

Summary of West Nile Virus Activity, United States 2005

7th National Conference on West Nile Virus
in the United States

San Francisco, February 23, 2006

The ArboNET Team

Eileen C. Farnon, MD

Division of Vector-Borne Infectious Diseases

National Center for Infectious Diseases

Fort Collins, Colorado



Outline

- **Overview of ArboNET**
- **Historical WNV activity**
- **Humans**
 - **Transfusion cases**
 - **Transplant cases**
 - **Hurricanes**
- **Mosquitoes**
- **Birds**
- **Veterinary**
- **Other arboviruses**
- **Summary**

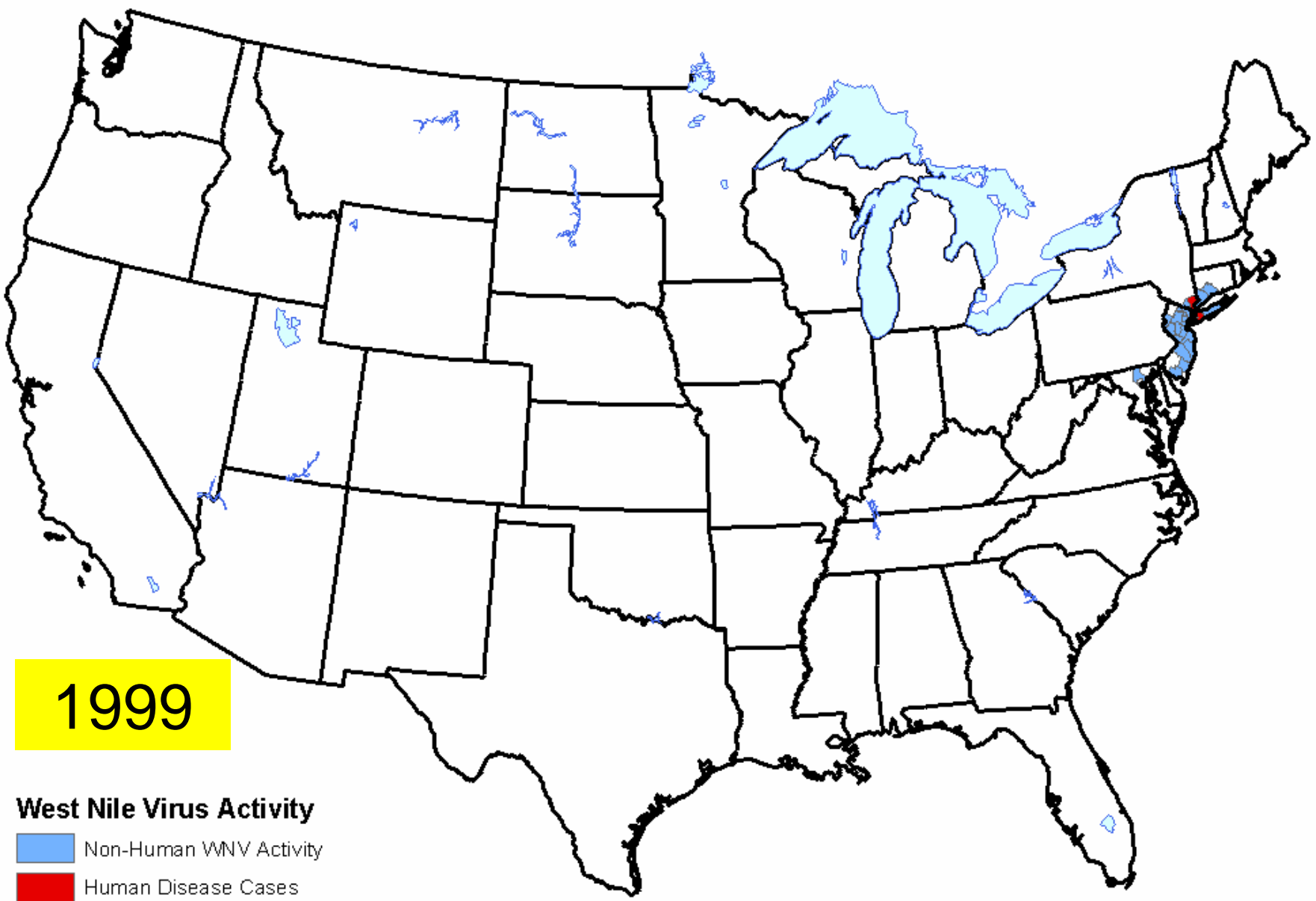
ArboNET



- Arboviral national electronic surveillance system
- Humans
- Ecologic
 - Mosquitoes
 - Birds
 - Animals
 - WNV, SLE, EEE, WEE, LAC, DEN, VEE
- All data current as of February 14, 2006

Historical Perspective

Progression of West Nile Virus Activity in
the United States, 1999-2005

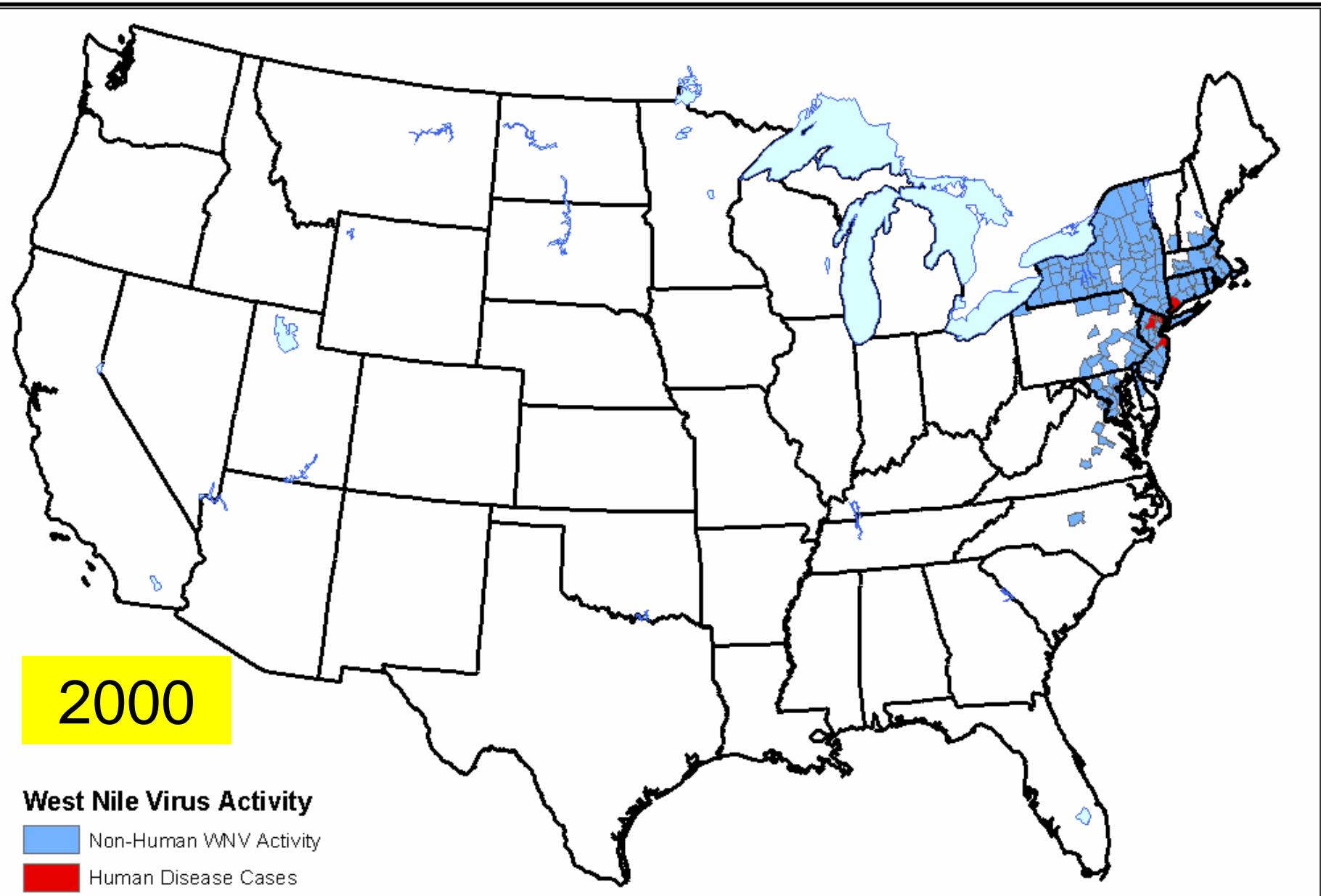


1999

West Nile Virus Activity
Non-Human WNV Activity
Human Disease Cases



National Center for Infectious Diseases
West Nile Virus Activity
Cumulative results for 1999 calendar year





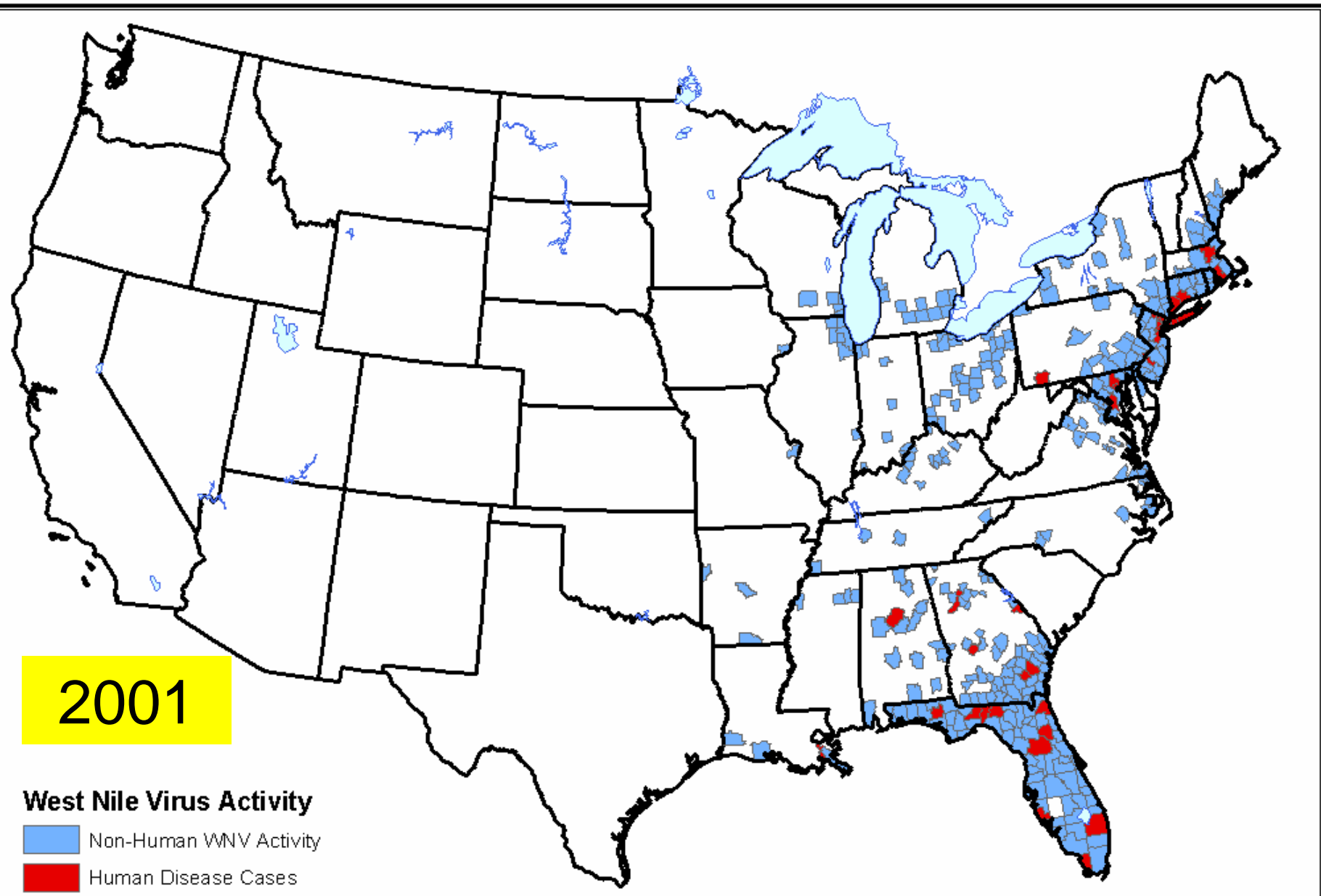
2000

West Nile Virus Activity

-  Non-Human WNV Activity
-  Human Disease Cases

National Center for Infectious Diseases
West Nile Virus Activity
Cumulative results for 2000 calendar year





