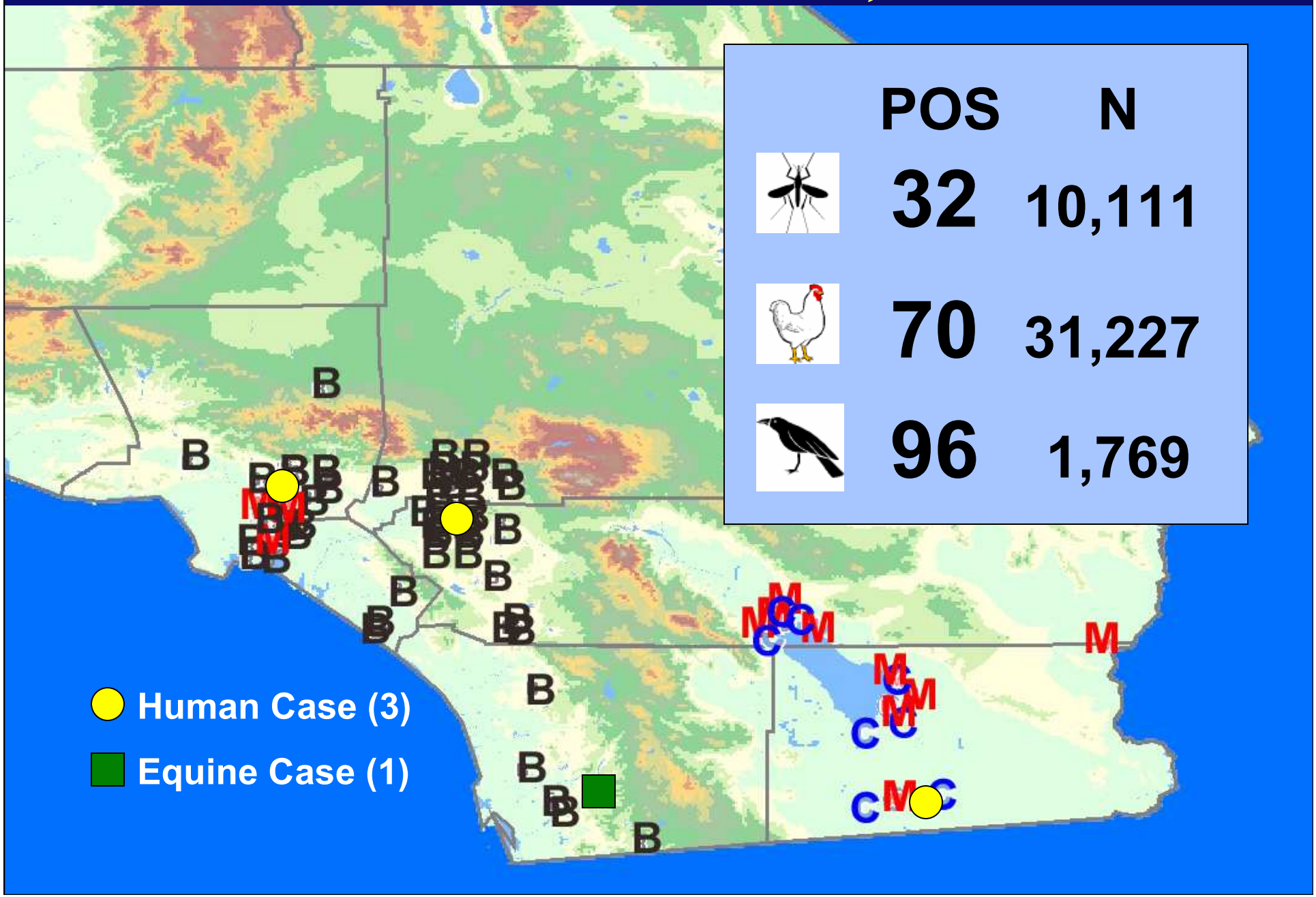
West Nile Virus Activity in California

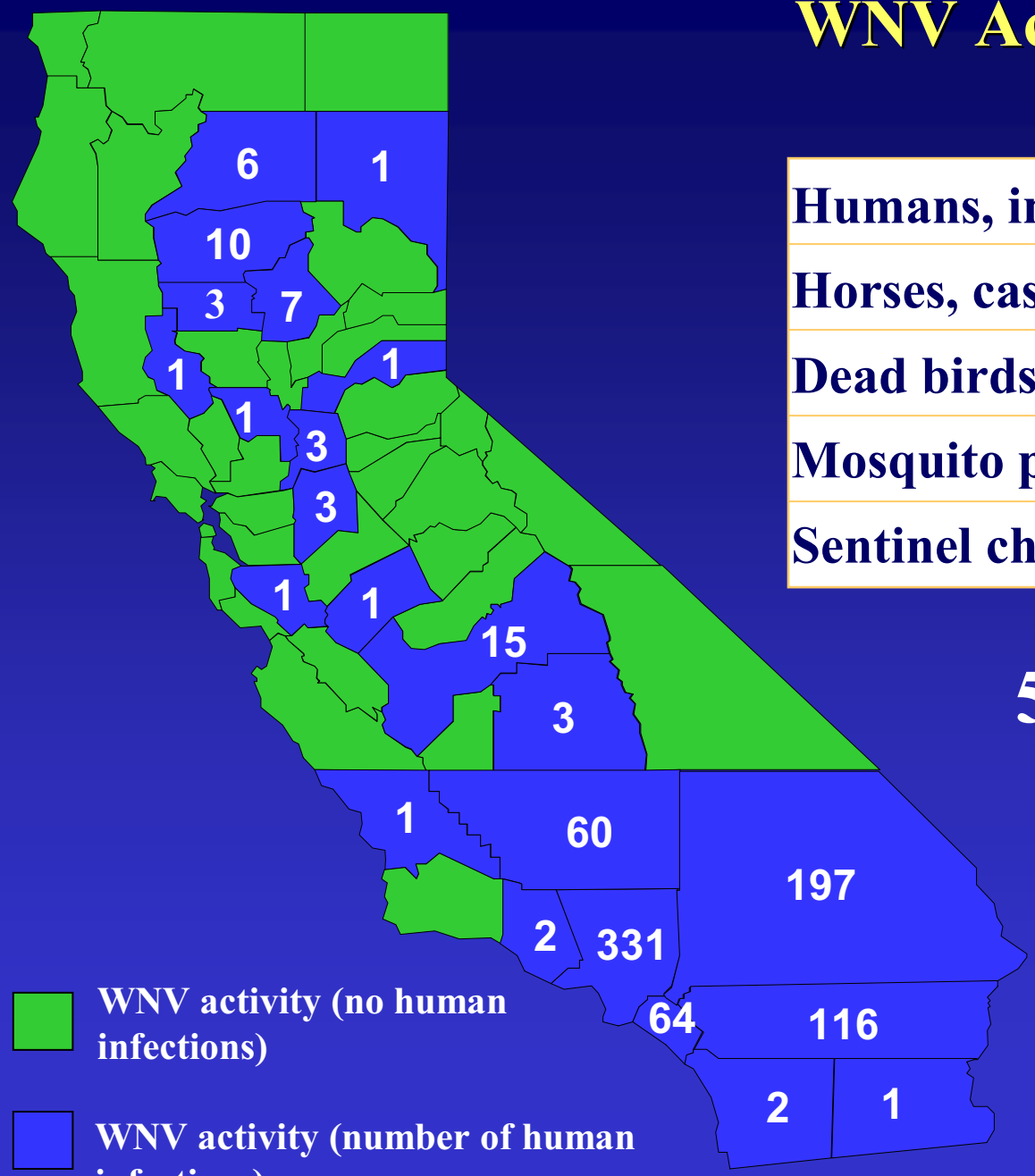
2006

Division of Communicable Disease Control
California Department of Health Services

WNV in California, 2003



WNV Activity in California 2004

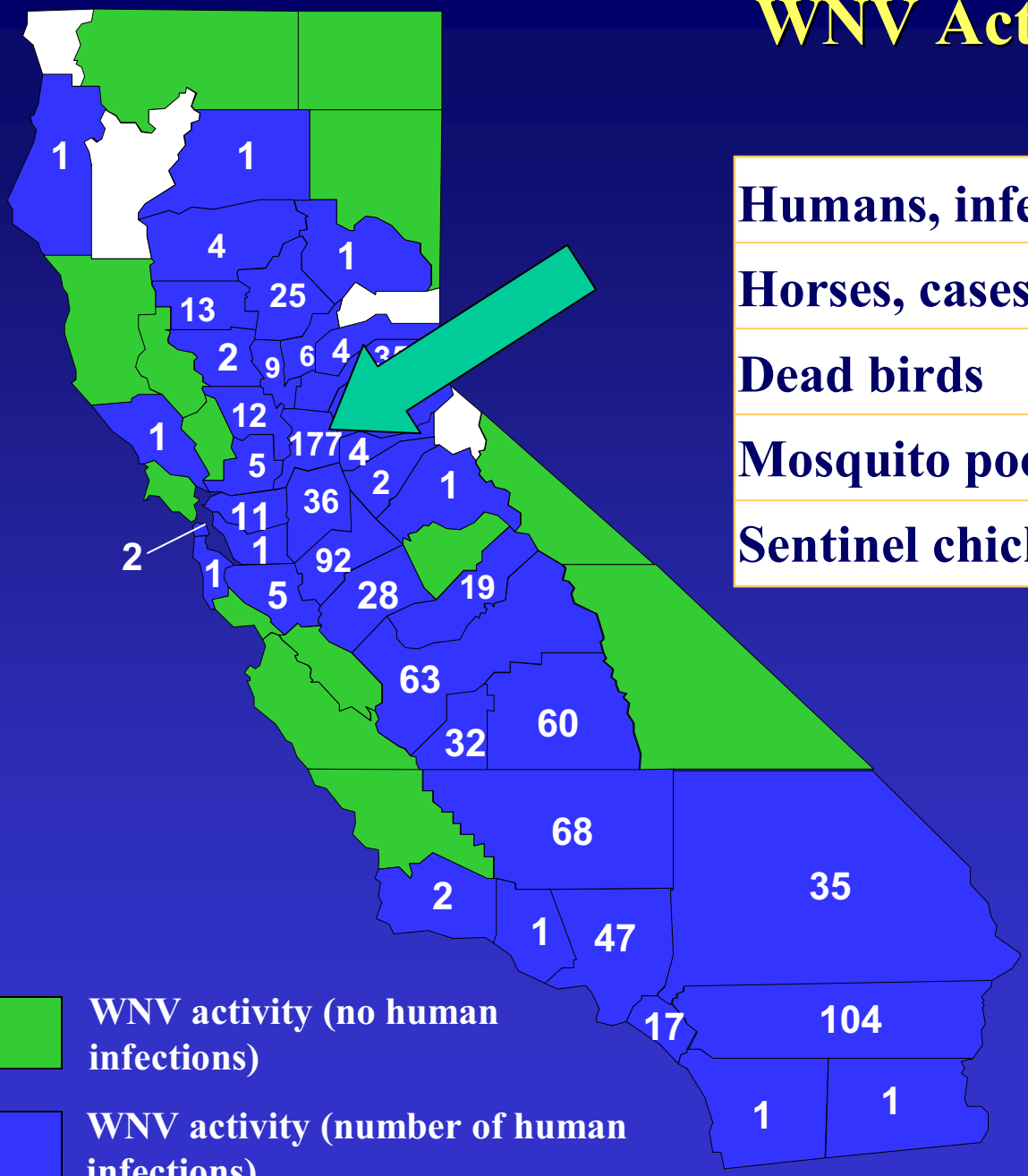


Humans, infections / deaths	830 / 28
Horses, cases / deaths	540 / 230
Dead birds	3,232
Mosquito pools	1,136
Sentinel chickens	805

58 counties

WNV Activity in California 2005

Humans, infections / deaths	935 / 19
Horses, cases / deaths	456 / 200
Dead birds	3,046
Mosquito pools	1,242
Sentinel chickens	790

