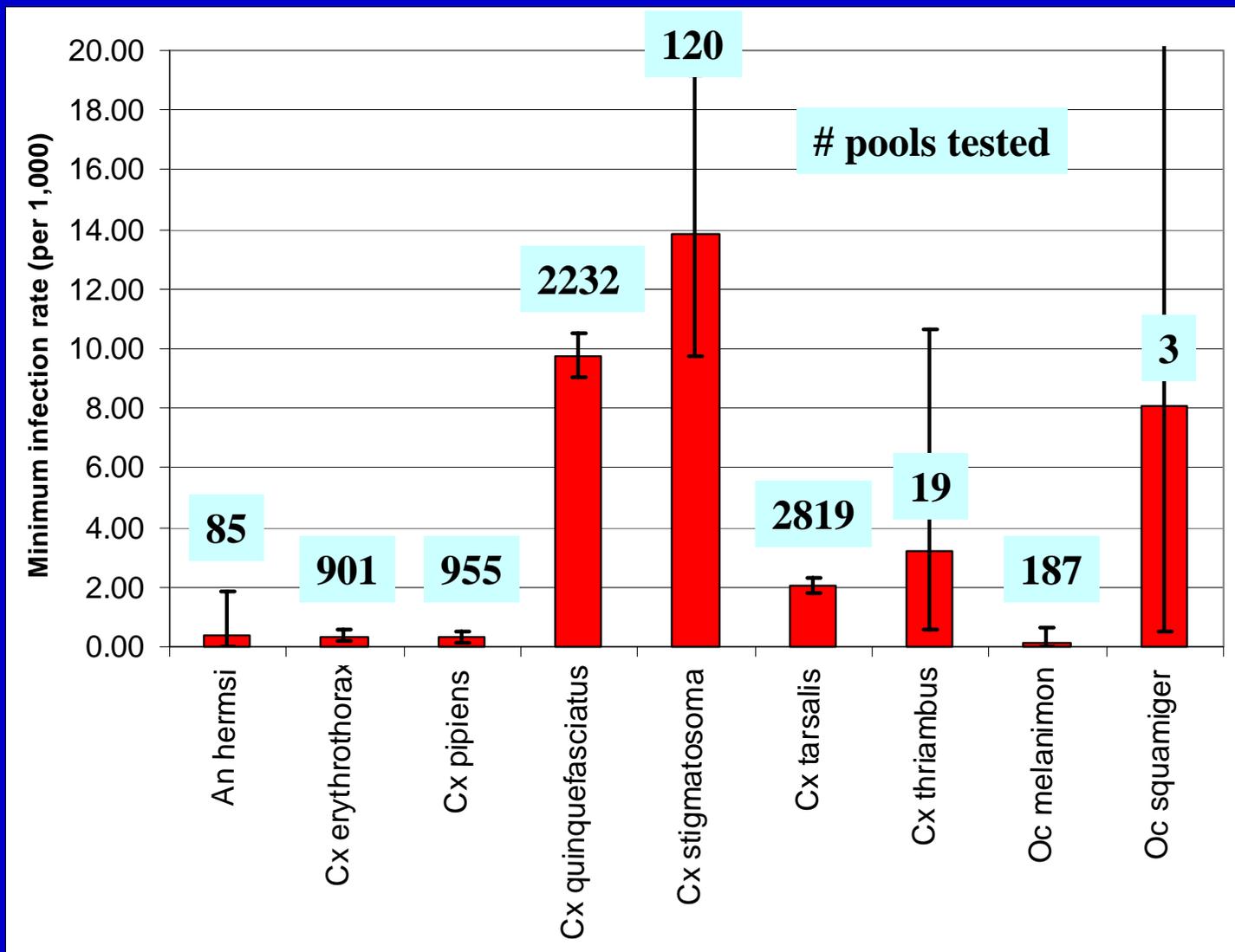
CULEX

<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),