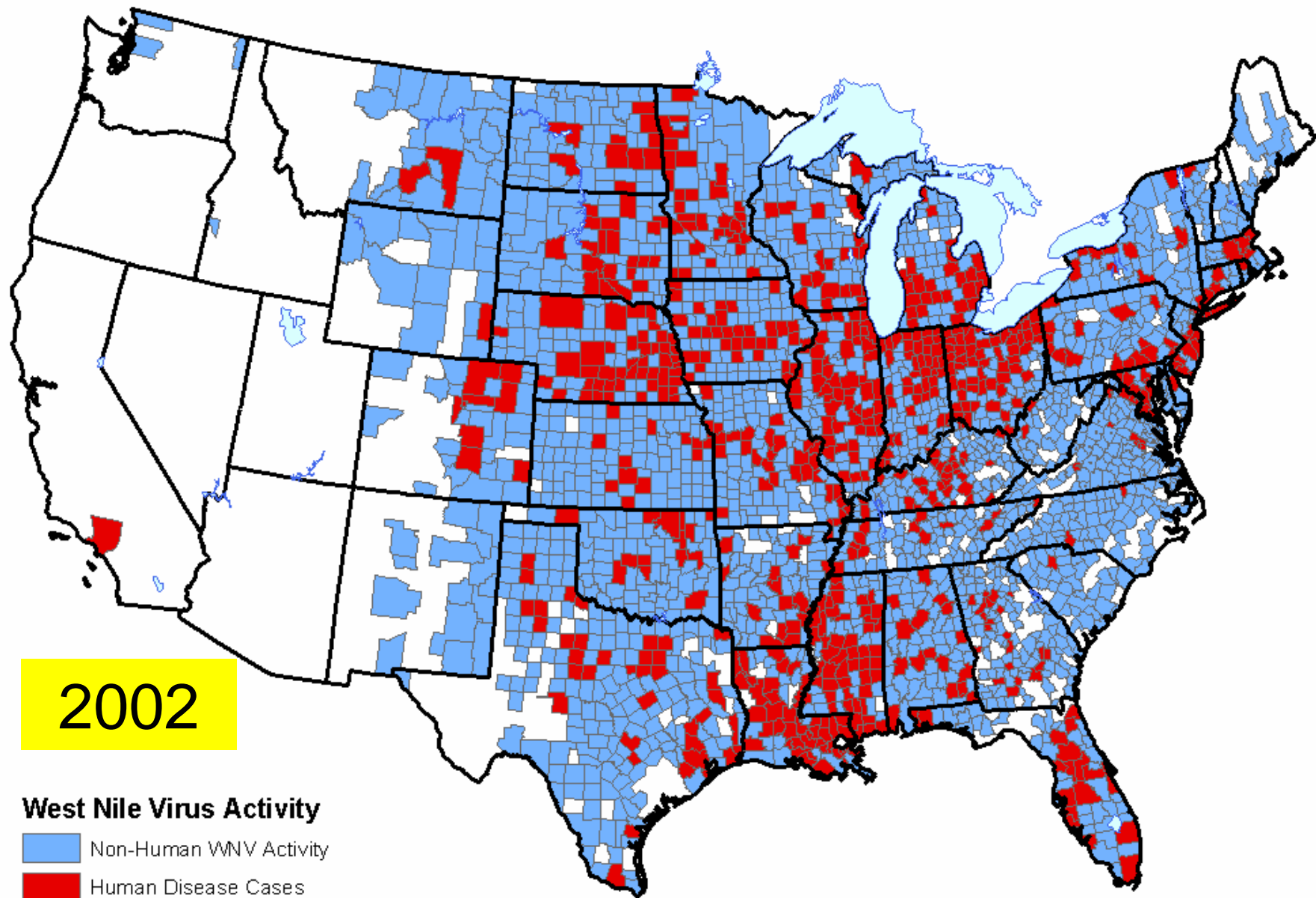
2001

West Nile Virus Activity

- Non-Human WNV Activity
- Human Disease Cases

National Center for Infectious Diseases
West Nile Virus Activity
Cumulative results for 2001 calendar year