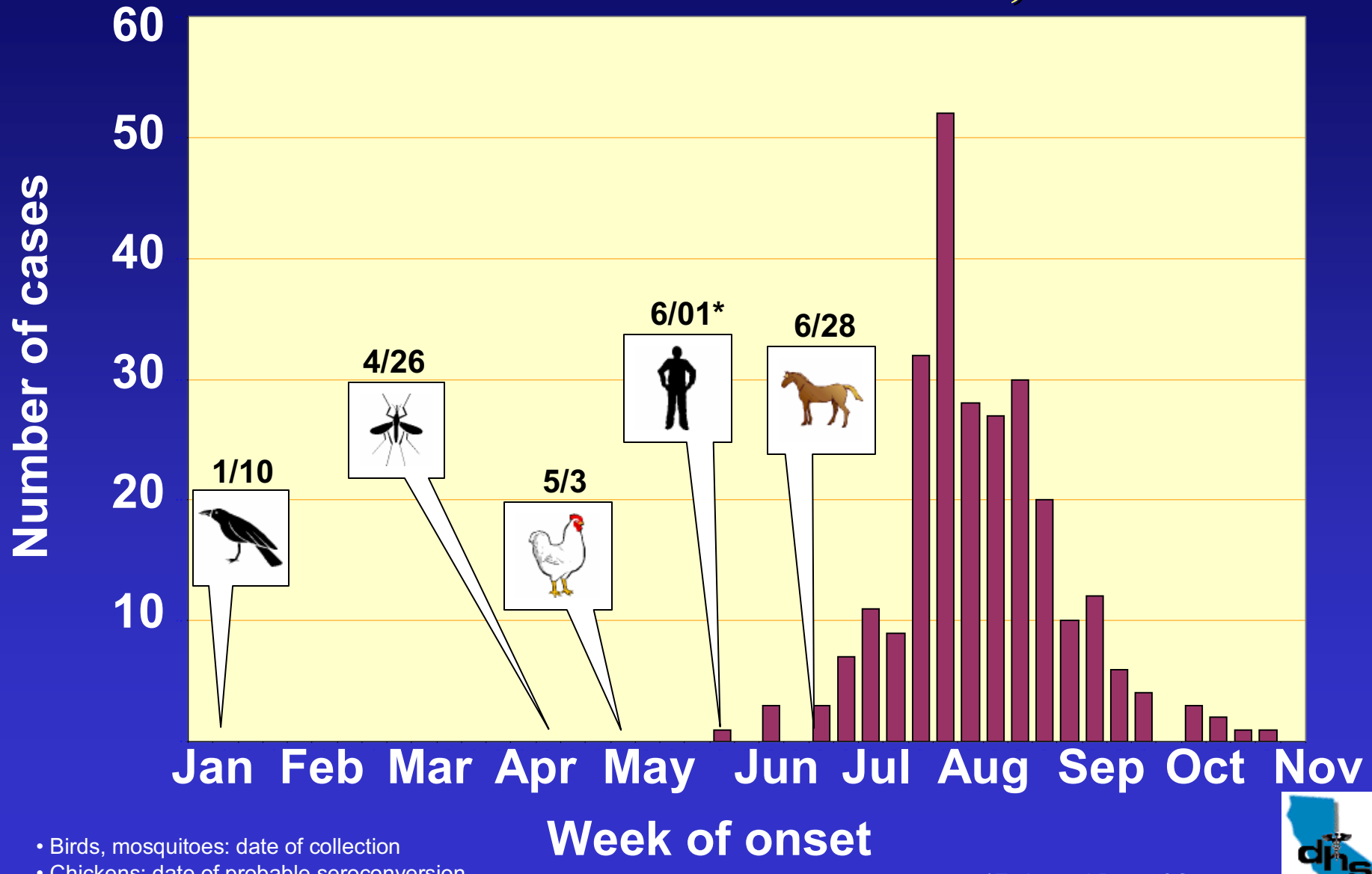


N = 40 counties with human infection

WNV activity (no human infections)

WNV activity (number of human infections)

Sequence of WNV detection events in California relative to human case onset, 2006

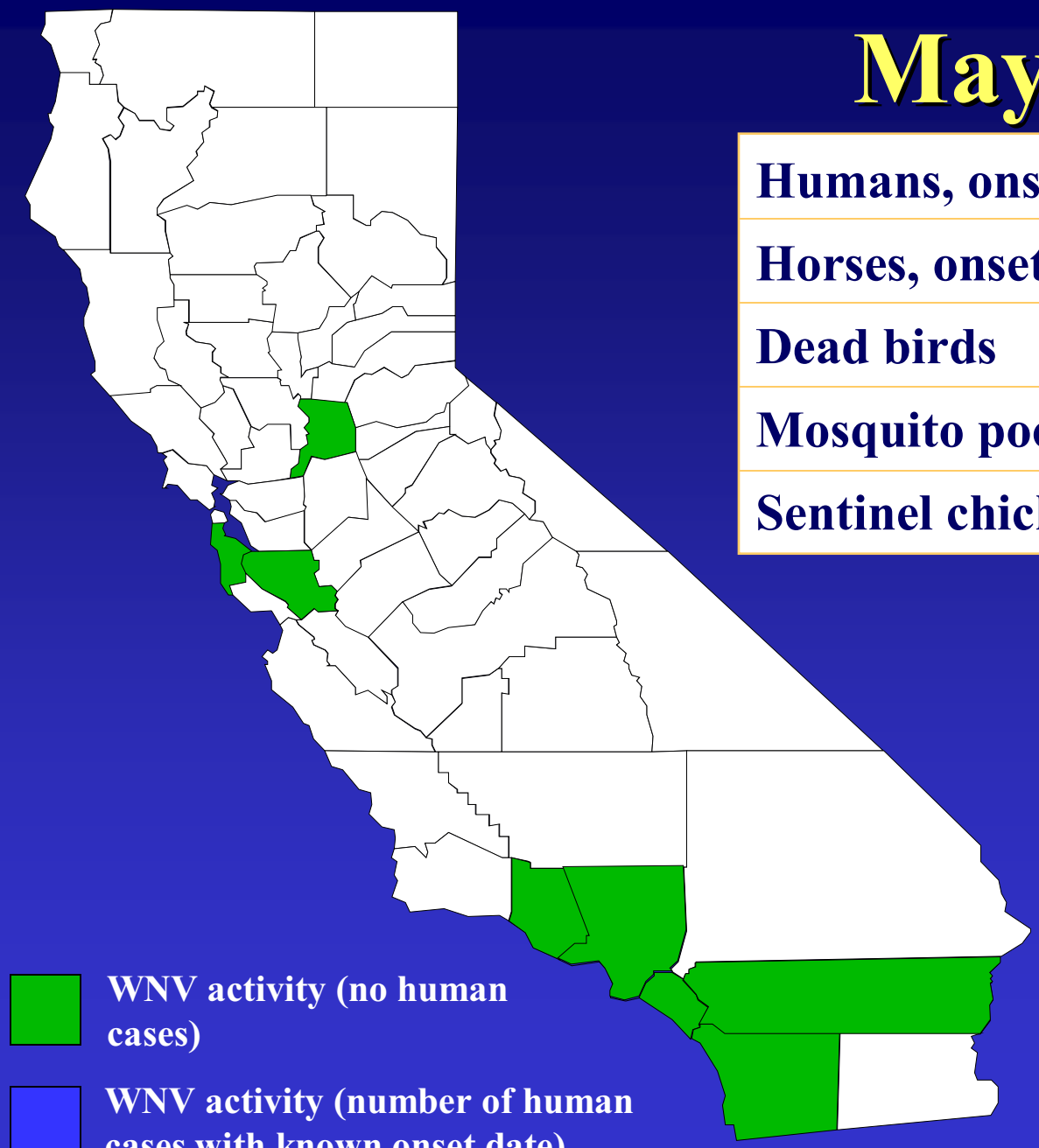


- Birds, mosquitoes: date of collection
- Chickens: date of probable seroconversion

*Estimated Date of Onset

May 26, 2006

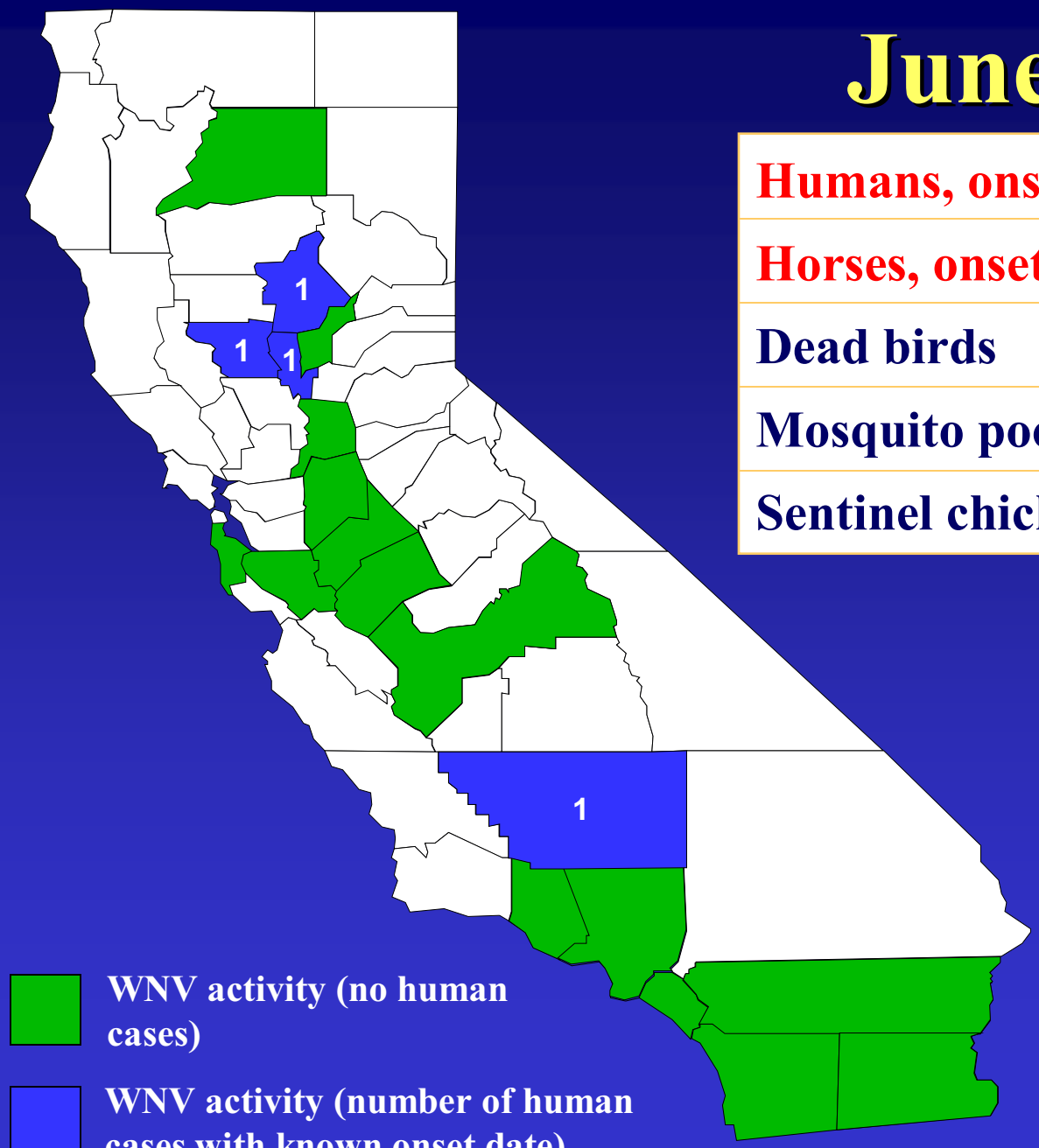
Humans, onset / reported	0 / 0
Horses, onset / reported	0 / 0
Dead birds	8
Mosquito pools	19
Sentinel chickens	1