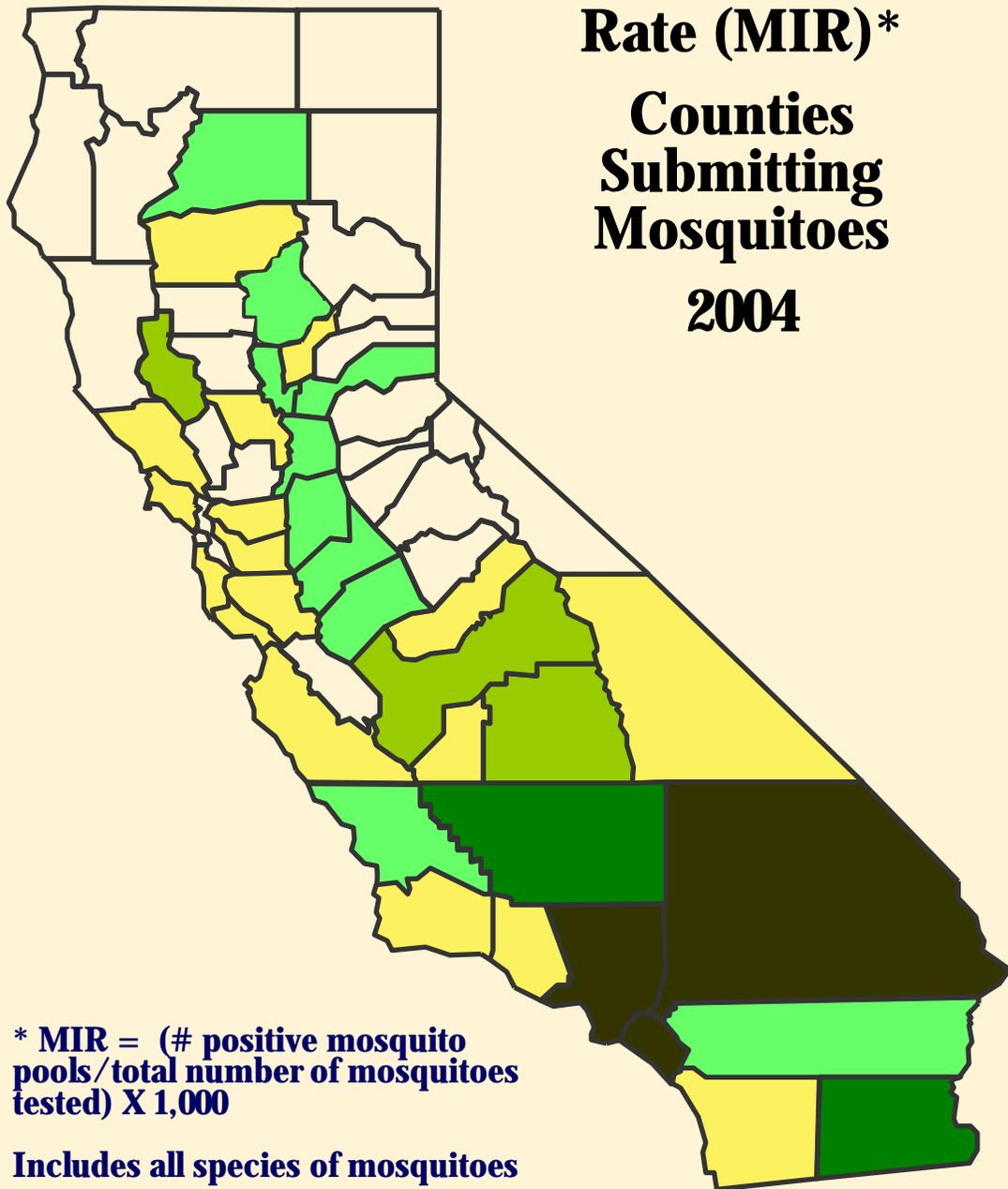
Minimum Infection Rates (per 1,000) by Species July - September 2004