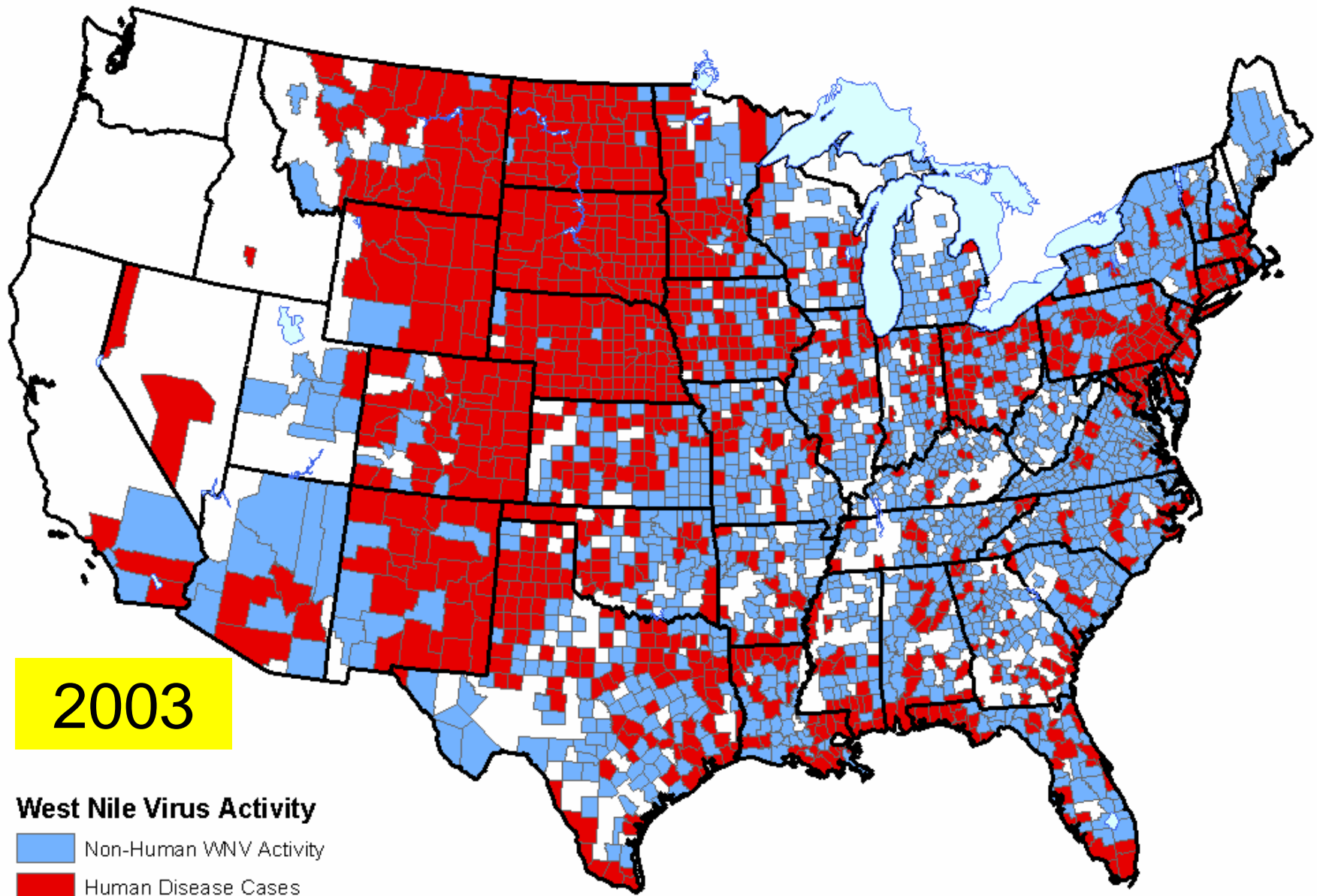


National Center for Infectious Diseases

West Nile Virus Activity

Cumulative results for 2002 calendar year reported as of April 15, 2003

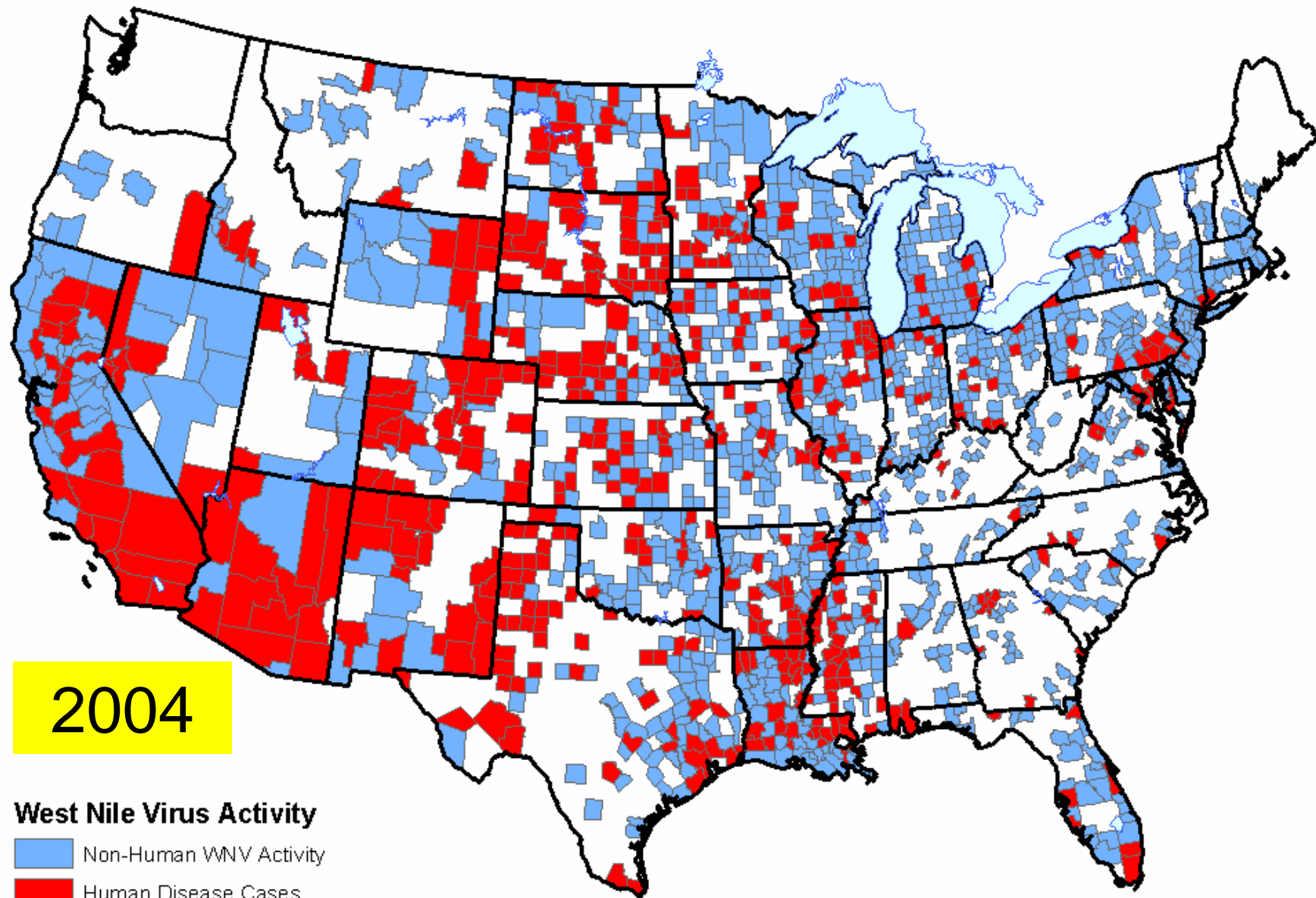
CDC



2003

West Nile Virus Activity

- Non-Human WNV Activity
- Human Disease Cases

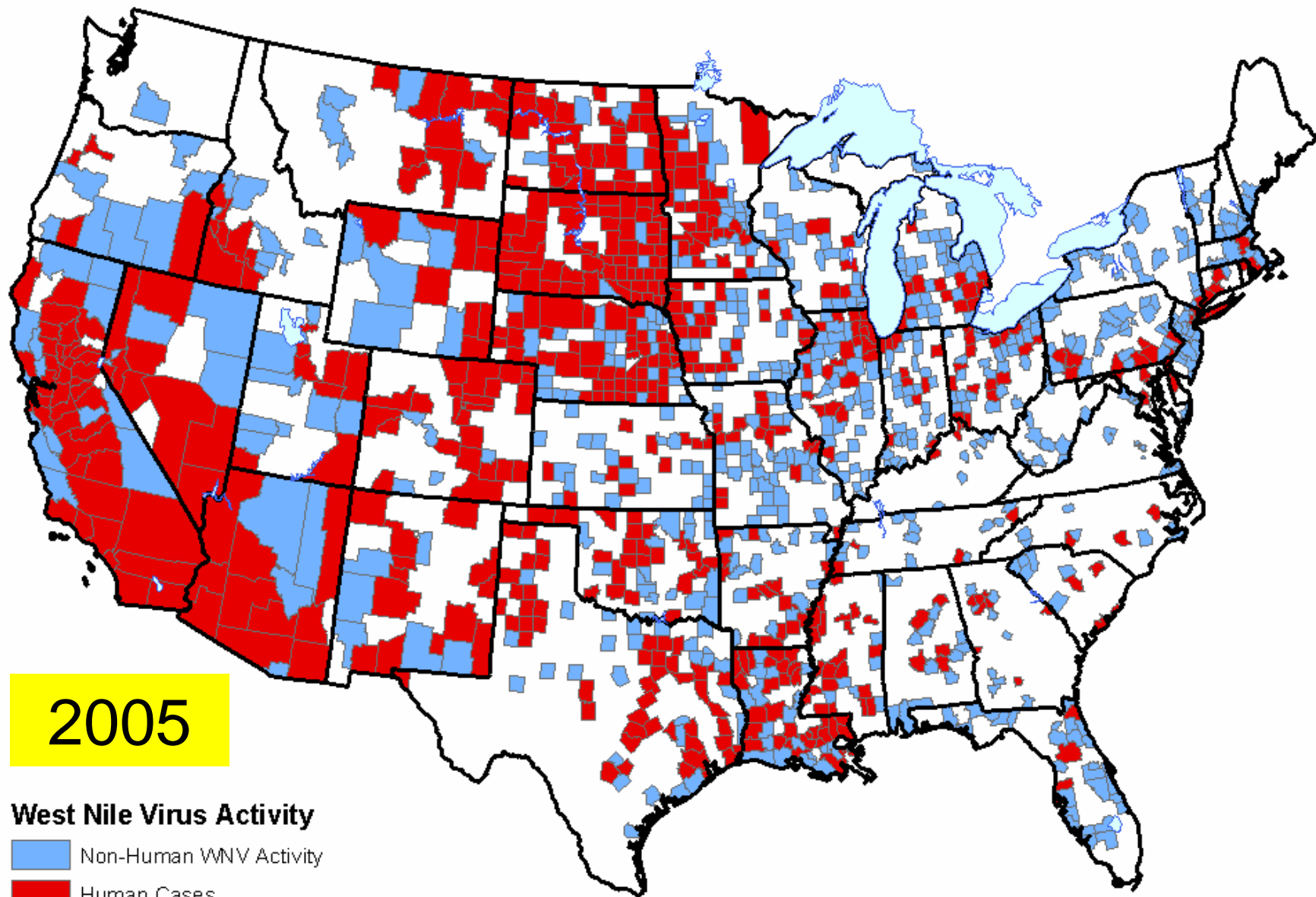


National Center for Infectious Diseases

West Nile Virus Activity

Cumulative results for 2004 calendar year reported as of June 21, 2005

CDC



2005

West Nile Virus Activity

- Non-Human WNV Activity
- Human Cases

National Center for Infectious Diseases

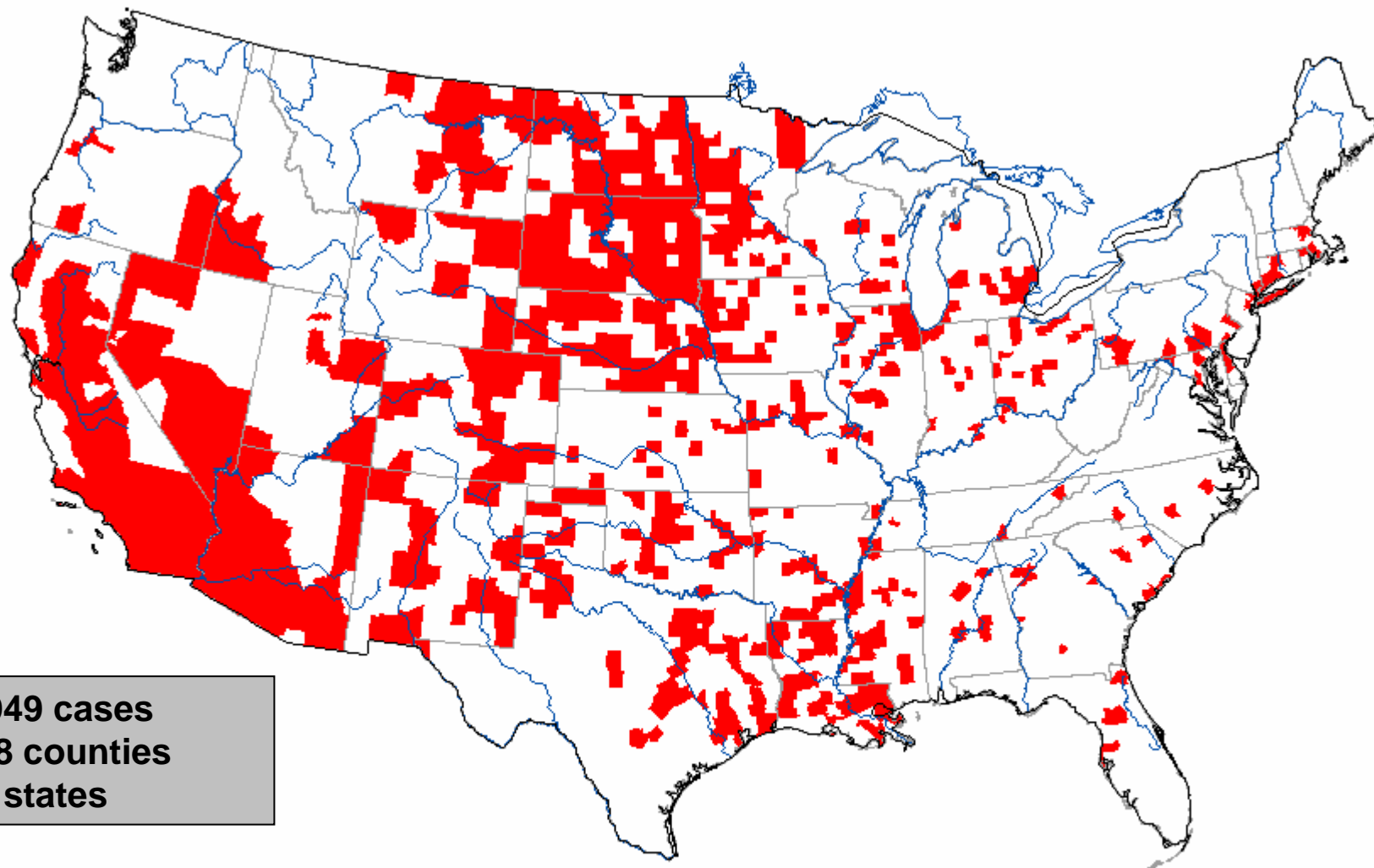
West Nile Virus Activity

Cumulative results for 2005 calendar year reported as of February 14, 2006

CDC

HUMANS

U.S. Counties Reporting Human WNV Disease Cases, 2005



2,949 cases
628 counties
42 states

Through MMWR week 52 (ending 12/31/2005) - 628 counties
Reported through ArboNET as of 2/14/2006

CDC/NCID/DVBID

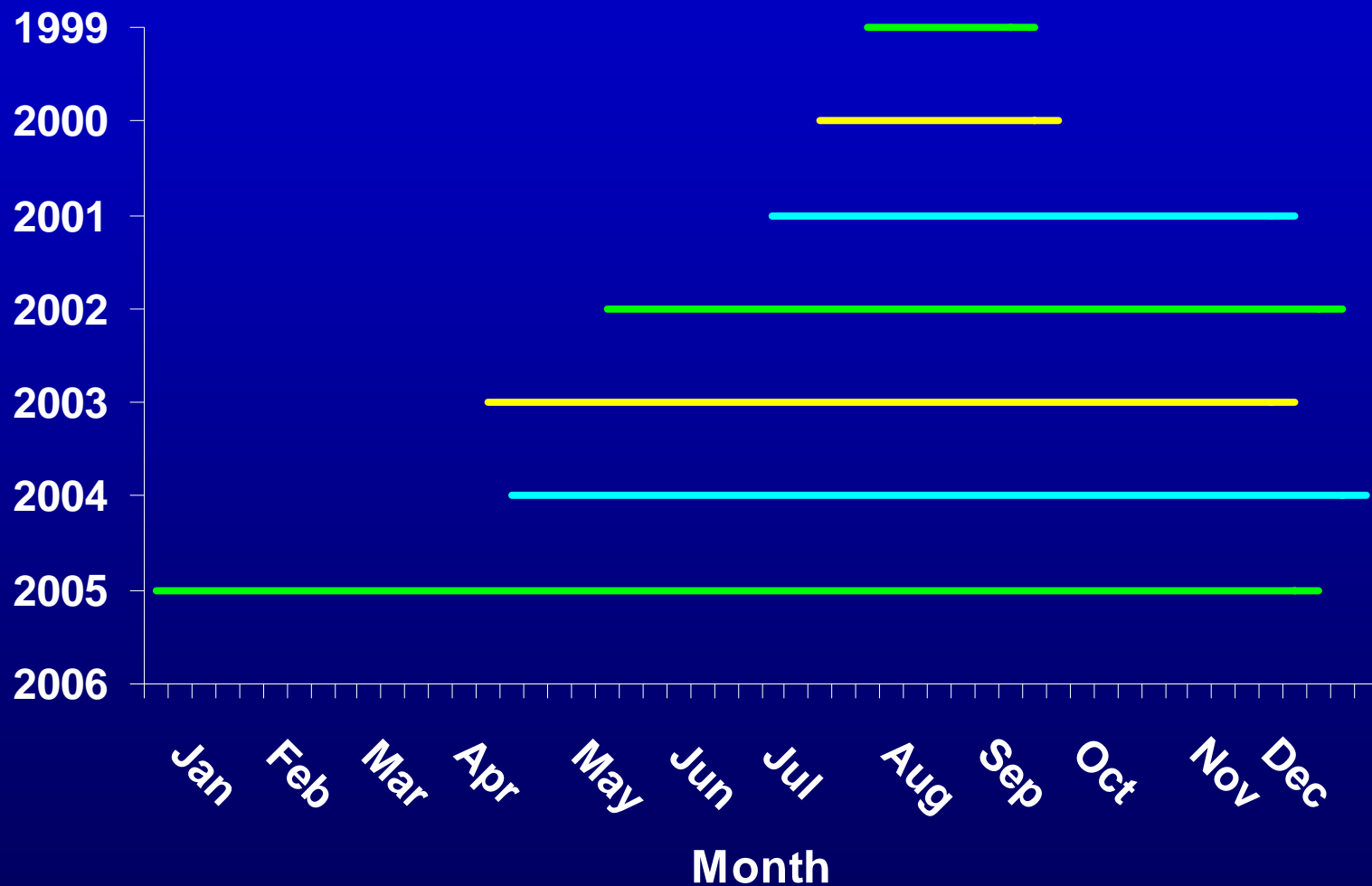
Reported WNV Disease Cases in Humans, United States 1999-2005*

Year	Total	WNND	WNF/other	Deaths
1999-2001	149	142	7	18
2002	4,156	2,946	1,210	284
2003	9,862	2,866	6,996	264
2004	2,539	1,148	1,391	100
2005	2,949	1,288	1,661	116
Total	19,655	8,390	11,265	782