N = 0 counties with human cases

June 30, 2006

Humans, onset / reported	4 / 1
Horses, onset / reported	1 / 0
Dead birds	45
Mosquito pools	22
Sentinel chickens	6



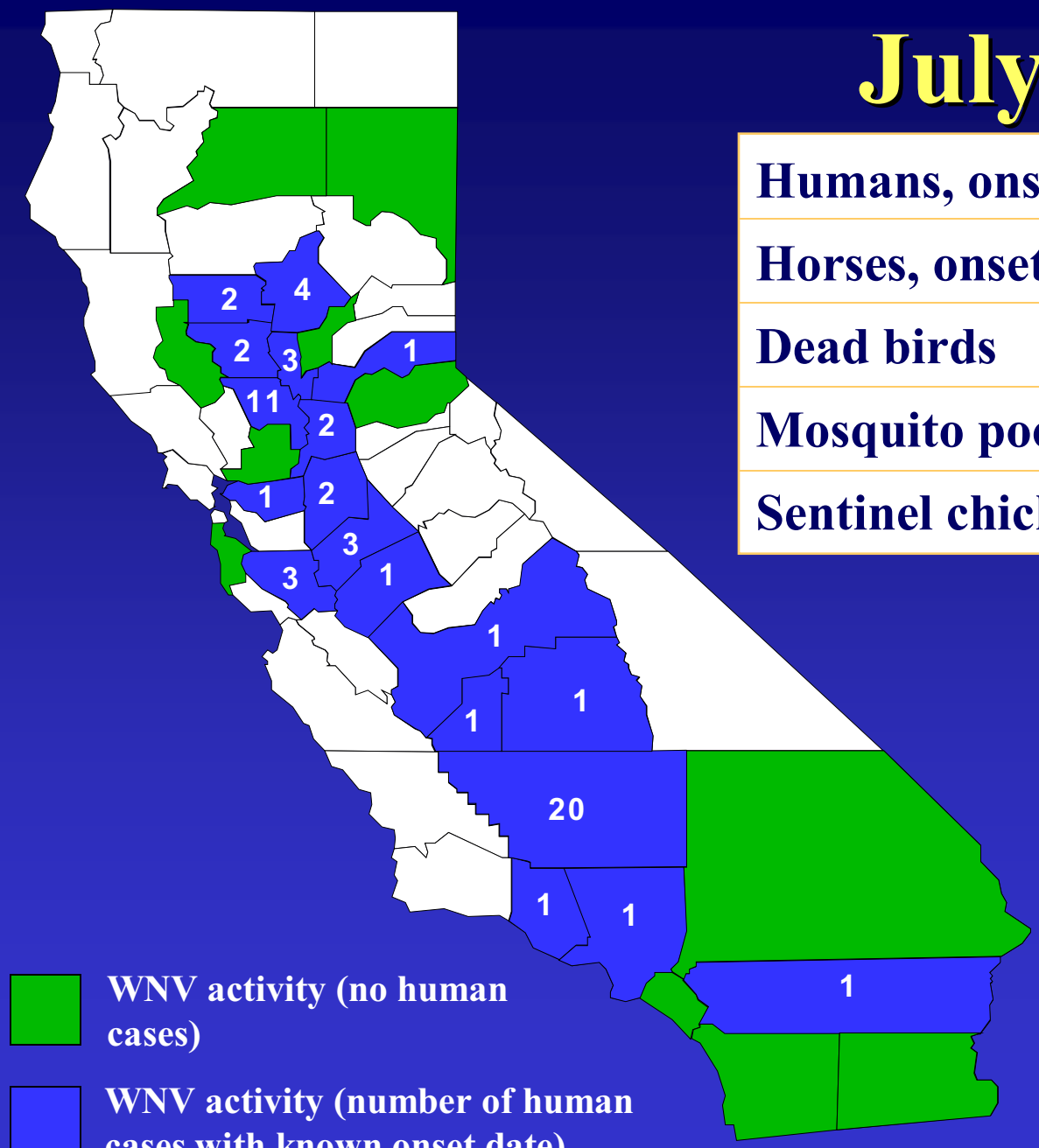
N = 4 counties with human cases

WNV activity (no human cases)

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

July 28, 2006

Humans, onset / reported	61 / 17
Horses, onset / reported	10 / 5
Dead birds	219
Mosquito pools	184
Sentinel chickens	91



N = 19 counties with human cases

August 29, 2006

Humans, onset / reported	213 / 127
Horses, onset / reported	34 / 25
Dead birds	688
Mosquito pools	575
Sentinel chickens	323

N = 34 counties with human cases

WNV activity (no human cases)

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

September 29, 2006

Humans, onset / reported	255 / 251
Horses, onset / reported	51 / 49
Dead birds	1,162
Mosquito pools	794
Sentinel chickens	491
Squirrels	24

N = 36 counties with human cases

WNV activity (no human cases)

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

October 31, 2006

Humans, onset / reported	261 / 278
Horses, onset / reported	52 / 53
Dead birds	1,340
Mosquito pools	825
Sentinel chickens	628
Squirrels	32

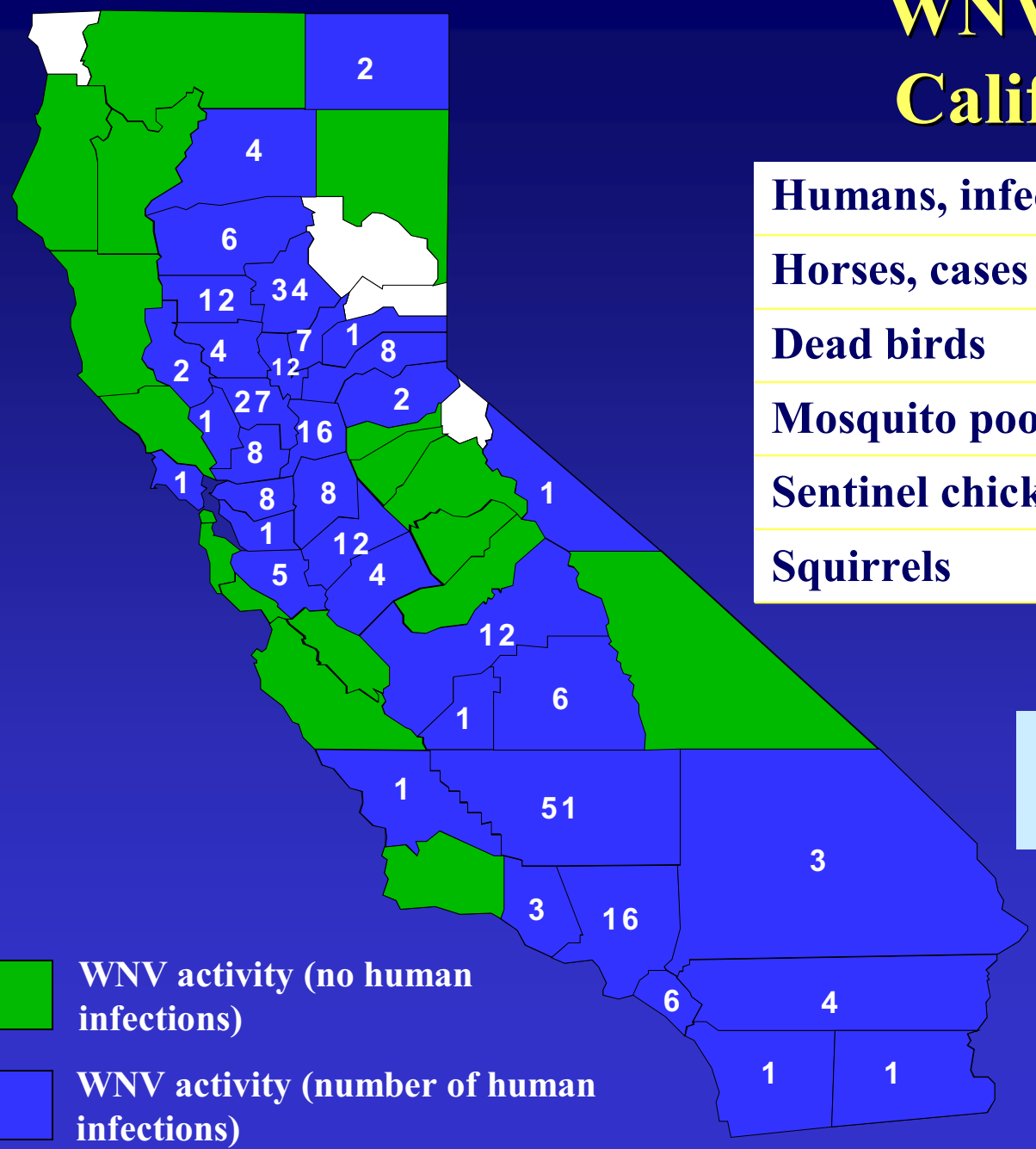
N = 36 counties with human cases

WNV activity (no human cases)

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

WNV Activity in California, 2006

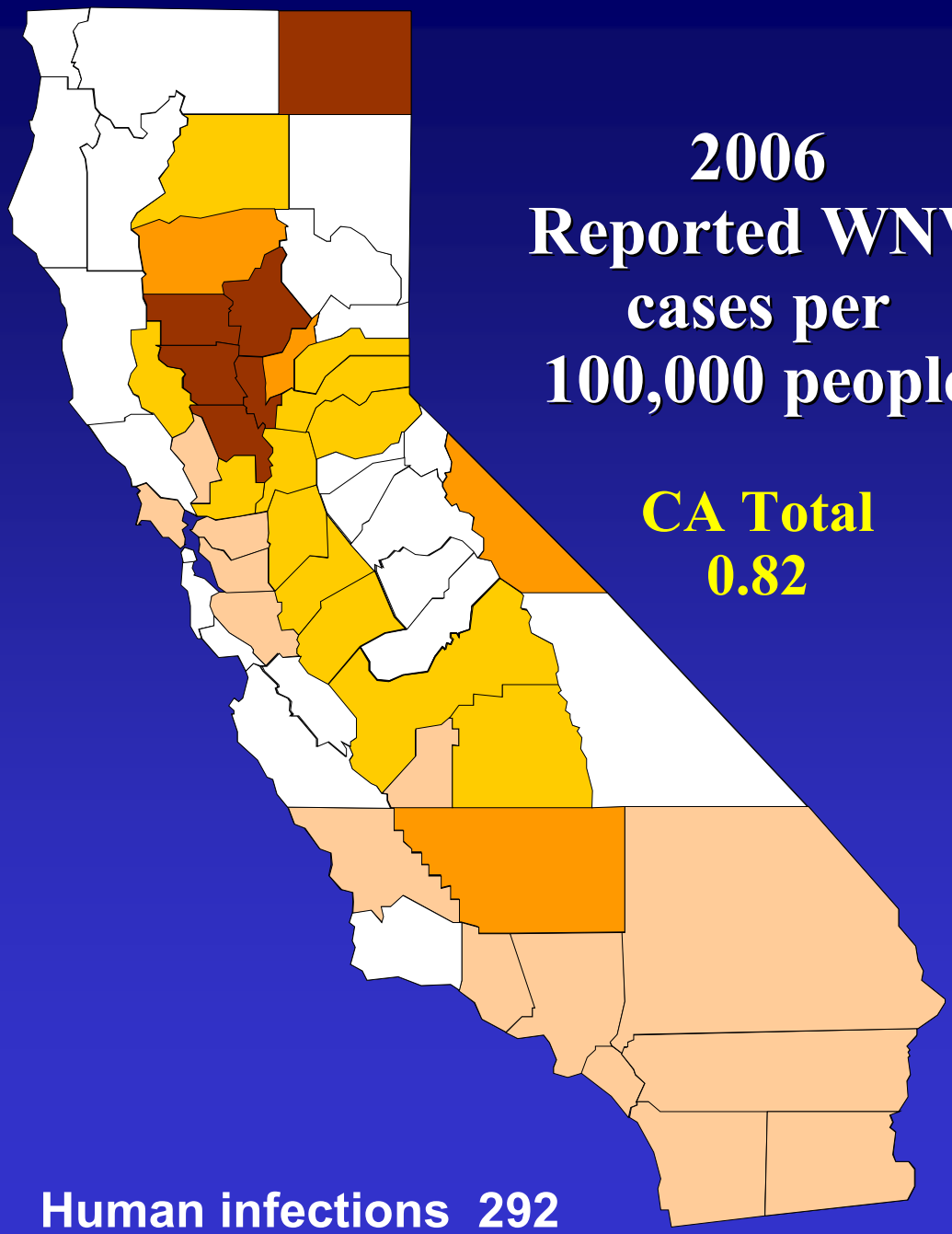
Humans, infections / deaths	292 / 7
Horses, cases / deaths	58 / 24
Dead birds	1,446
Mosquito pools	832
Sentinel chickens	640
Squirrels	32