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

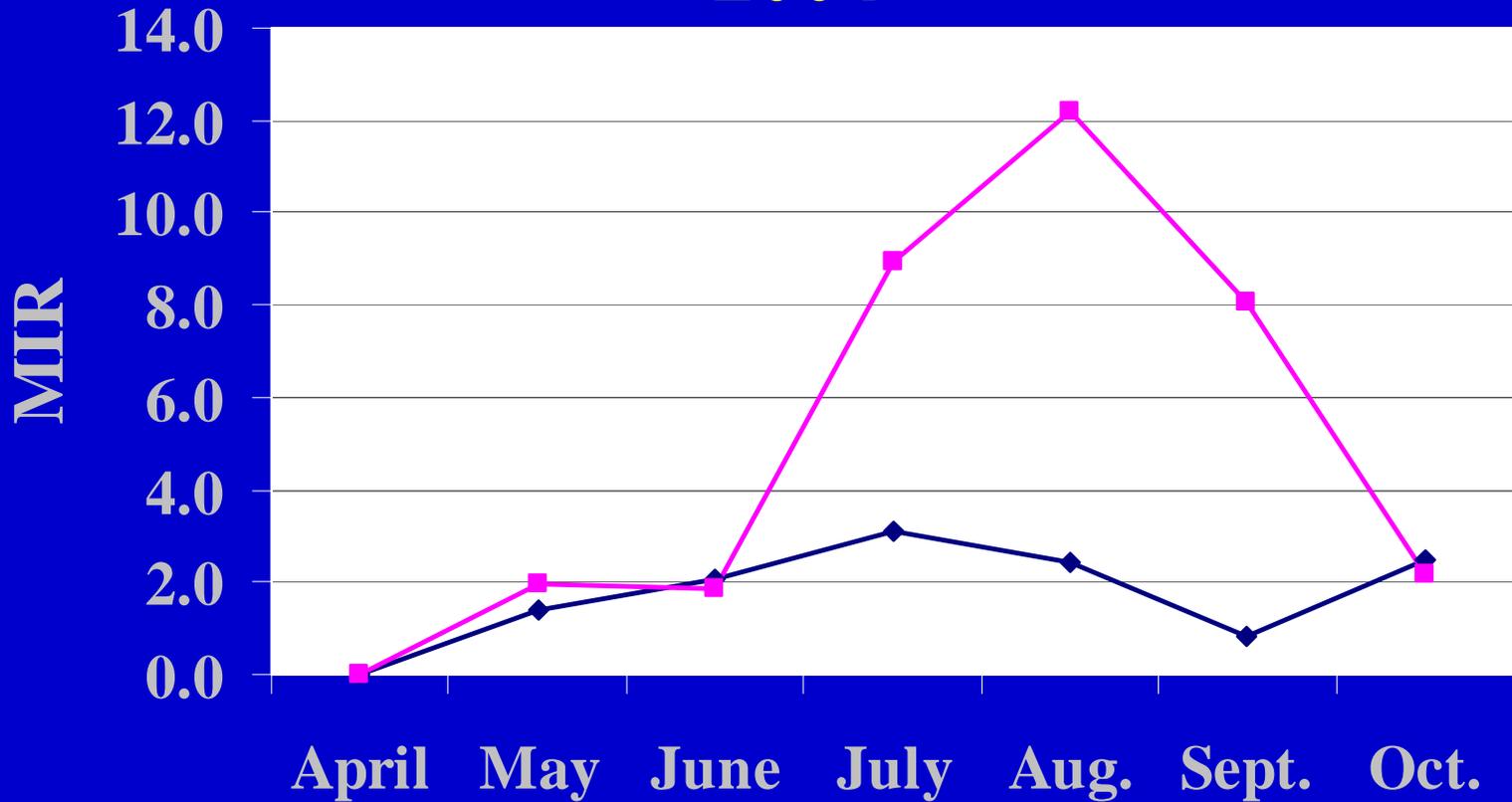


San Bernardino	8.5		
Los Angeles	6.9	≥ 6.0	■
Orange	6.1		
Kern	5.7	≥ 4.0	■
Imperial	4.0		
Lake	2.8		
Fresno	2.0	≥ 2.0	■
Tulare	2.0		
Shasta	1.7		
Sacramento	1.6		
Sutter	1.2		
Riverside	1.6	≥ 0.1	■
Butte	1.3		
Placer	1.0		
San Luis Obispo	0.3		
Merced	0.1		
San Joaquin	0.1		
Stanislaus	0.1		
No positive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