*Reported as of 2/14/2006

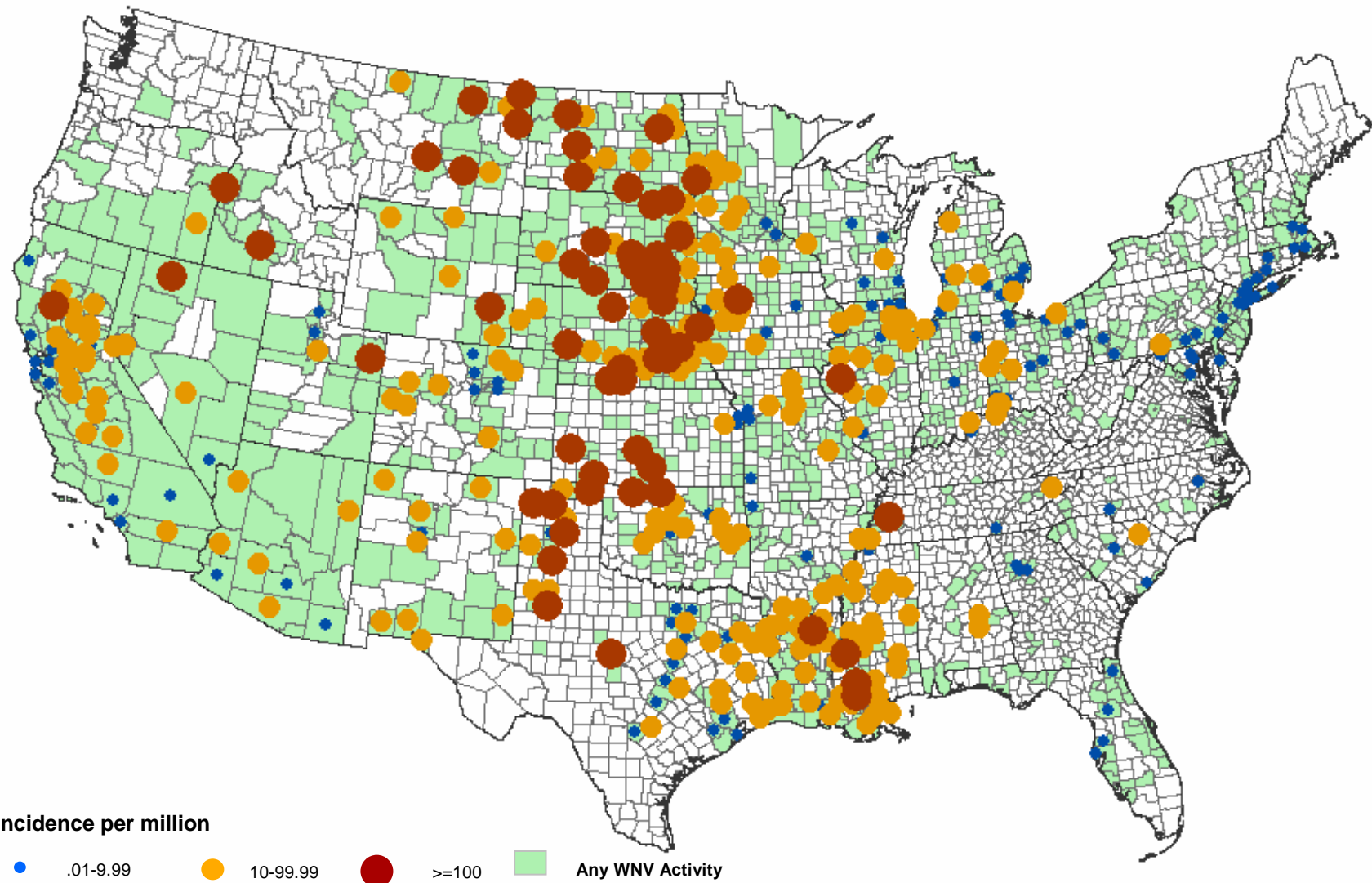
** Plus D.C.

Onset of Human WNV Disease, United States 1999-2005*



*Reported as of 2/14/2006

WNND County Level Incidence per Million, United States, 2005*

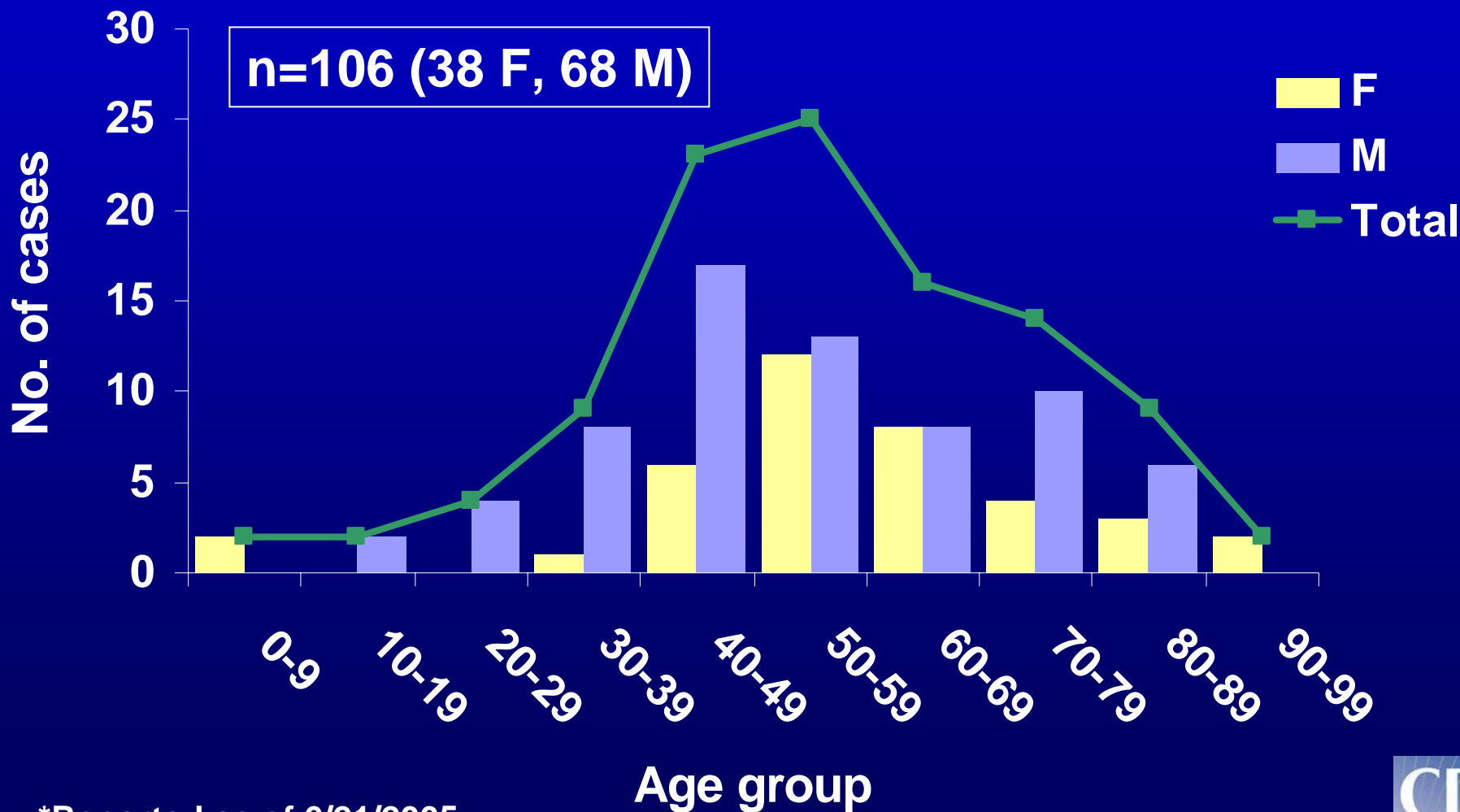


*Reported as of 2/14/2006

WNV Acute Flaccid Paralysis (AFP) United States, 2004-5

- 112 cases
 - 44 female (39%), 68 male (61%)
 - Median age 55 (2-84), n=106
 - 17 fatal (15%)
- Top 3 states
 - CA 49 (44%)
 - NM 13 (12%)
 - IA 8 (7%)

Acute Flaccid Paralysis, by Age Group and Sex, 2004-5*



*Reported as of 6/21/2005

Summary of Human WNV Surveillance United States, 2005

- **WNV activity: high in West, persisted in East**
- **Dates of onset for WNV disease span the year**
- **Highest incidence of WNND: West, Central**
- **112 cases of AFP reported 2004-5; peak age 50-59**

TRANSFUSION & TRANSPLANTATION

WNV Blood Screening

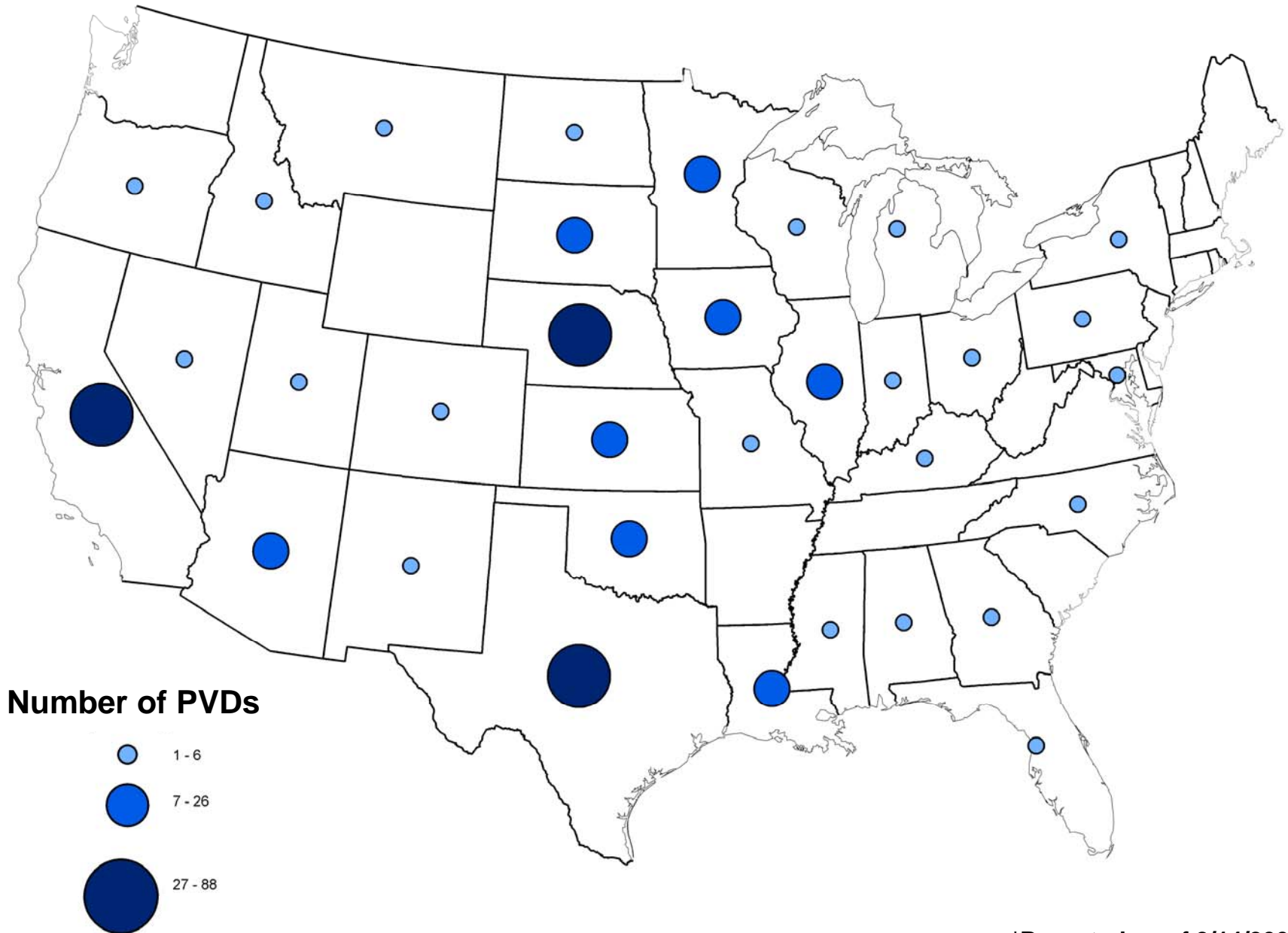
- **Transmission via blood transfusion, 2002**
- **Nucleic acid amplification tests (NAT), 2003**
- **Blood banks report presumptively viremic donors (PVDs) to local public health department**
 - **Remove products**
- **Public health departments report to ArboNET**
 - **Demographics**
 - **Clinical follow-up**

WNV PVDs by Year*

Year	Number of PVDs
2003	818
2004	224
2005	399
Total	1441

*Reported as of 2/14/2006

West Nile Viremic Blood Donors, by State of Residence, 2005*



*Reported as of 2/14/2006

PVDs Reported to ArboNET*, 2005

- Over 8 million donations screened
- 399 PVDs reported to ArboNET
 - 92 (23%) WNF
 - 3 (0.8%) WNND
 - 8 (2%) other
- 198 (50%) reported from 3 states: CA, TX, NE