N = 36 counties with human infections

WNV activity (no human infections)

WNV activity (number of human infections)



2006 Reported WNV cases per 100,000 people

CA Total 0.82

Glenn	45.36	
Colusa	21.27	
Modoc	21.17	
Yolo	16.01	≥ 15
Butte	15.26	
Sutter	15.2	
Tehama	10.71	
Yuba	8.30	≥ 5
Mono	7.78	
Kern	7.41	
Lake	3.43	
Placer	3.22	
Stanislaus	2.46	
Shasta	2.45	
Solano	2.03	
Merced	1.90	≥ 1
Tulare	1.63	
San Joaquin	1.42	
Fresno	1.38	
El Dorado	1.28	
Sacramento	1.23	
Nevada	1.09	
Others		> 0

Human infections 292

Top Five Counties with Human WNV Infections

2004

Los Angeles	323
San Bernardino	191
Riverside	112
Orange	64
Kern	60

2005

Sacramento	177
Riverside	104
Stanislaus	92
Kern	67
Fresno	63

2006

Kern	51
Butte	34
Yolo	27
Sacramento	16
Los Angeles	16

Human Infections 2005-2006

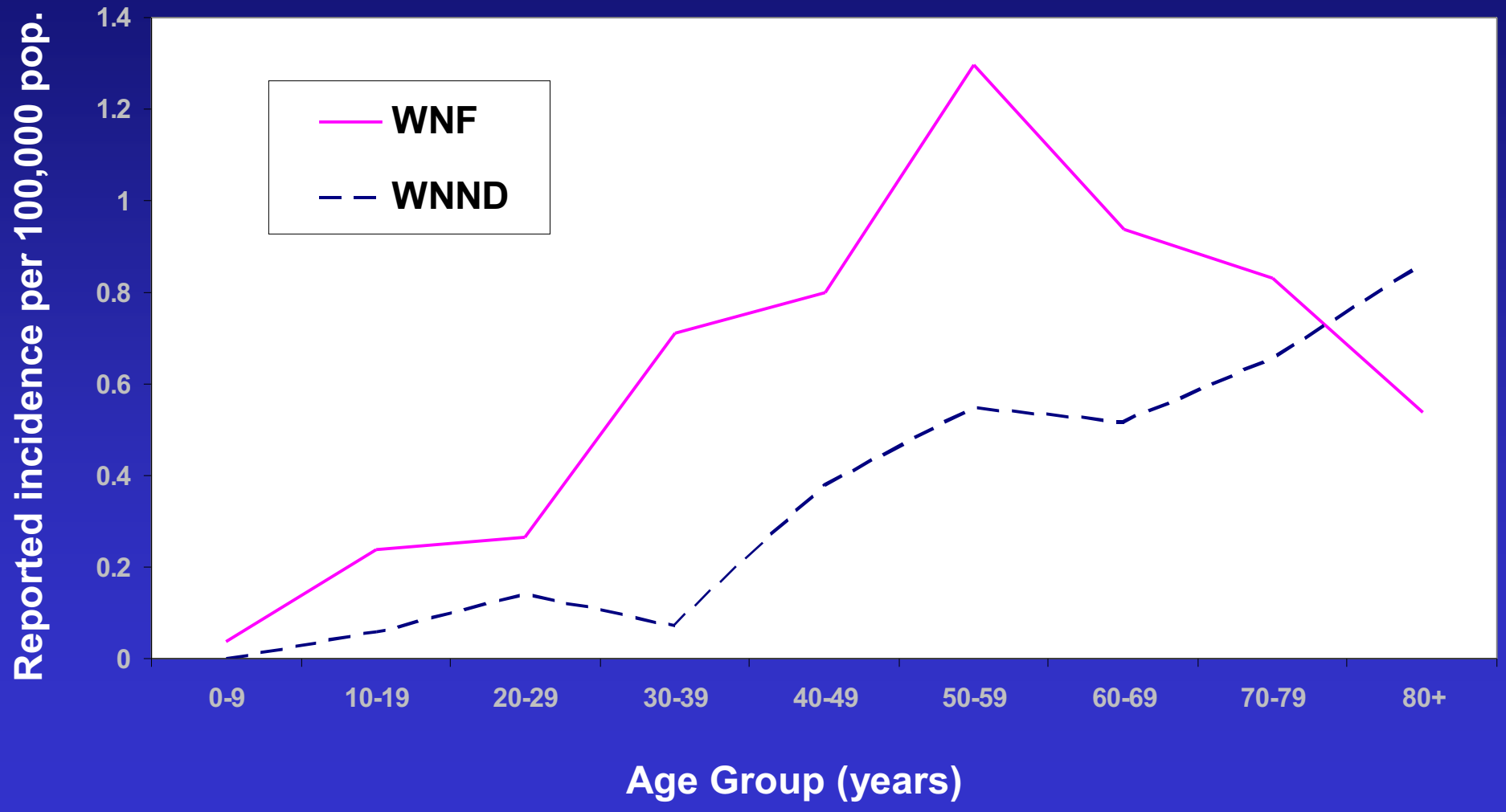
	2005	2006
Human infections	928	292
Counties	40	36
Positive blood donors	93	28
Symptomatic donors	42 (45%)	14 (50%)

Human WNV Clinical Presentation 2005 - 2006

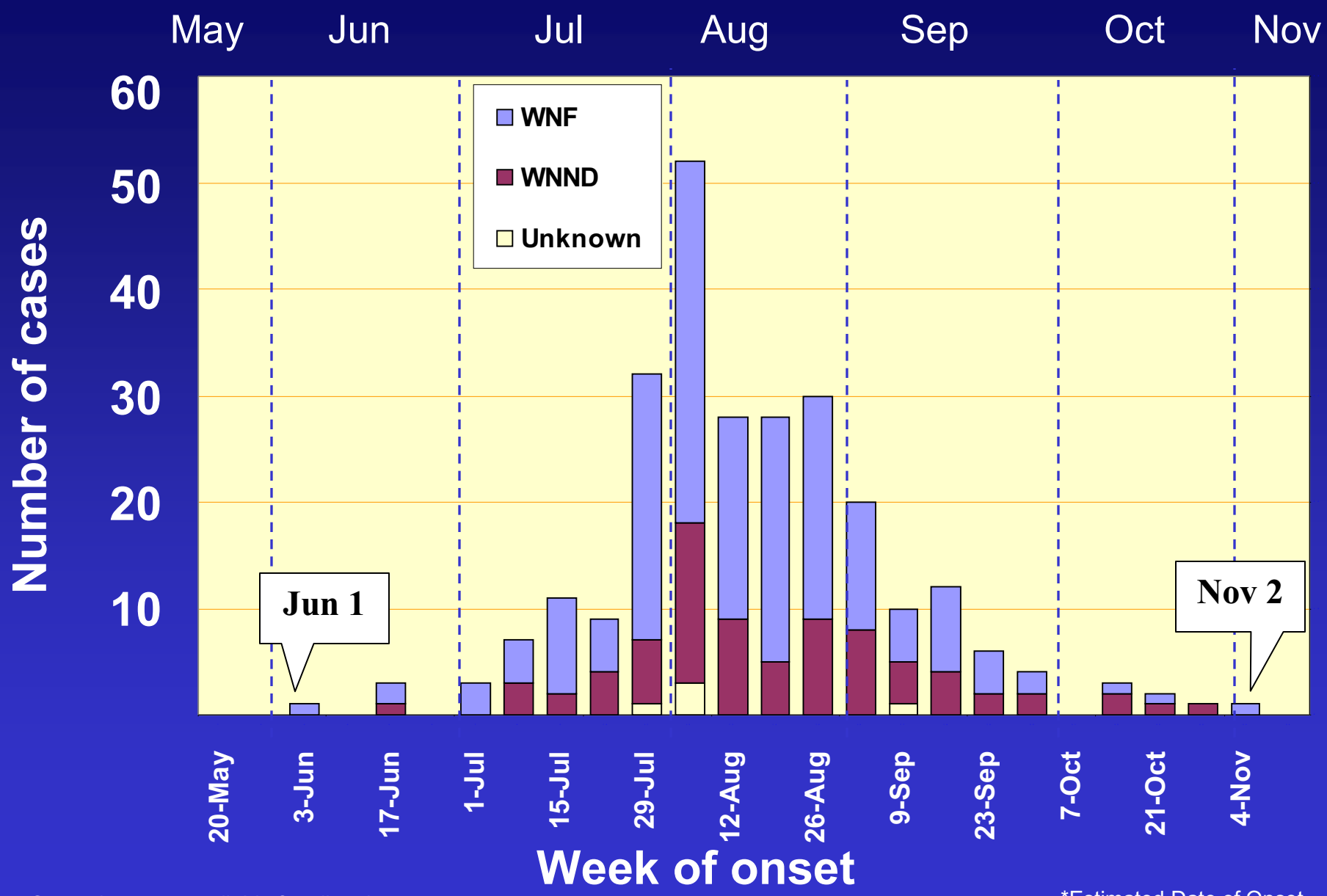
	2005	2006
Number of symptomatic cases	873	278
Clinical presentation		
Neuroinvasive	301 (36%)	83 (30%)
Fever	524 (64%)	190 (68%)
Unknown	48	5
Median age	51 yrs	49 yrs
Fatal cases	18	7
Median age of fatalities	79 yrs	82 yrs

Incidence of WNV illness by age and clinical presentation, California, 2006

(n=278)