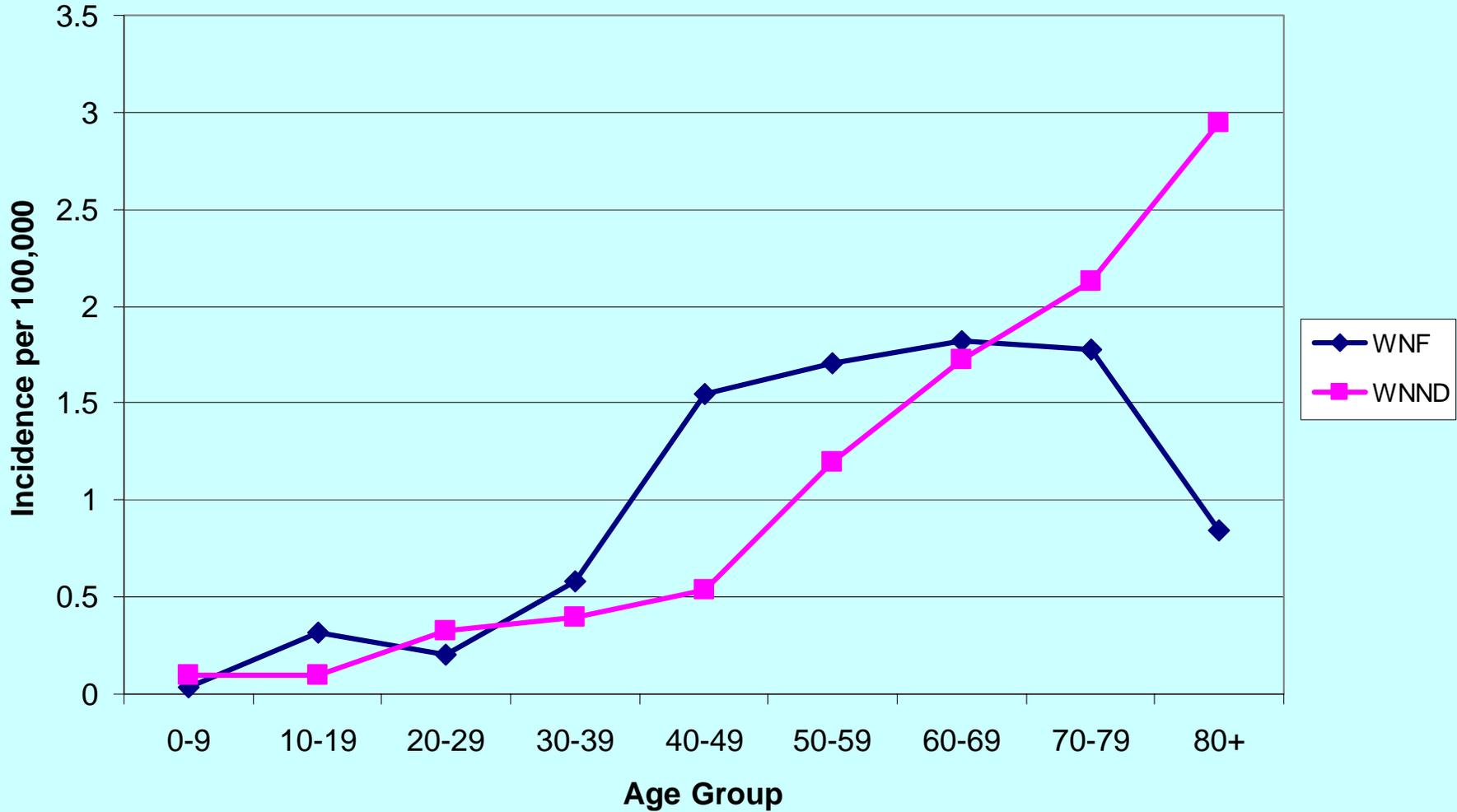
Human WNV Infections, 2004*

- 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

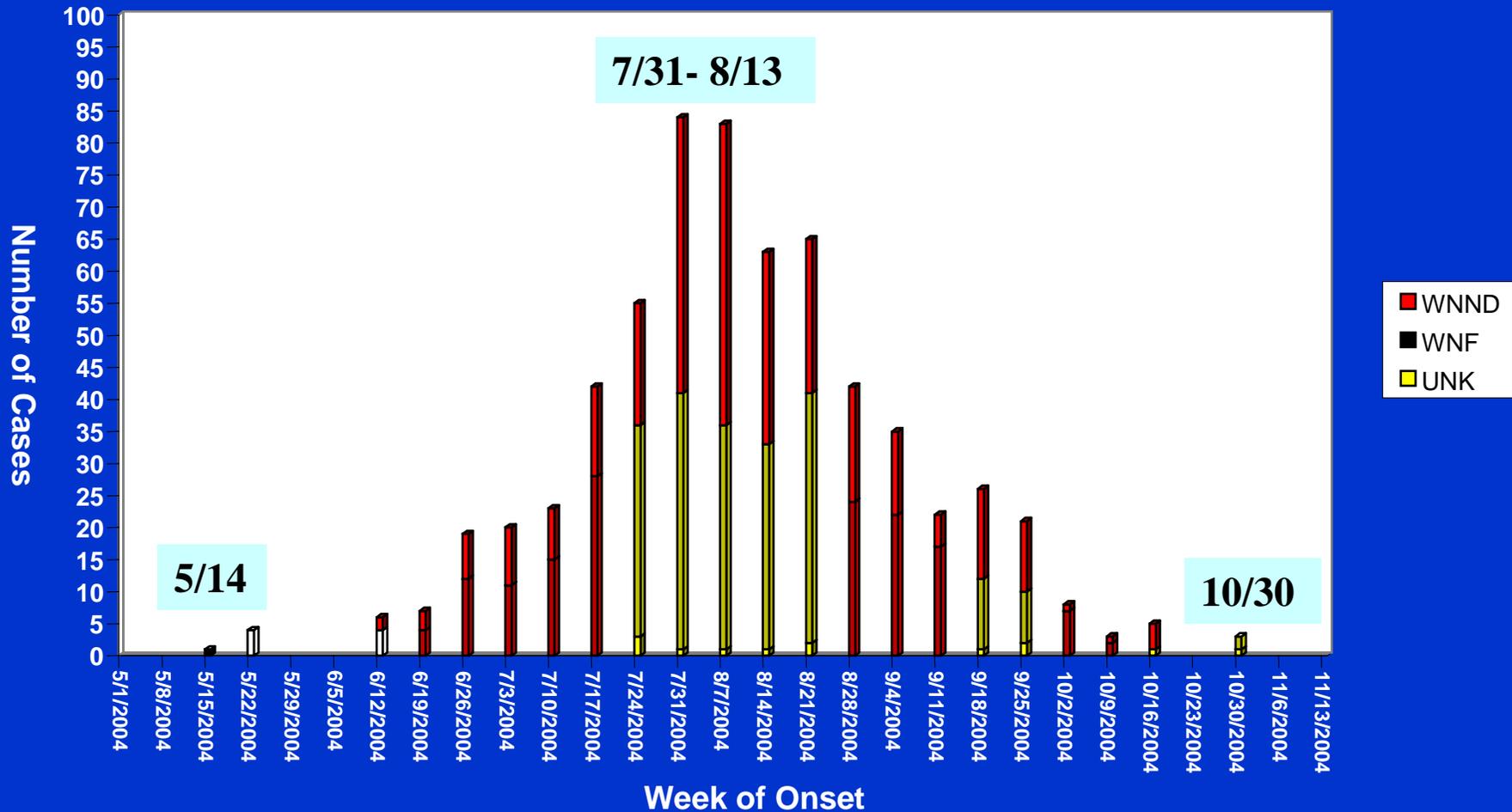