* Reported by health departments as of 2/14/2006

WNV Transfusion-associated Transmission Investigations, 2005

- **8 case investigations initiated**
 - **6 no WNV transmission**
 - **1 inconclusive**
 - **1 investigation open**
 - **No probable cases of WNV transmission**

Transmission via Solid Organ Transplant, 2002

- August, 2002
- 4 recipients – all infected
 - 3 encephalitis
 - 1 fever
- Related to blood transfusion

Solid Organ Transplant Cases, 2005

- **Organ donor in NYC, August 2005**
- **4 recipients**
 - **3 developed WNV infection**
 - **2 WNND (liver, lung recipients)**
 - **1 asymptomatic (1st kidney recipient)**
 - **1 not infected (2nd kidney recipient)**
 - **All treated with Omr-IgG-am**

Organ Donor Testing, 2005

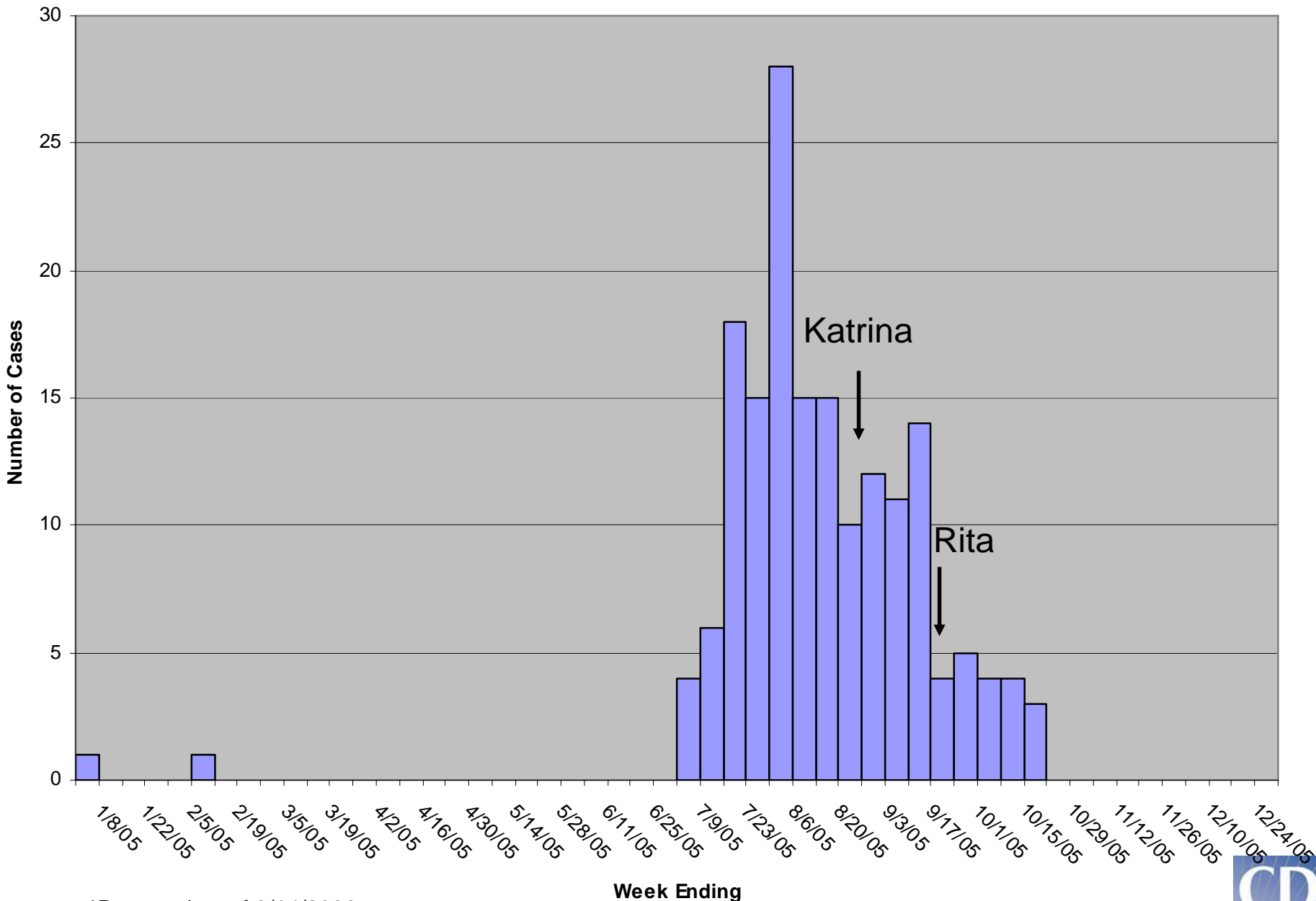
- Serum 1 day prior to organ harvesting
 - Positive WNV IgM, IgG; negative NAT
- Liver, gallbladder, kidney, spleen, and epidural hematoma
 - Negative by immunohistochemistry
- Transmission despite immune response
- Likely infected via mosquito bite

Summary of Surveillance for WNV Transmission via Transfusion and Transplantation, United States, 2005

- **Most PVDs reported from CA, NE, TX**
- **No cases of transfusion-associated transmission**
- **3 cases of transplant-associated transmission**

HURRICANES

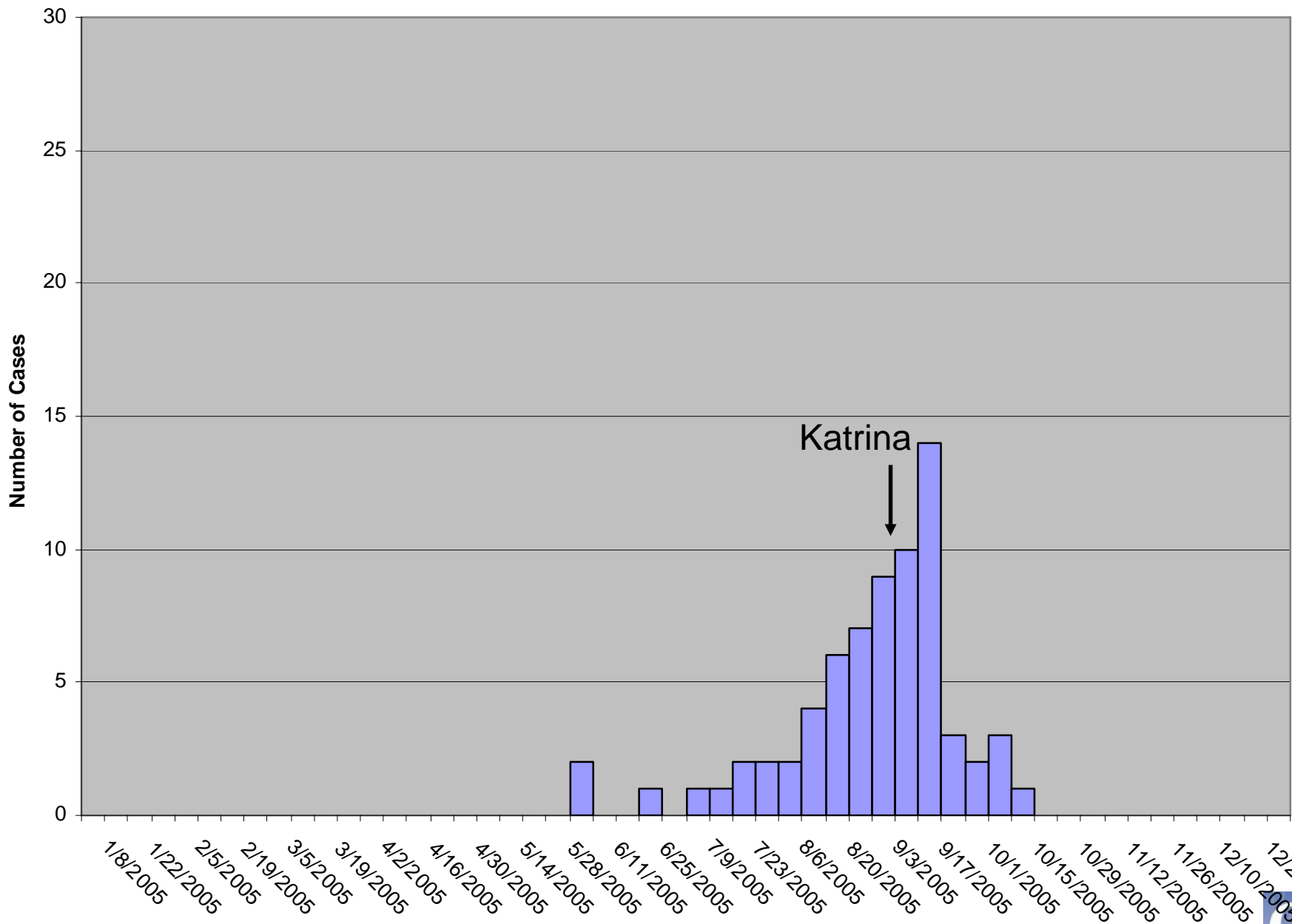
Human WNV cases by week of onset, Louisiana, 2005*



*Reported as of 2/14/2006



Human WNV cases by week of onset, Mississippi, 2005*

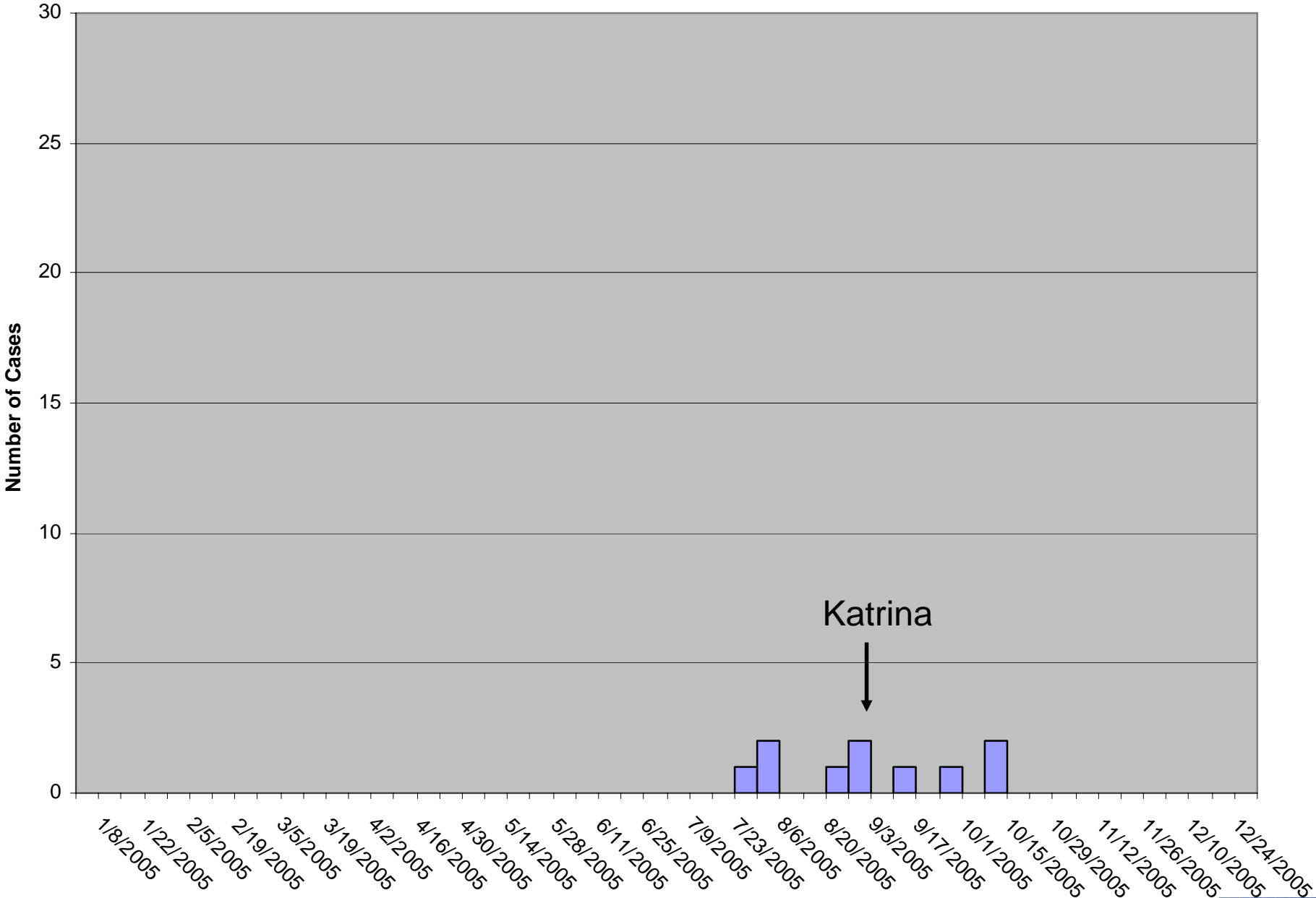


*Reported as of 2/14/2006

Week Ending



Human WNV cases by week of onset, Alabama, 2005*



*Reported as of 2/14/2006



Hurricane-related WNV Surveillance and Prevention: AL, LA, MS, 2005

- Arbovirus Diseases Branch, CDC
- Surveillance
 - Slight reporting lag (human cases, LA)
 - Animal, mosquito testing continued
- Vector Control
 - Multi-agency teams assisted LA and MS
 - LA – aerial spraying in 12 parishes
 - MS – larviciding and adulticiding