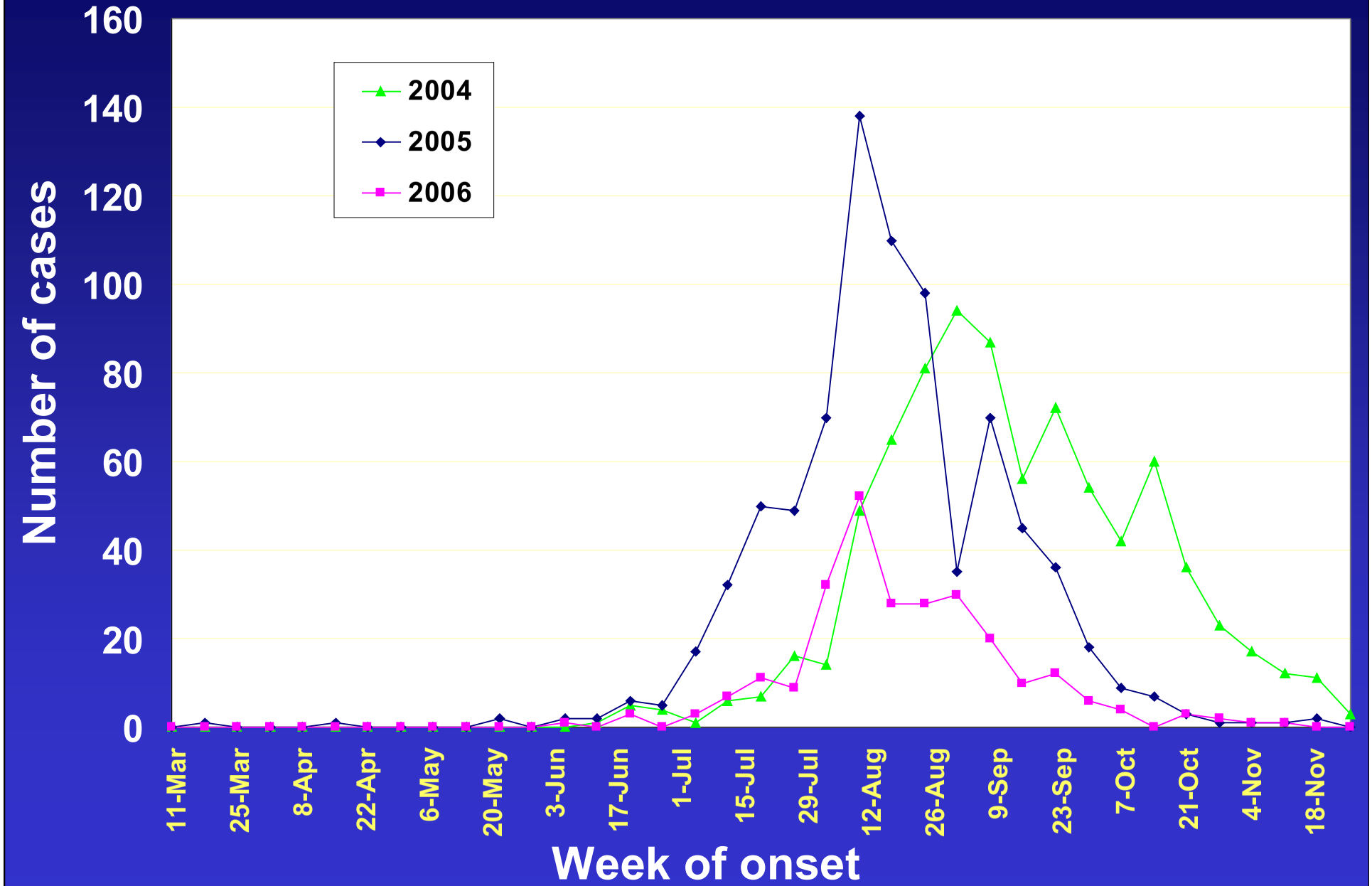
Human WNV Cases in California, 2006



• Onset dates not available for all patients

*Estimated Date of Onset

Onset of Human Illness 2005-2006

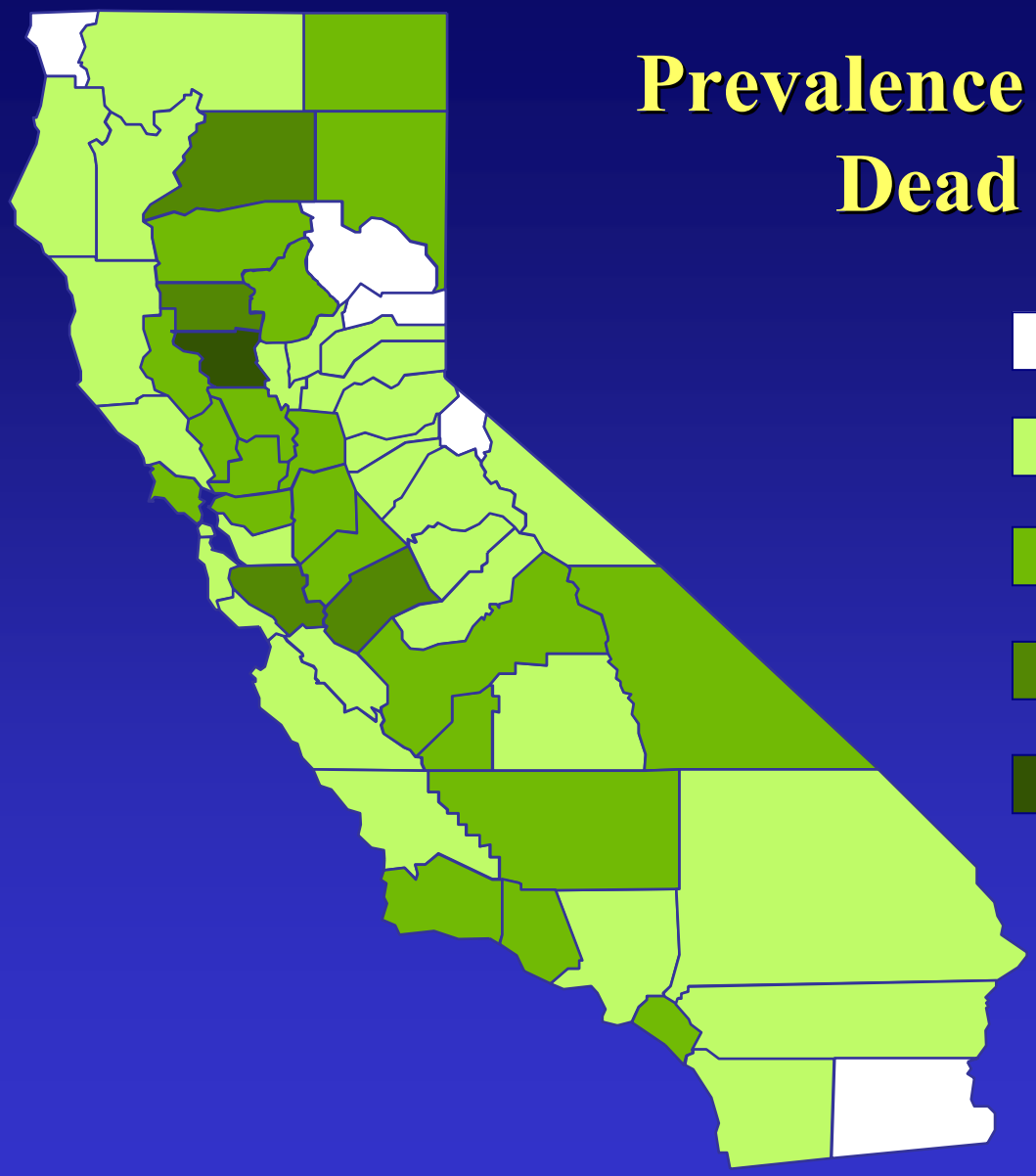


Dead Bird Surveillance

Dead Bird Surveillance Program 2000 - 2006

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
2005	109,375	9,263	3,046
2006	46,345	6,535	1,446