California Human Case Statistics

- **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

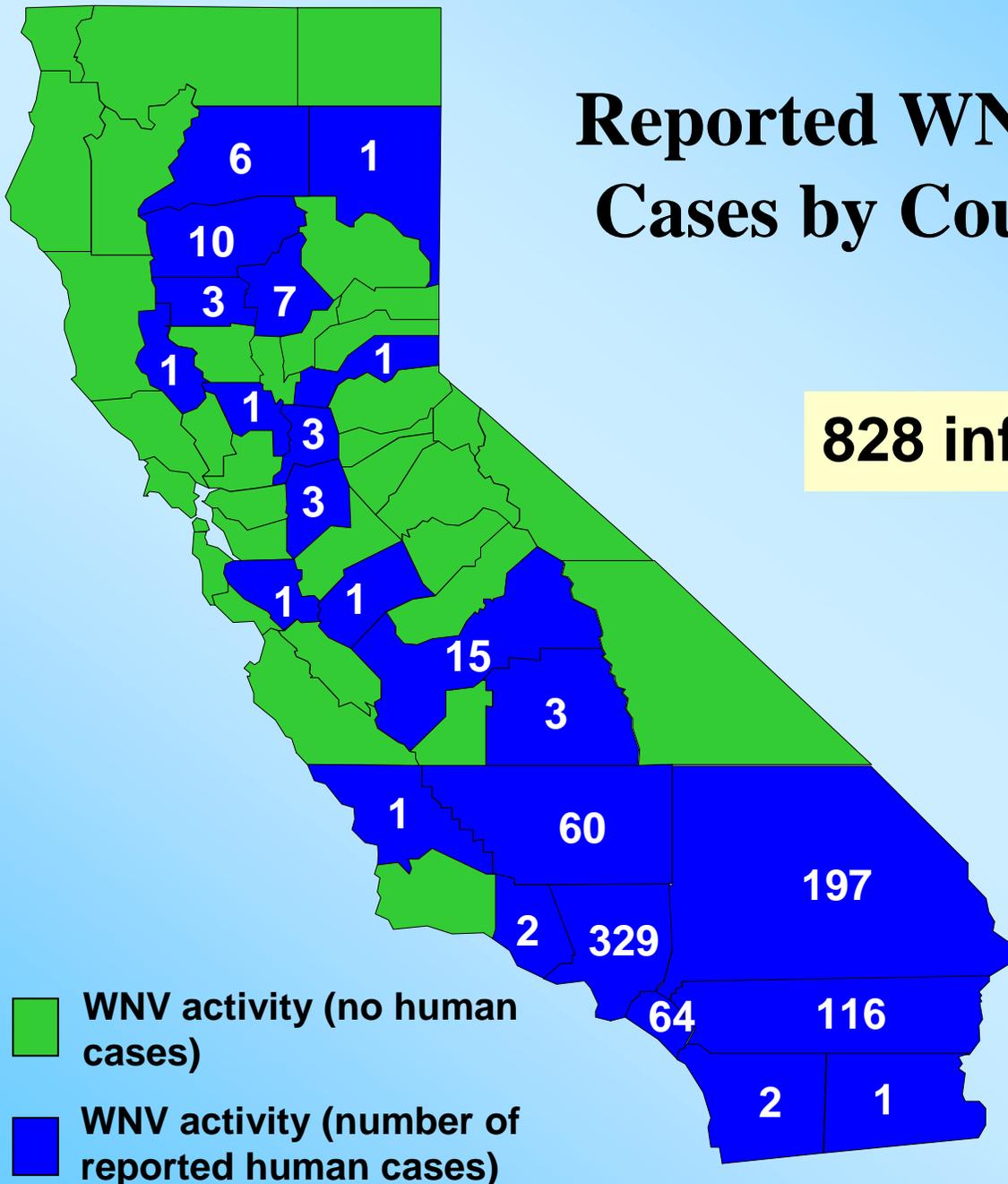