Summary of Hurricane-related WNV Surveillance, United States, 2005

- **Hurricanes did not appear to affect human WNV**
- **Lag in reporting human cases to ArboNET**
- **Vector control activities by multi-agency effort**

MOSQUITOES

WNV Surveillance, United States, 2005: Summary of Mosquito Data

- 2.3 million individual mosquitoes tested
- 11,485 WNV-positive mosquito pools
 - 39 species
 - 42 states and DC
- Earliest and latest
 - *Culex quinquefasciatus*
 - January 21 in East Baton Rouge Parish, LA
 - November 30 in Los Angeles County, CA

Top Five WNV-Positive Mosquito Species Reported, United States, 2005*

Species	#Positive pools	% of Total
<i>Cx. species</i>	3784	33%
<i>Cx. quinquefasciatus</i>	3139	27%
<i>Cx. tarsalis</i>	1605	14%
<i>Cx. pipiens</i>	1236	11%
<i>Cx. pipiens/restuans</i>	1041	9%

1999-2005: 60 WNV-positive mosquito *spp.* reported to CDC
1 newly reported in 2005: *Cs. incidens*

BIRDS

WNV Surveillance, United States, 2005*: Summary of Dead Bird Data

- 21,496 dead birds reported
- 8,653 tested (40%)
- 5,344 WNV-positive birds
 - 592 counties, 45 states
 - 4,355 (81%) corvids, 989 (19%) other *spp.*
- 1999-2005: 308 WNV-positive bird *spp.* reported to CDC**
 - 240 native species
 - 14 newly reported species in 2005

* Reported as of 2/14/2006

* Reported as of 11/8/2005

Top Five WNV-Positive Bird Species Reported, United States, 2005*

Species	# Positive Birds	% of Total
American Crow	2093	39%
Blue Jay	898	17%
Western Scrub Jay	835	16%
Yellow-billed Magpie	362	7%
House Sparrow	161	3%

*Reported as of 2/14/2006

VETERINARY

WNV-Infected Non-Human Mammals Reported, United States, 1999-2005*

Year	Equine	Squirrel	Canine	Other
1999-2001	821	1	0	9
2002	14,571	9	7	16
2003	5,145	20	37	49
2004	1,441	7	11	85
2005	1,139	6	7	10

* Reported as of 2/14/2006

Summary of Ecologic WNV Surveillance United States, 2005

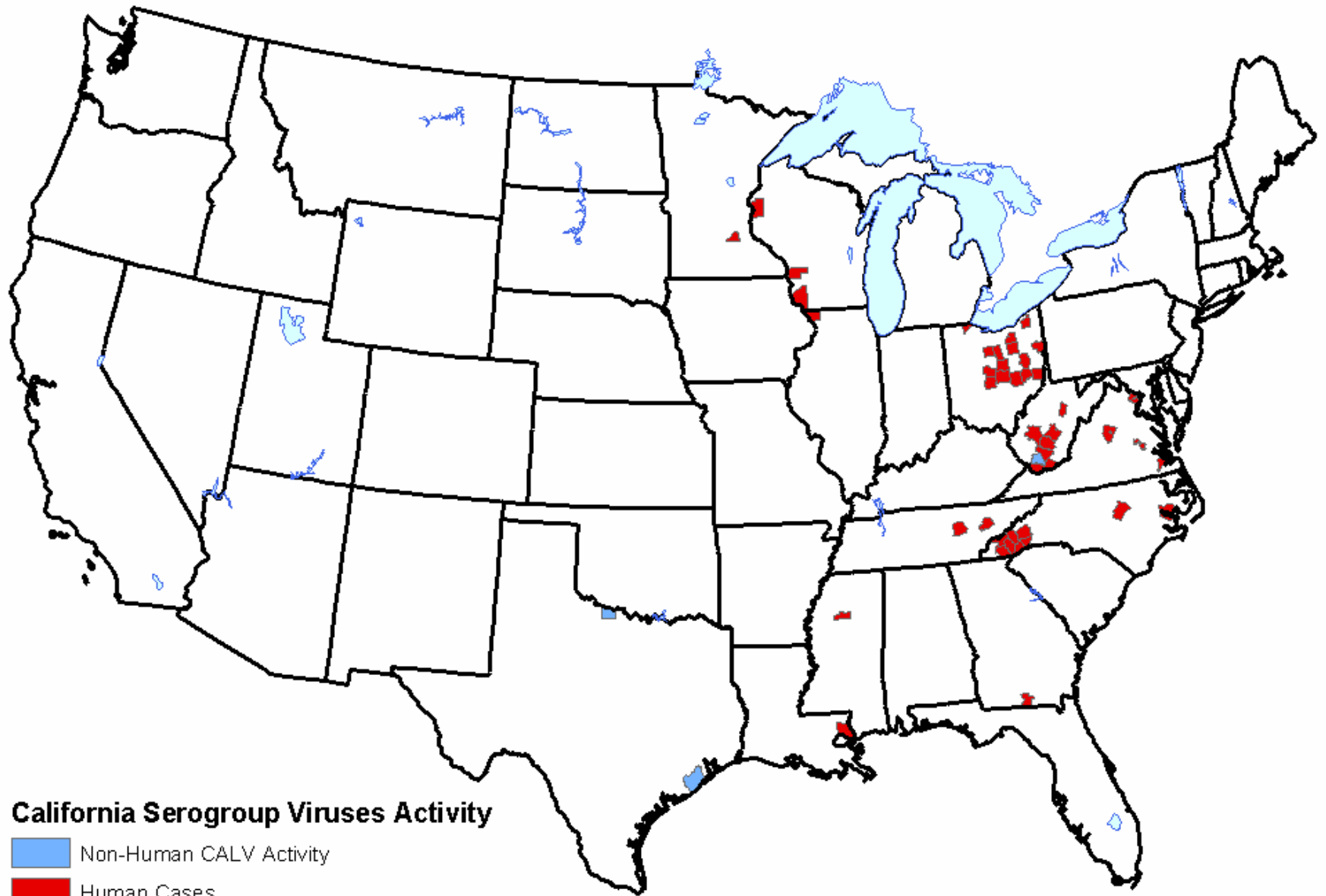
- 39 mosquito species: *Culex* most common
- *Cx. quinquefasciatus*: earliest and latest pool
- 5,344 birds: corvids most common
- 1,139 equines: most in Western U.S.

Other Domestic Arboviruses

Arboviruses Reported to ArboNET – Humans, United States, 2005*

Arbovirus**	# cases	# deaths	# states	median age
WNV	2949	116	42	59 (22-81)
CAL (LAC)	74	1	11	8 (1-81)
EEE	21	8	7	47 (0-81)
SLE	11	0	3	58 (22-81)
POW	1	0	1	83
DEN	61	0	11	35 (1-81)