Prevalence of WNV in Tested Dead Birds*, 2006



- No detected incidence
- 1 – 19 %
- 20 – 39 %
- 40 – 59 %
- 60 – 79 %

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

2006: 87 species of WNV positive dead birds

Non-Corvids
(82 species) 23%

Other Corvids
(2 species) 2%

American Crow 47%

Yellow-billed
Magpie 7%

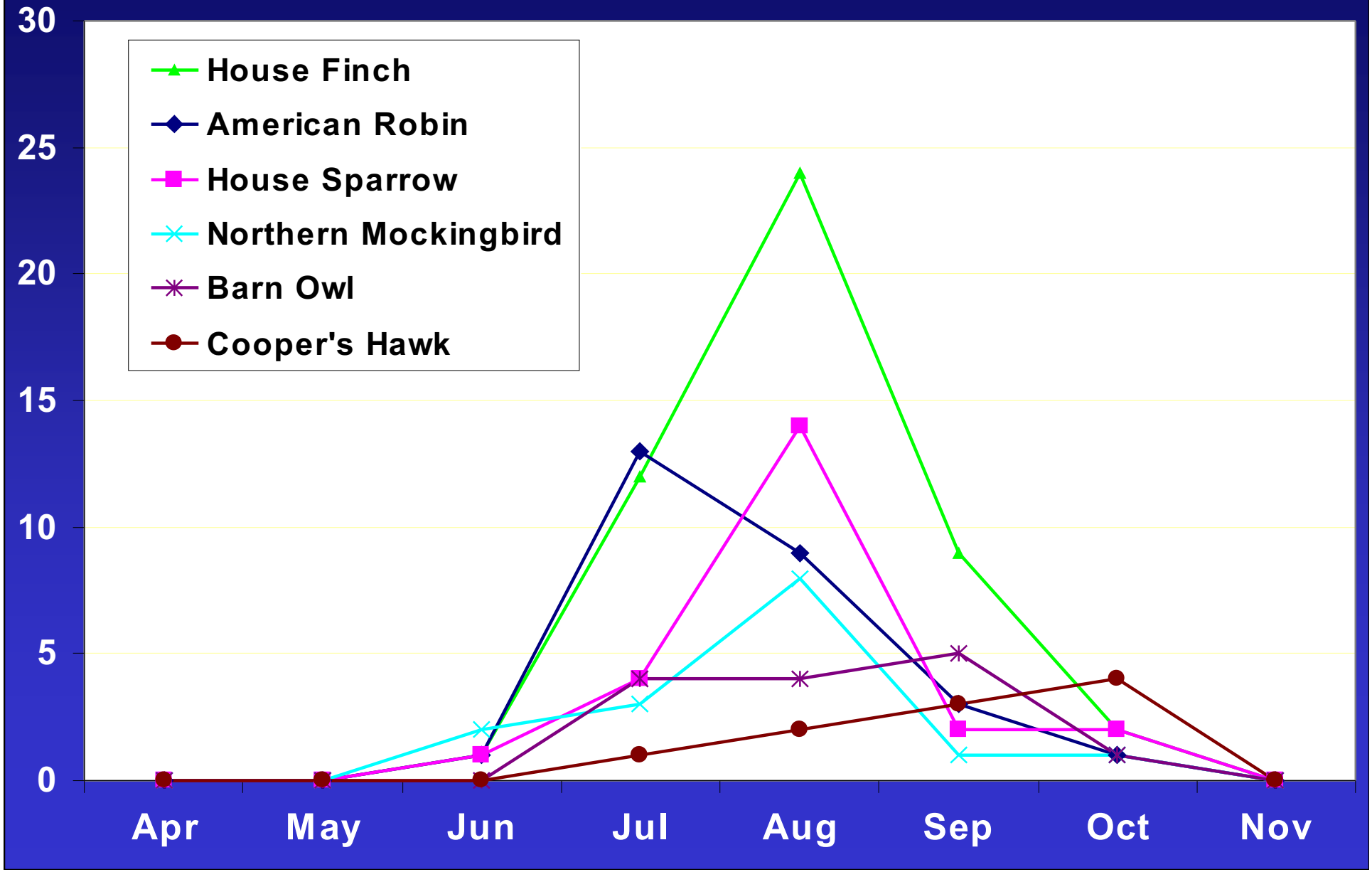
Western Scrub Jay 21%

Number reported = 46,345

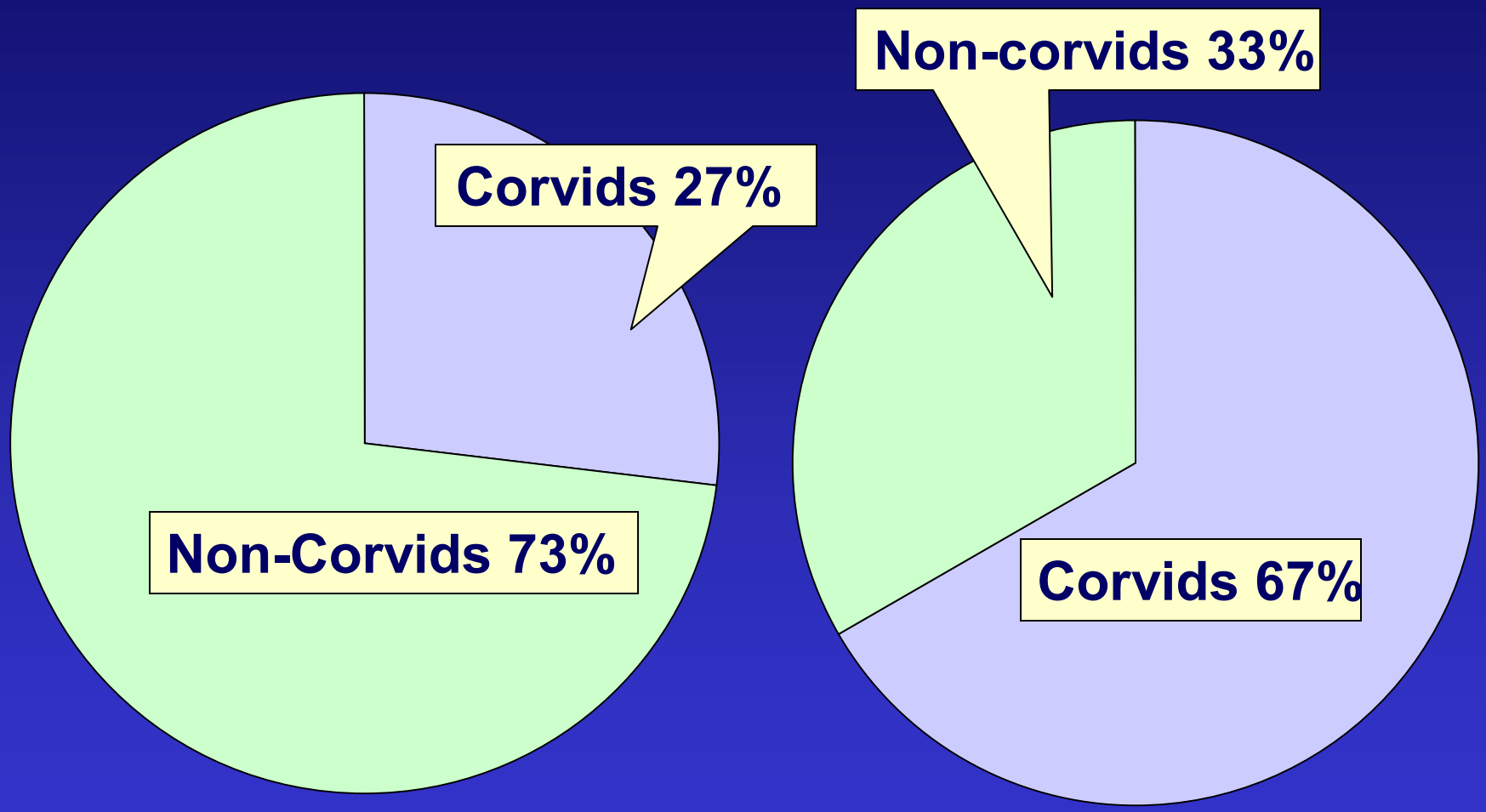
Number tested = 6,535

Number WNV pos = 1,446

Top 6 WNV Positive Non-Corvids, 2006



WNV Positive Corvids and Non-Corvids January-April



2005 2006

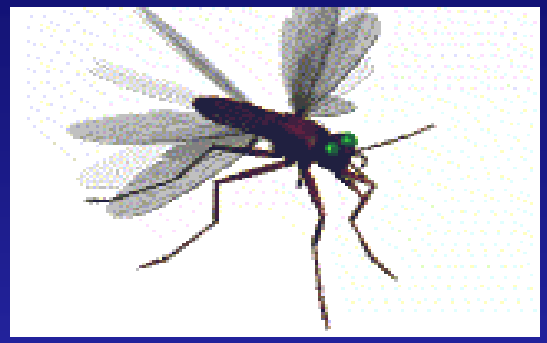
DYCAST 2006

- DYCAST is a statistical model that was used to identify clustering of dead bird reports temporally and spatially
- Correlation between dead bird reports per capita and human cases
  - The more reports made, the more likely that DYCAST identified increased WNV activity where human cases subsequently occurred
- DYCAST was used by most of the local agencies to assist them in directing mosquito larviciding and adulticiding in 2006

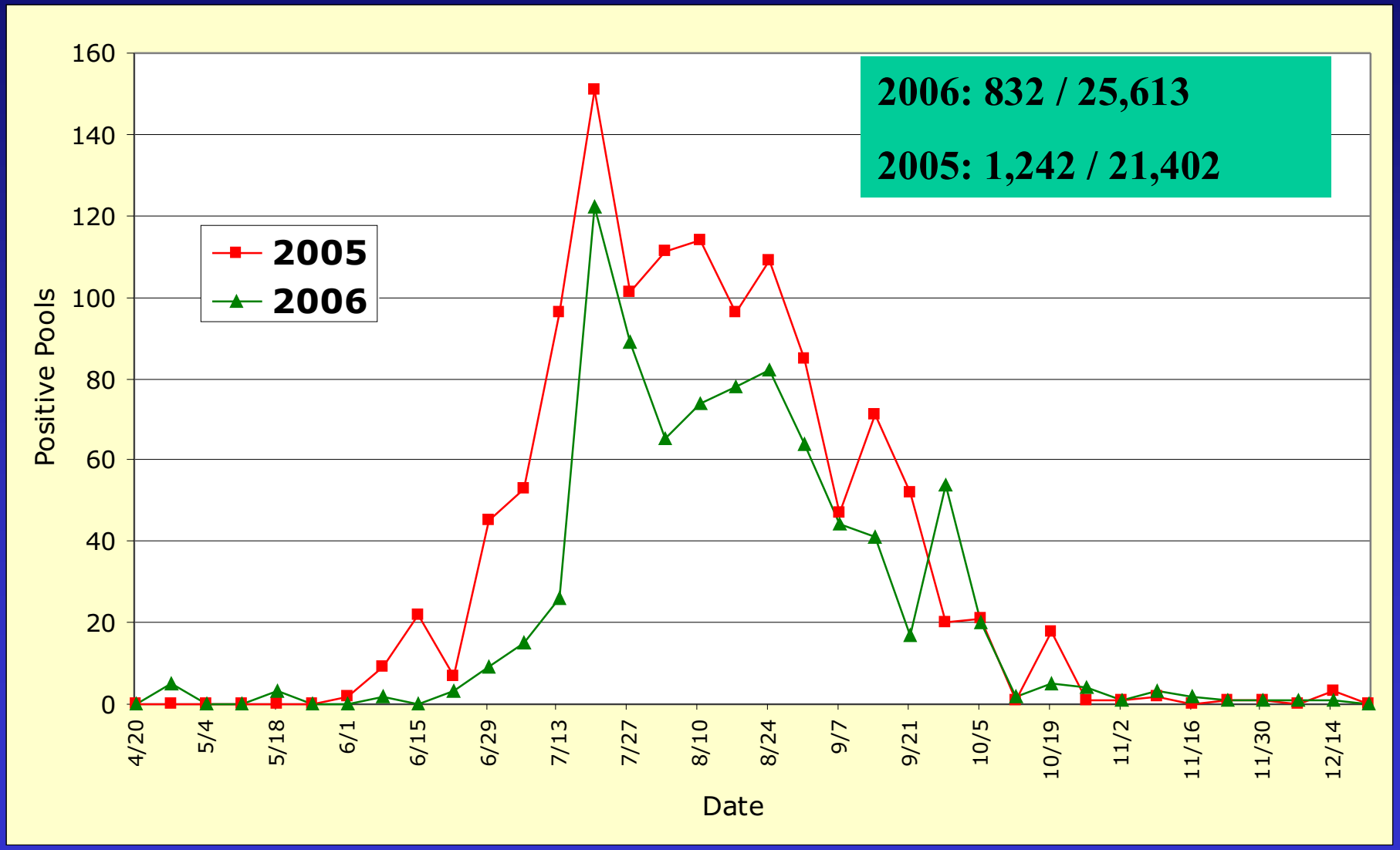
WNV in California Tree Squirrels - 2006

- First positive squirrel: August 1, 2006
- Prevalence (PCR): 23.2% (32/138)
  - nine counties with positive tree squirrels
- Similar to prevalence in dead birds (22.1%)

WNV Activity in Mosquitoes



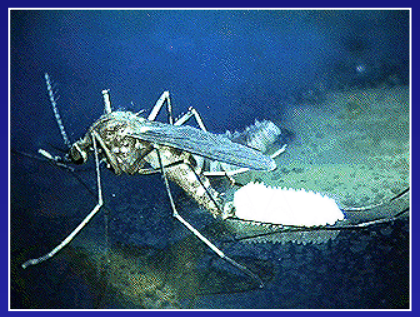
WNV Activity in Mosquitoes
number positive pools



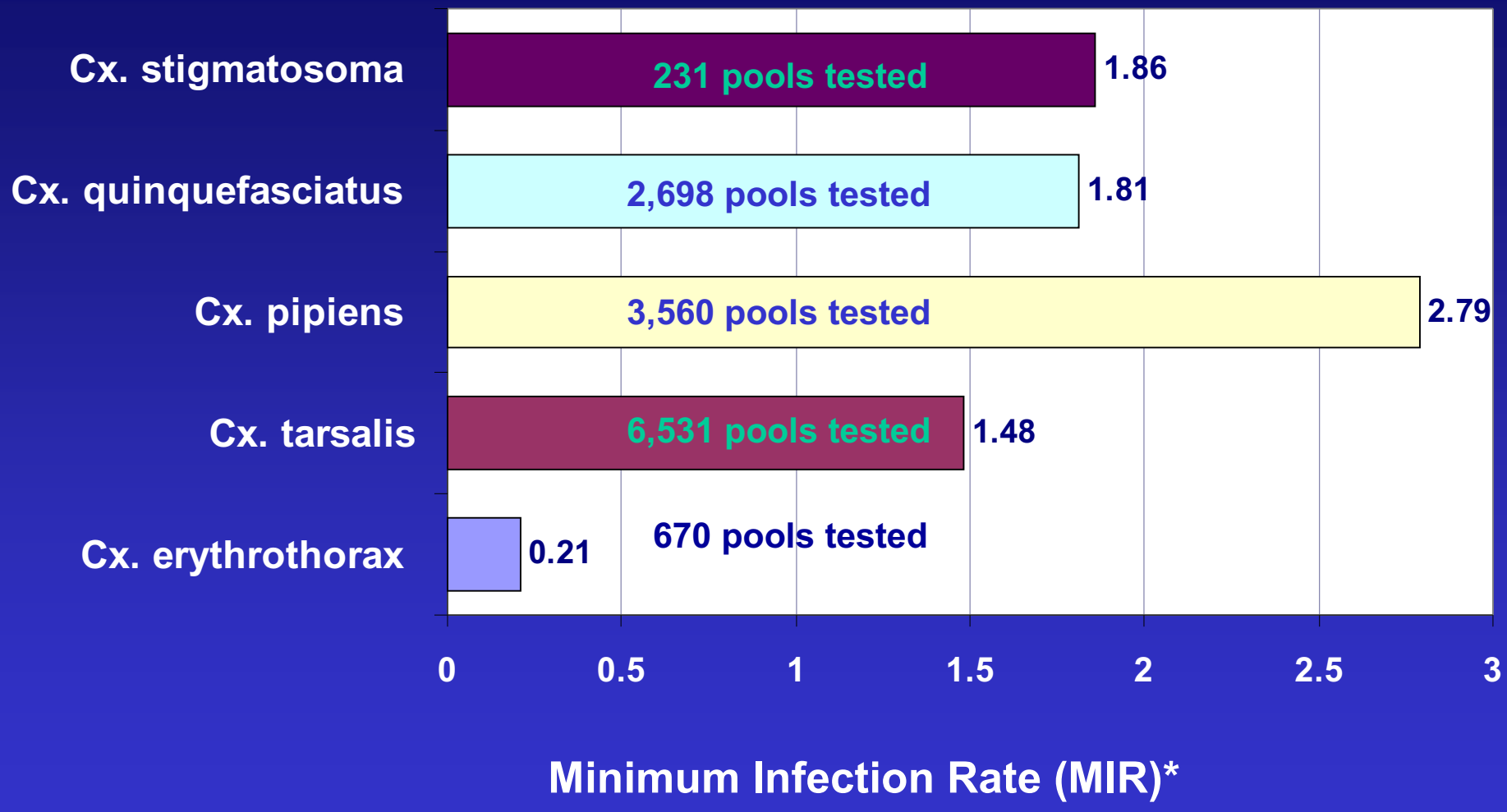
WNV Positive Mosquito Species

832 positive pools

Culex		
tarsalis	**430**	**(52%)**
quinquefasciatus	**266**	**(32%)**
pipiens	**119**	**(14%)**
stigmatosoma	**6**	**(<1%)**
erythrothorax	**7**	**(<1%)**
Culiseta incidens	**1**	**(<1%)**
Anopheles freeborni	**1**	**(<1%)**
Aedes melanimon	**2**	**(<1%)**