Week of Onset for Human WNV Cases California 2004 (n=643)



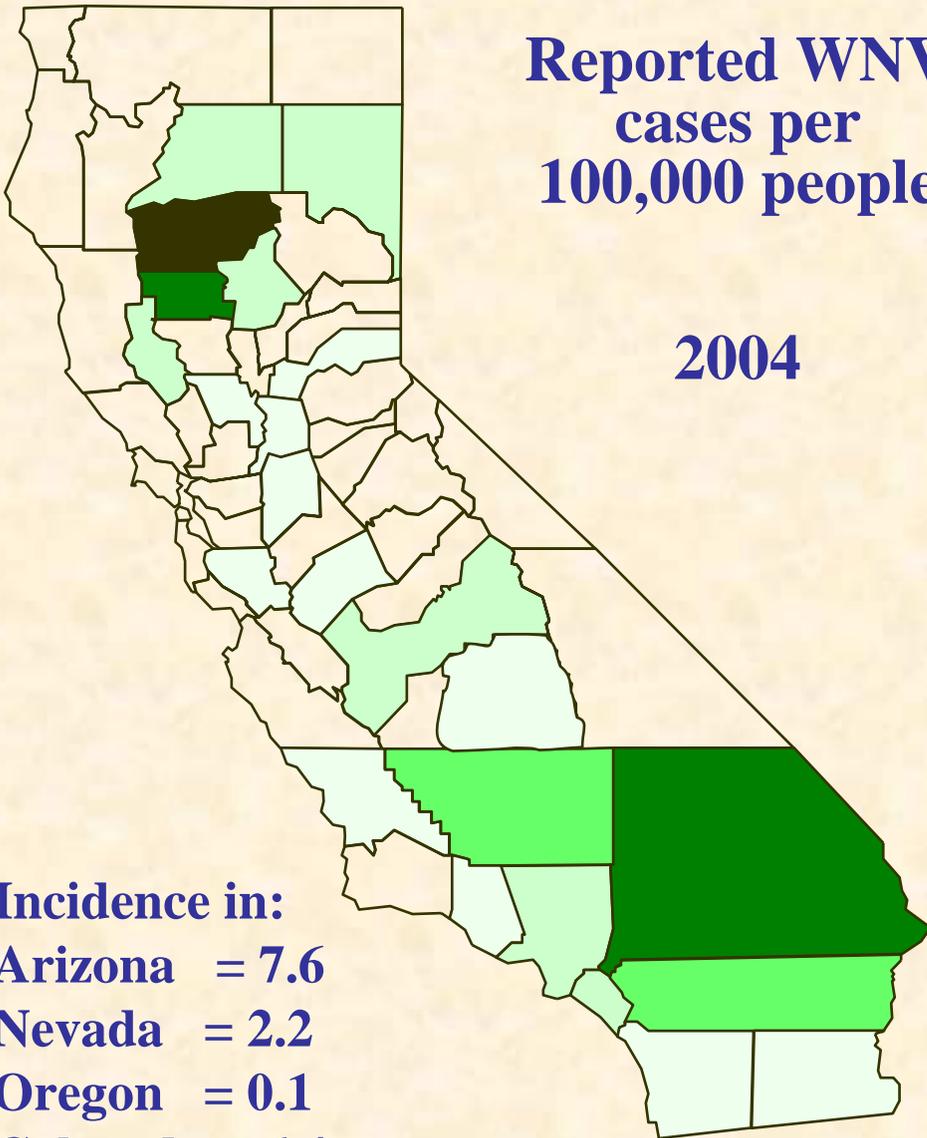
Reported WNV Human Cases by County, 2004