* Reported as of 2/14/2006



California Serogroup Viruses Activity

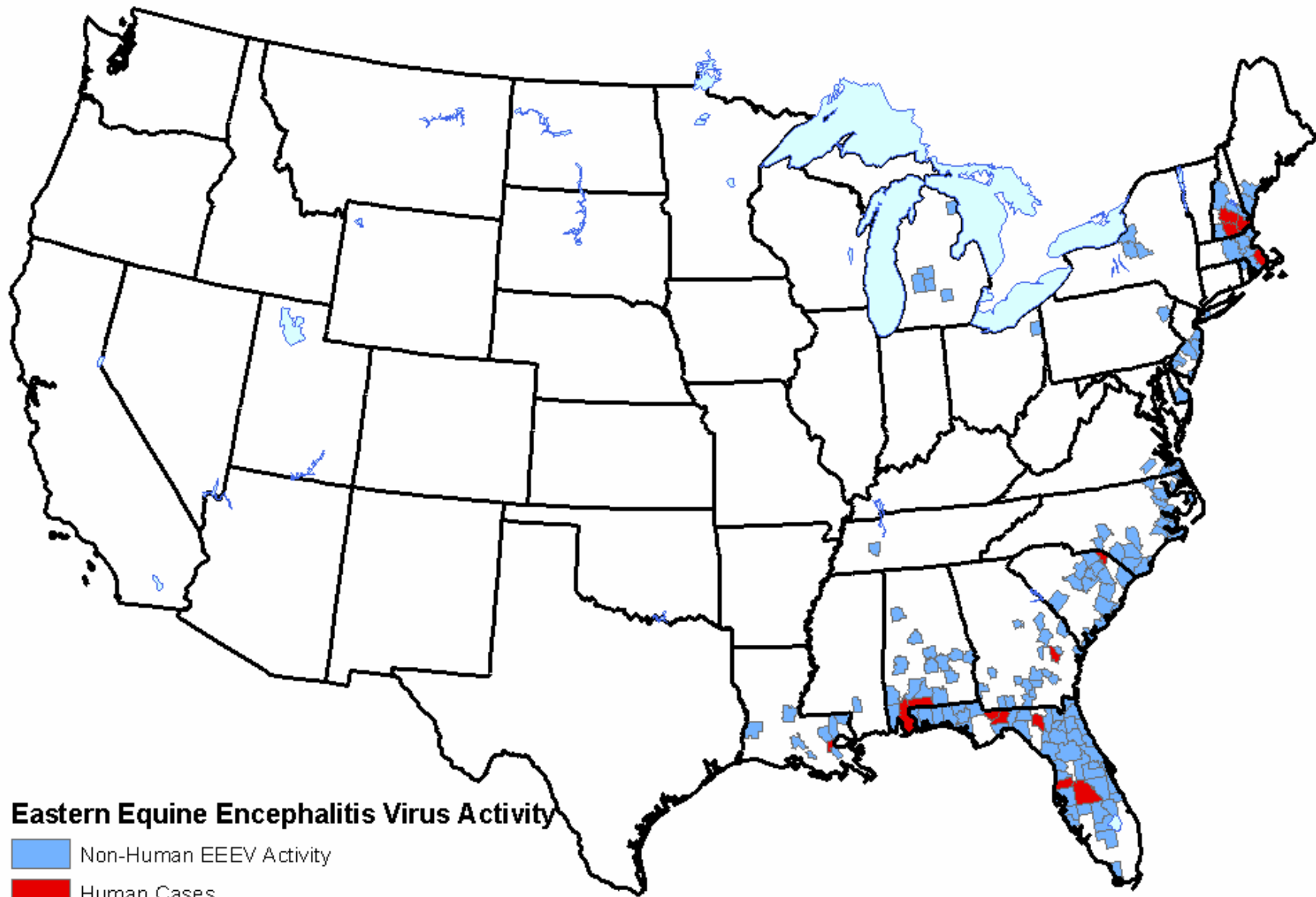
- Non-Human CALV Activity
- Human Cases

National Center for Infectious Diseases

California Serogroup Viruses Activity

Cumulative results for 2005 calendar year reported as of February 14, 2006





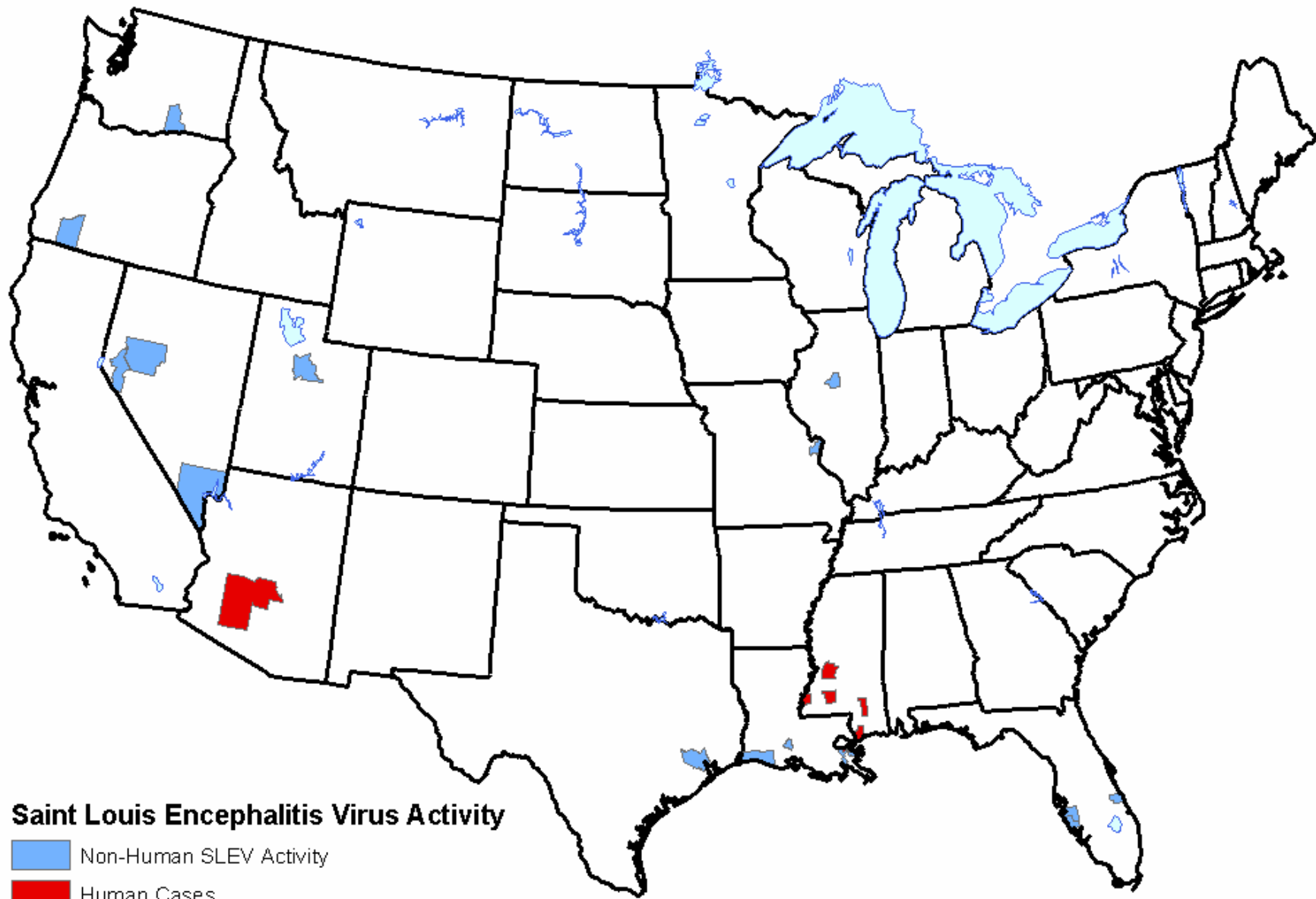
Eastern Equine Encephalitis Virus Activity

- Non-Human EEEV Activity
- Human Cases



National Center for Infectious Diseases

Eastern Equine Encephalitis Virus Activity
Cumulative results for 2005 calendar year reported as of February 14, 2006

CDC



Saint Louis Encephalitis Virus Activity

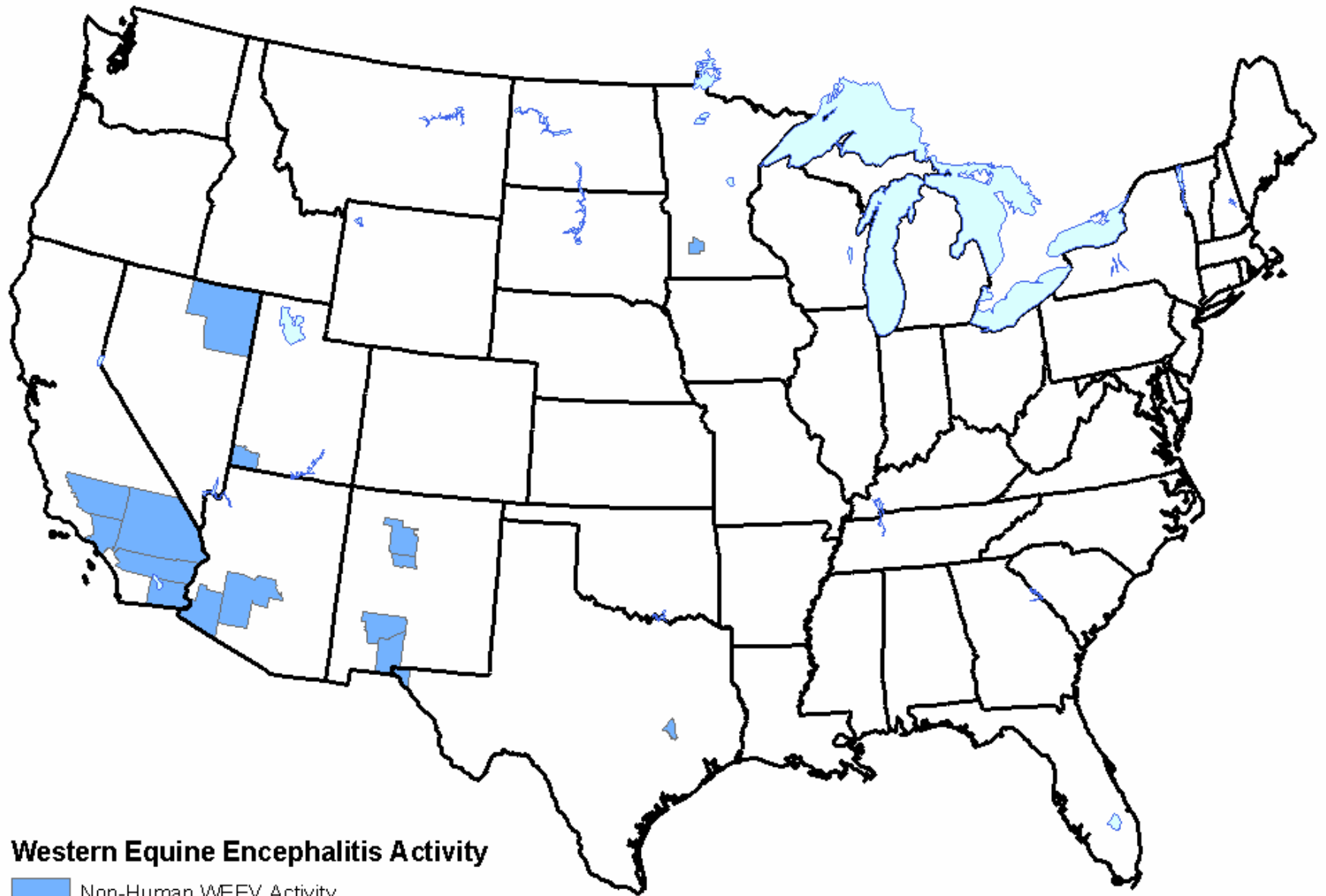
-  Non-Human SLEV Activity
-  Human Cases

National Center for Infectious Diseases

Saint Louis Encephalitis Virus Activity

Cumulative results for 2005 calendar year reported as of February 14, 2006

CDC



Western Equine Encephalitis Activity

■ Non-Human WEEV Activity

National Center for Infectious Diseases

Western Equine Encephalitis Virus Activity

Cumulative results for 2005 calendar year reported as of February 14, 2006



Summary of Other Domestic Arbovirus Surveillance, United States, 2005

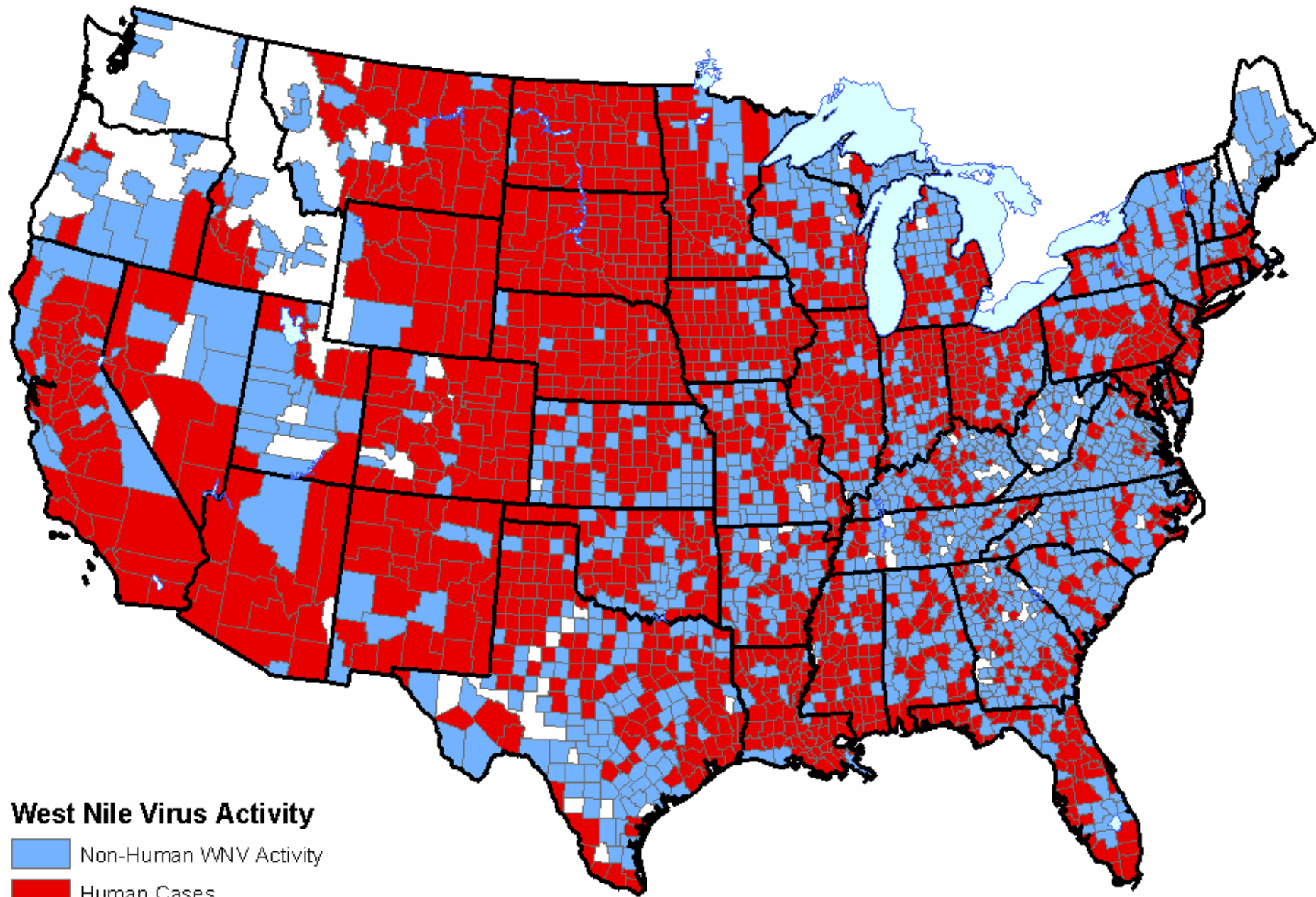
- LAC most common: cluster in NC
- EEE higher than average: human epidemic in NH
- SLE, POW: few cases
- DEN mostly imported, cluster in TX
- WEE: no human cases

SUMMARY

Human WNV Surveillance Totals, United States, 2005 and 1999-2005*

Category	2005	1999-2005
Human WNV cases	2,949	19,655
WNND	1,288	8,390
Deaths	116	782
States reporting	42†	46†

* Reported as of 2/14/2006 † Plus DC



National Center for Infectious Diseases

West Nile Virus Activity 1999-2005

Cumulative results for 1999-2005 calendar year reported as of February 14, 2006

CDC

2005 National WNV Surveillance Summary

- **WNV activity: high in West, persisted in East**
- **Highest incidence of WNND: West, Central**
- **Dates of onset for WNV disease span the year**
- **No cases of transfusion-associated transmission**
- **3 cases of transplant-associated transmission**
- **Hurricanes did not appear to affect human WNV**
- ***Cx. quinquefasciatus*: earliest and latest**
- **Corvids most common dead bird reported**