Minimum Infection Rates (per 1,000) by Species July – September 2006

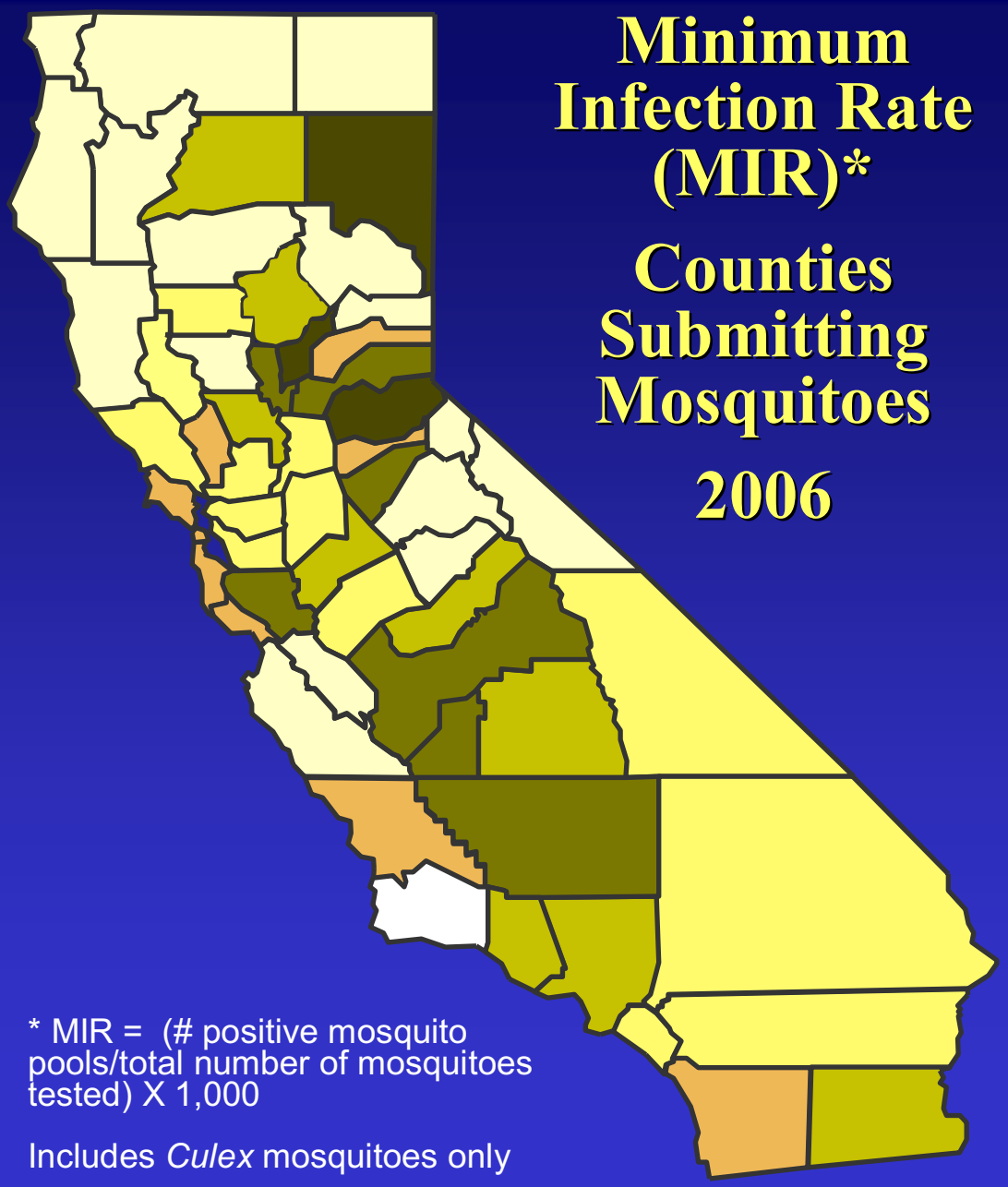


* MIR = (# positive mosquito pools / total number of mosquitoes tested) X 1,000

Minimum Infection Rate (MIR)*

Counties Submitting Mosquitoes

2006

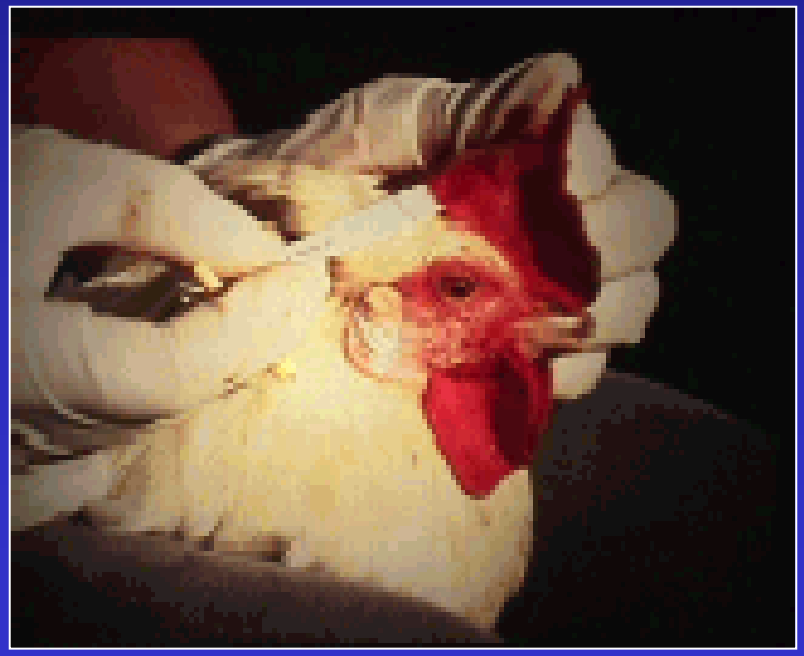


Yuba	6. 7	≥ 4.0
Lassen	5.8	
El dorado	4.8	
Calaveras	3.8	≥ 2.0
Kern	3.3	
Santa Clara	3.2	
Sutter	2.8	
Kings	2.3	
Fresno	2.2	
Placer	2.0	
Shasta	1.9	≥ 1.0
Madera	1.7	
Tulare	1.5	
Ventura	1.3	
Yolo	1.3	
Stanislaus	1.1	
Los Angeles	1.1	
Imperial	1.0	
Butte	1.0	
Lake	0.9	≥ 0.1
Marin	0.8	
Inyo	0.8	
Sacramento	0.8	
San Bernardino	0.8	
San Joaquin	0.7	
Glenn	0.7	
Alameda	0.6	
Contra Costa	0.5	
Merced	0.5	
Solano	0.5	
Orange	0.4	
Sonoma	0.2	
Riverside	0.2	
Santa Barbara	0.07	
No positive pools	0	
No mosquitoes tested		

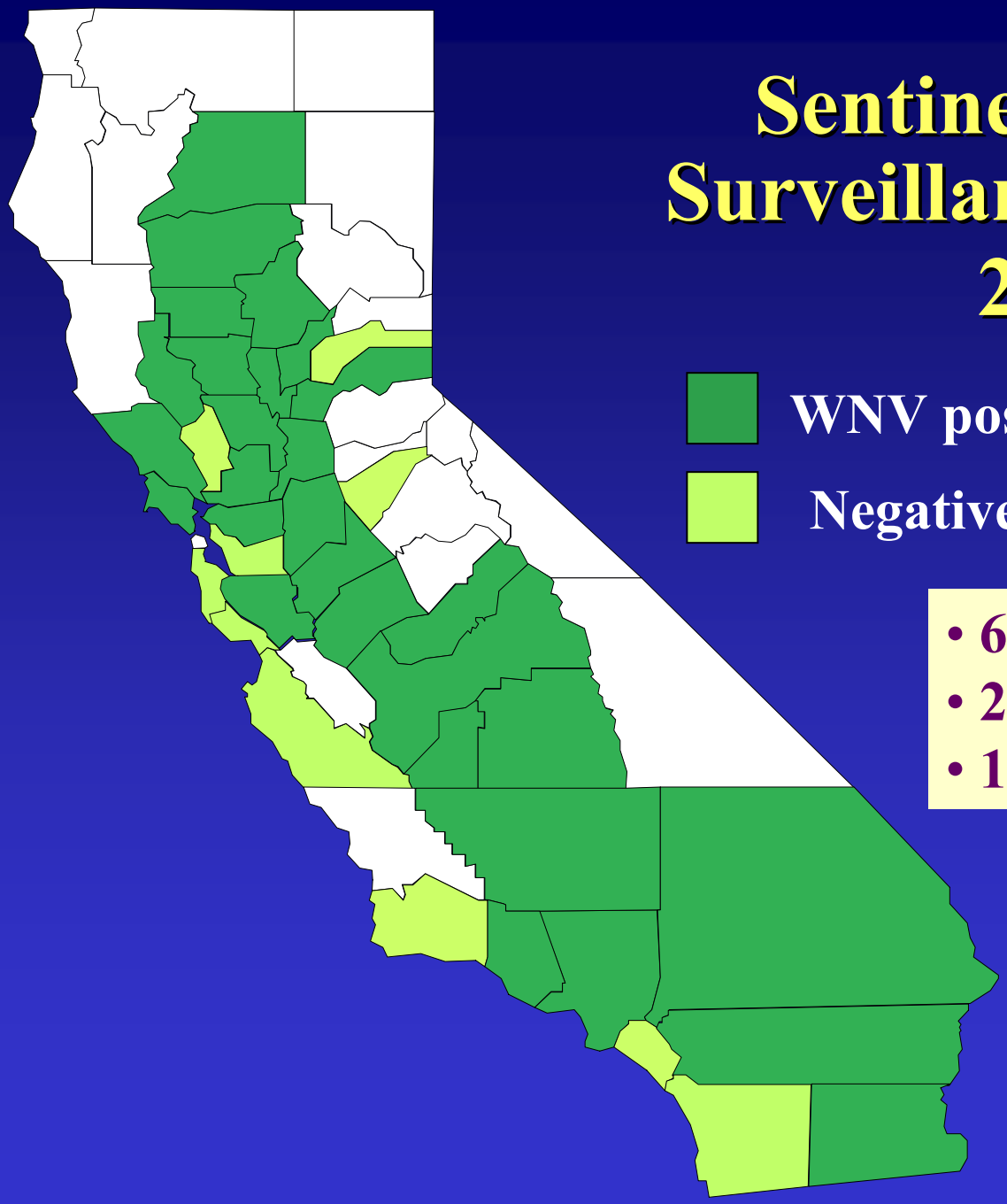
* MIR = (# positive mosquito pools/total number of mosquitoes tested) X 1,000