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

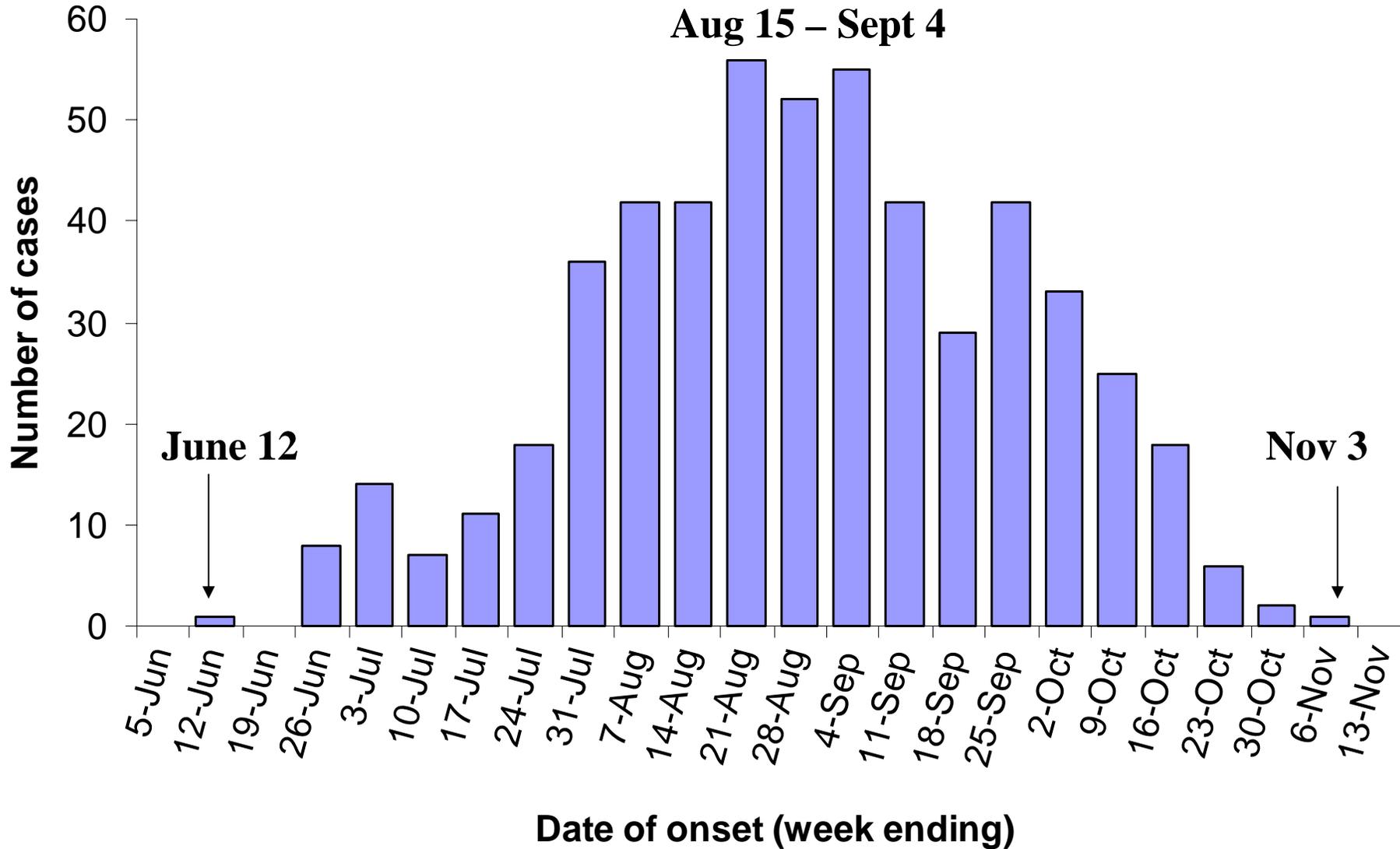
CA Total:	2.4	
Tehama	17.8	≥15 
San Bernardino	11.5	
Glenn	11.3	≥10 
Kern	9.0	
Riverside	7.2	≥5 
Shasta	3.7	
Butte	3.4	
Los Angeles	3.4	
Lassen	2.9	≥1 
Orange	2.2	
Fresno	1.8	
Lake	1.7	
Others	>0	

2004 Equine WNV Data

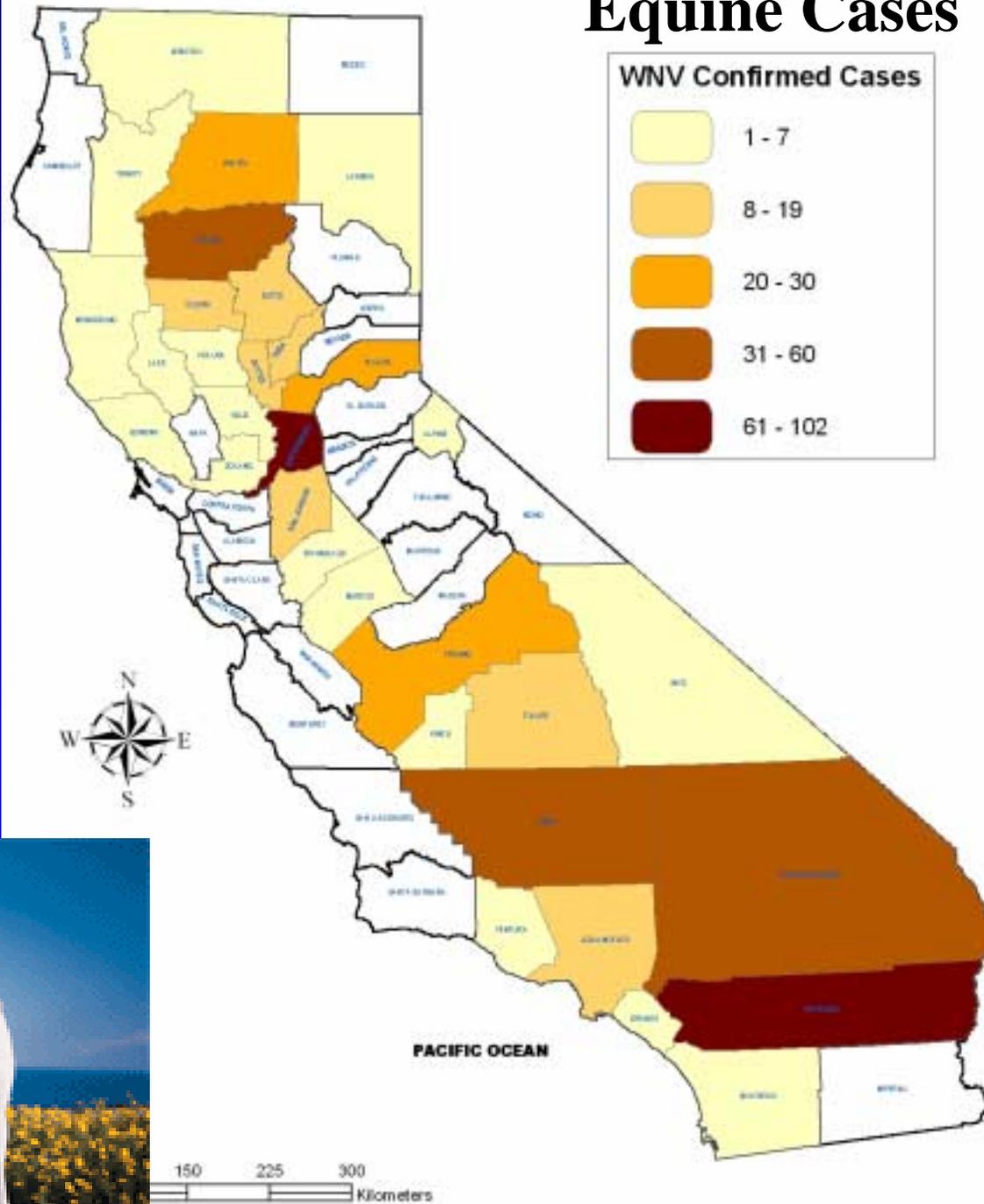
- **540 WNV infected horses (32 counties)**
- **230 (42%) died / euthanized**
- **Vaccination status**
 - **22 properly vaccinated**
 - **145 improperly vaccinated**
 - **356 unvaccinated**
 - **17 unknown**
- **First positive finding of WNV in 2 counties**



Week of Onset for Equine WNV Cases California, 2004



Equine Cases



**WNV
Hotspot**



**American crow
Christmas bird counts**

2005 ?



**Likely intensified
transmission in the
Central Valley driven
by American crows**



Related Posters by DHS Staff

- **Carney:** The California WNV Dead Bird Surveillance Program – Challenges and Solutions
- **Francisco:** 2004 CA Pediatric WNV Case Series
- **Jean:** Tracking Human WNV Cases in CA, 2004
- **Marcus:** A Summary of the 2004 California WNV Surveillance Program
- **Marcus:** The California WNV Website
- **Padgett:** WNV Infections in Tree Squirrels in CA
- **Hullinger & Sun:** 2004 WNV Outbreak in California: Characterization of Equine Cases
- **Viral and Rickettsial Disease Lab:** WNV diagnostics (5 posters)