Includes *Culex* mosquitoes only

WNV Activity in Sentinel Chickens



Sentinel Chicken Surveillance Program 2006

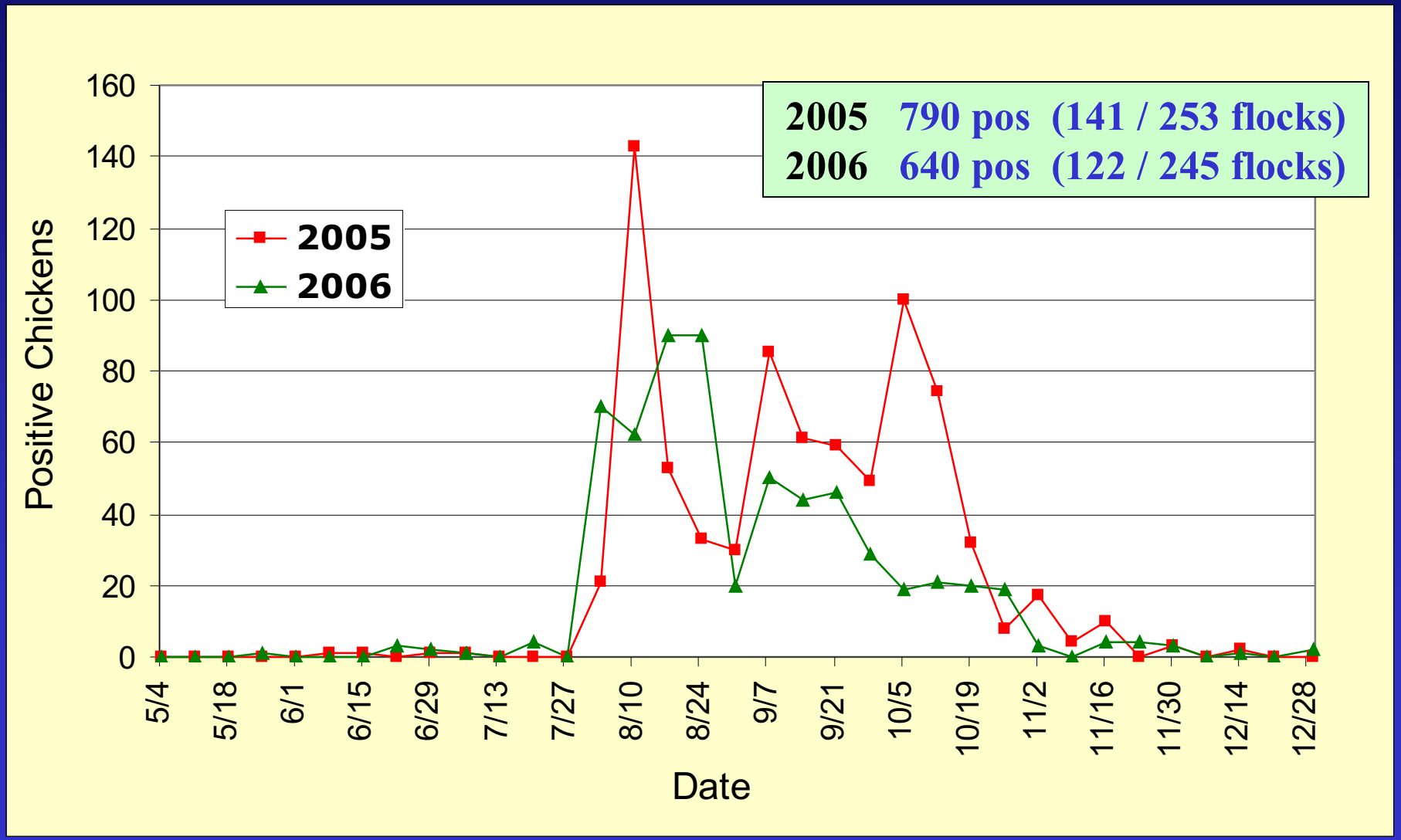


WNV positive flock

Negative flock

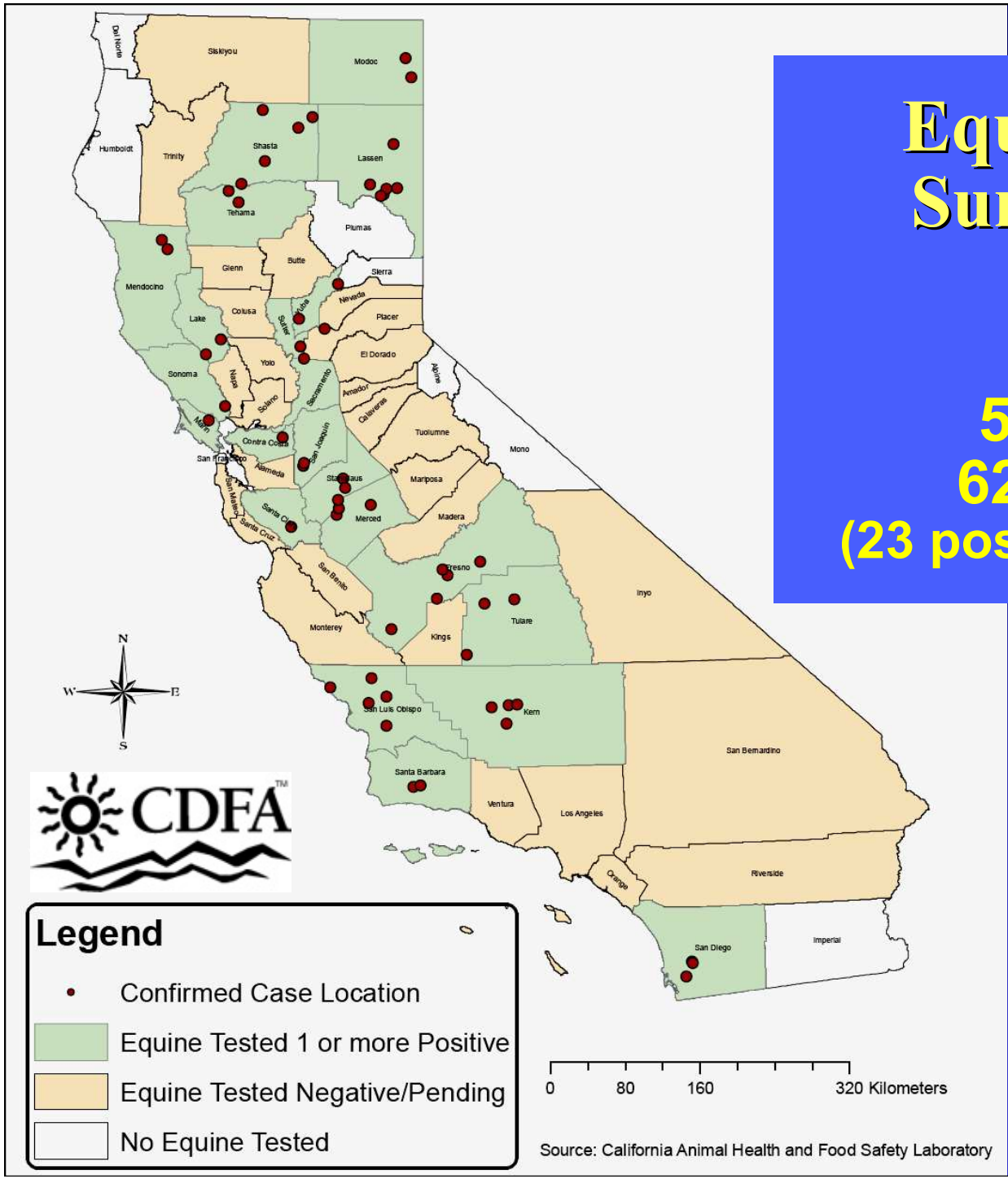
- 640 seroconversions
- 29 counties
- 122 / 245 flocks

WNV Activity in Sentinel Chickens



Equine WNV Surveillance 2006

58 cases
622 tested
(23 positive counties)

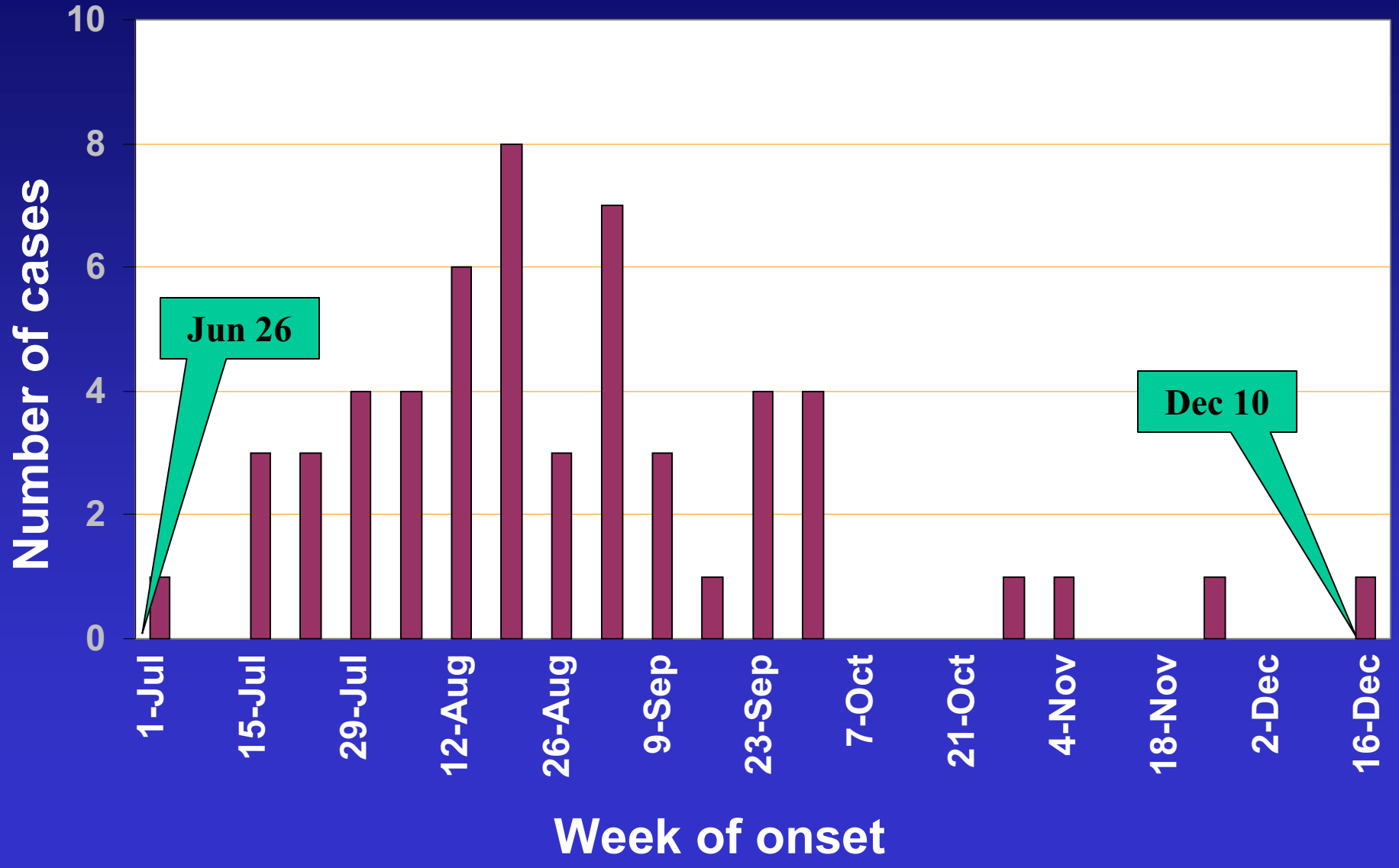


2005: 456 cases

2006 Equine WNV Cases

- 58 WNV infected horses (23 counties)
- 24 (41%) died / euthanized
- Vaccination status
  - 5 properly vaccinated
  - 2 improperly vaccinated
  - 44 non-vaccinated
- Median age: 11 years (1 – 34 years)

Week of Onset for Equine WNV Cases California, 2006



WNV Team at DHS

- VBDS
  - ✓ Vicki Kramer
  - ✓ Stan Husted
  - ✓ Ryan Carney
  - ✓ Kerry Padgett
  - ✓ Tina Feiszli
  - ✓ Colleen Barclay
  - ✓ Anne Kjemtrup
  - ✓ Jamie Riggs-Nagy
  - ✓ Rachel Owens
  - ✓ Mark Novak
  - ✓ Renjie Hu
  - ✓ Hotline staff
  - ✓ Regional biologists
- DIS
  - ✓ Jon Rosenberg
- VPHS
  - ✓ Ben Sun
  - ✓ James Glover
  - ✓ Claudia Erickson
- VRDL
  - ✓ Carol Glaser
  - ✓ Cynthia Jean
  - ✓ Cindi Cossen
  - ✓ Liz Baylis
  - ✓ Shilpa Jani
- OPA
  - ✓ Michele Mussuto

Collaborators

- Local Health Departments
- Local Public Health Laboratories
- Environmental Health Departments