Acknowledgements

- Jennifer Brown
- Grant Campbell
- Margaret Collins
- Nicholas Crall
- Lora Davis
- Eileen Farnon
- Marc Fischer
- Edward Hayes
- Alison Hinckley
- John Jones
- Krista Kniss
- Nicholas Komar
- Stephanie Kuhn
- Jennifer Lehman
- Daniel O'Leary
- Janet McAllister
- Roger Nasci
- Lyle Petersen
- John Roehrig
- Harry Savage
- James Sejvar
- Theresa Smith
- All reporting states, jurisdictions, and local health departments

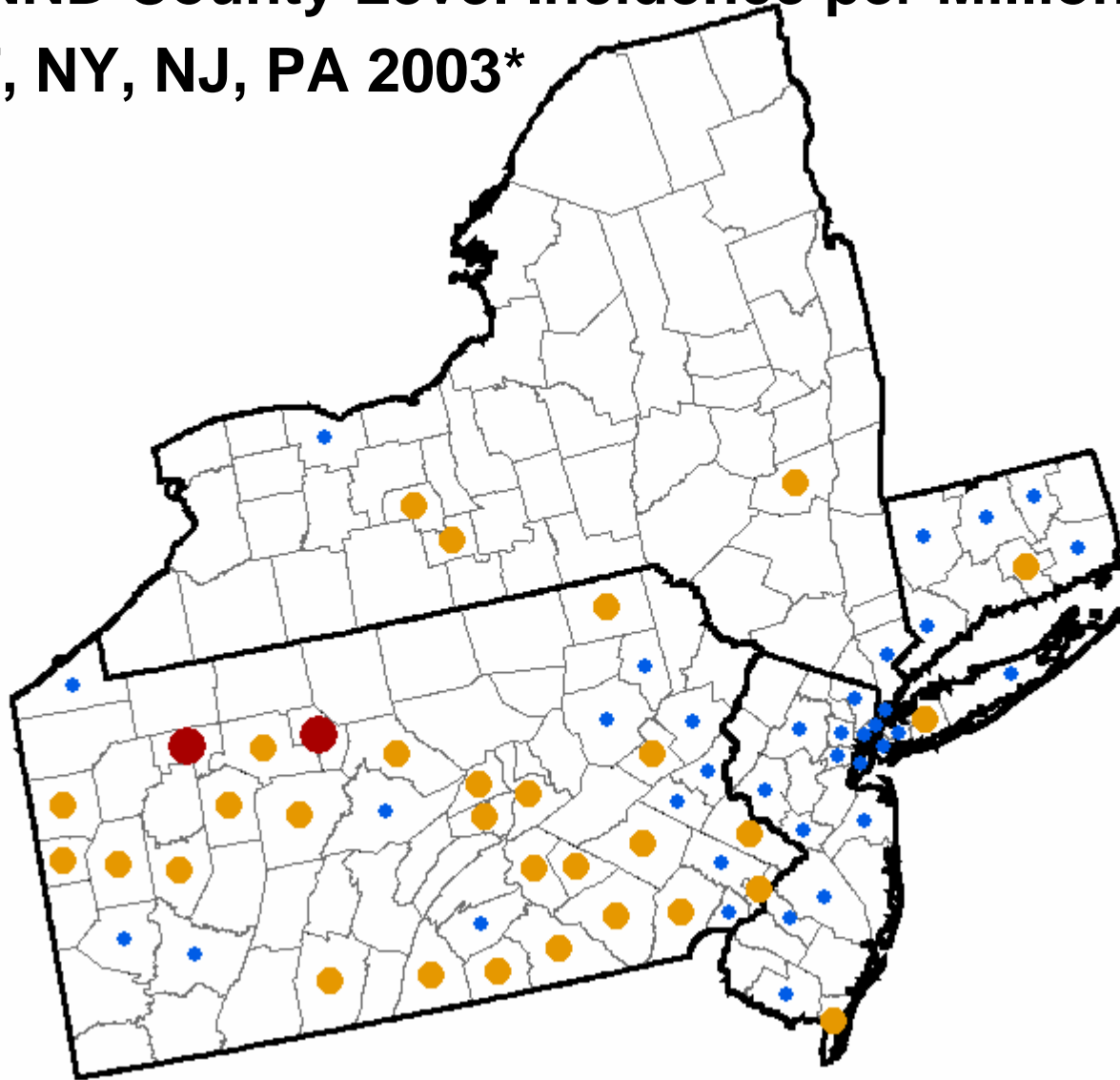




Photo: Meggan Gould

EXTRA SLIDES

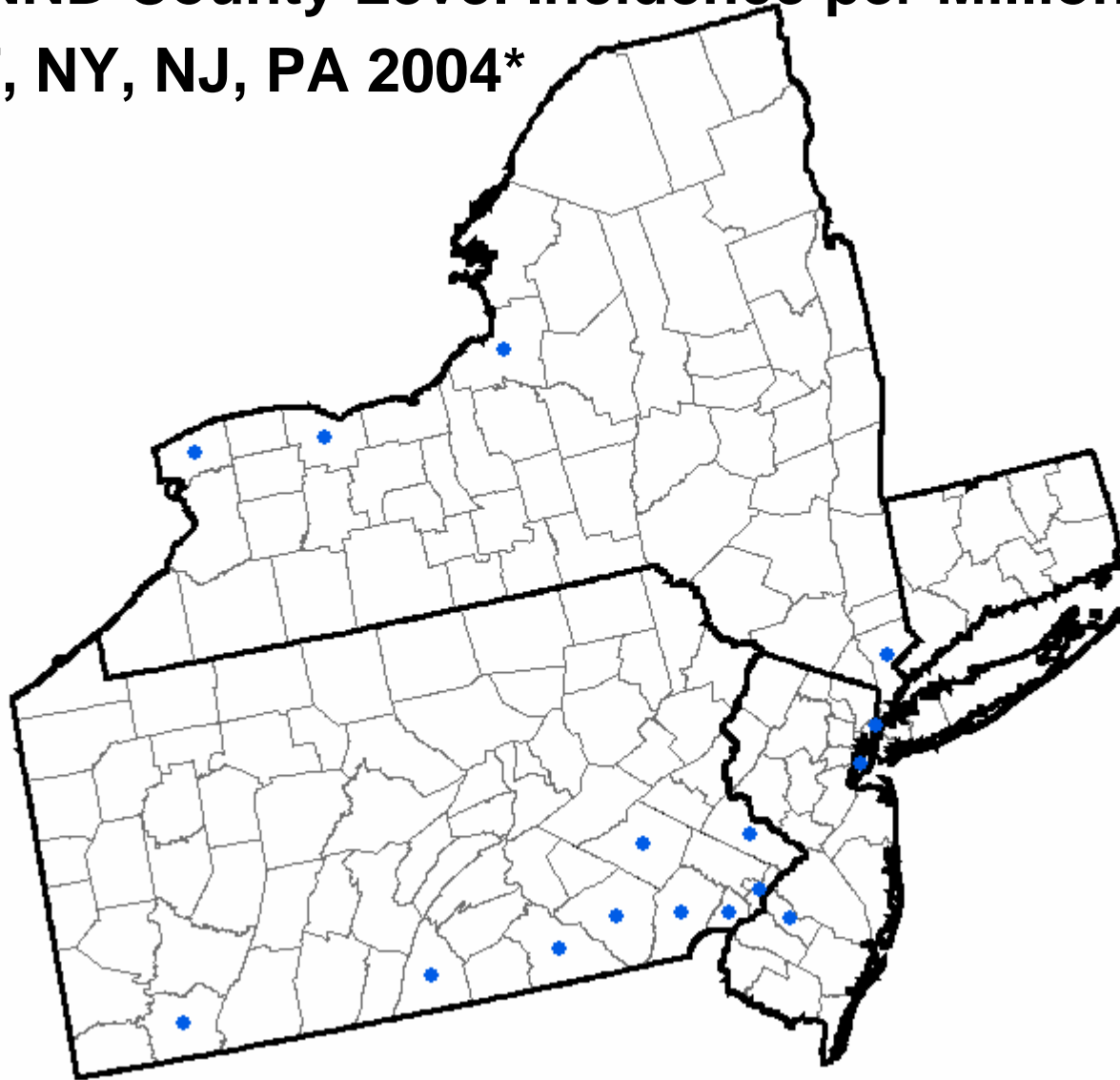
WNND County Level Incidence per Million, CT, NY, NJ, PA 2003*



Incidence per million



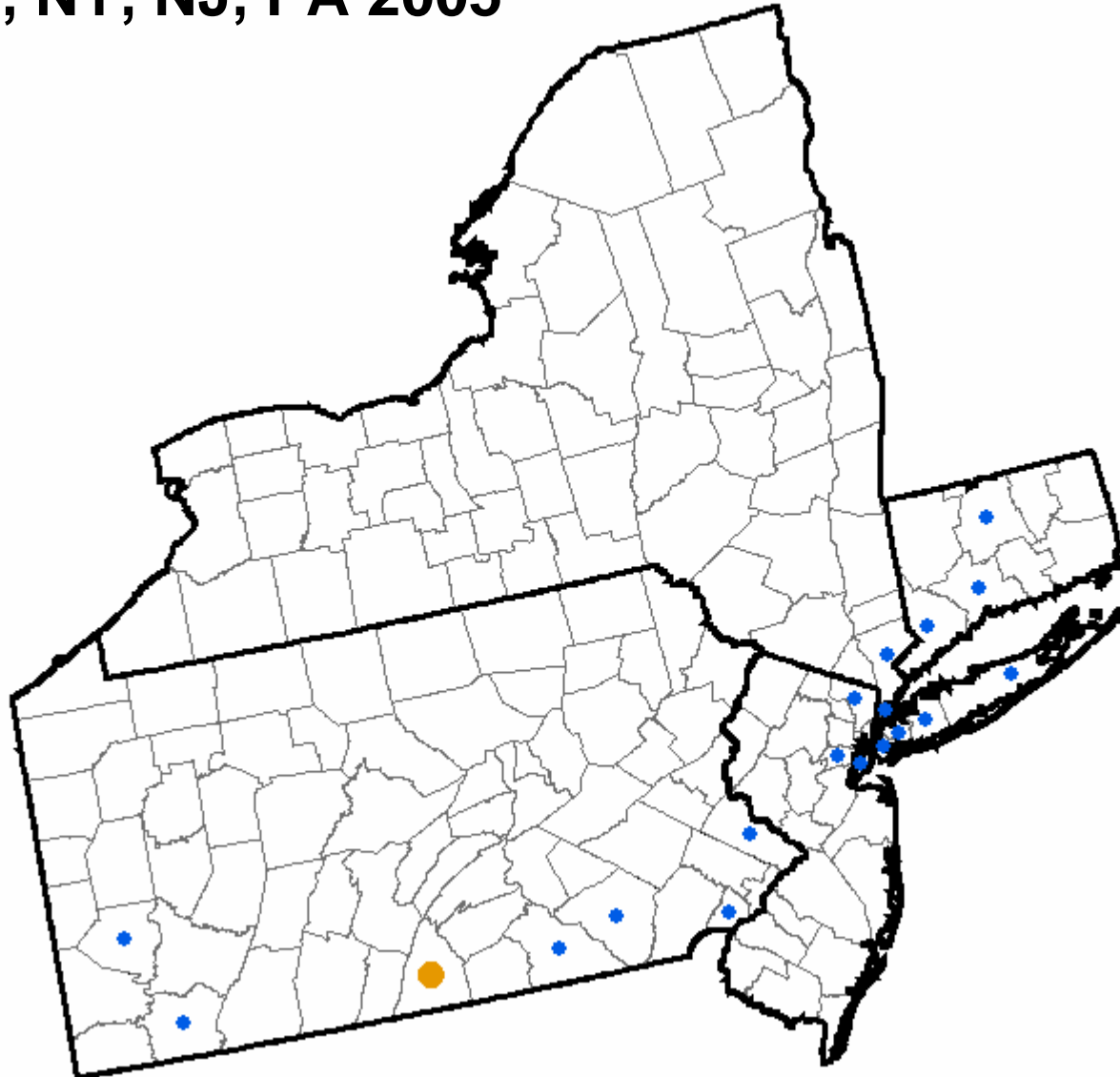
WNND County Level Incidence per Million, CT, NY, NJ, PA 2004*



Incidence per million



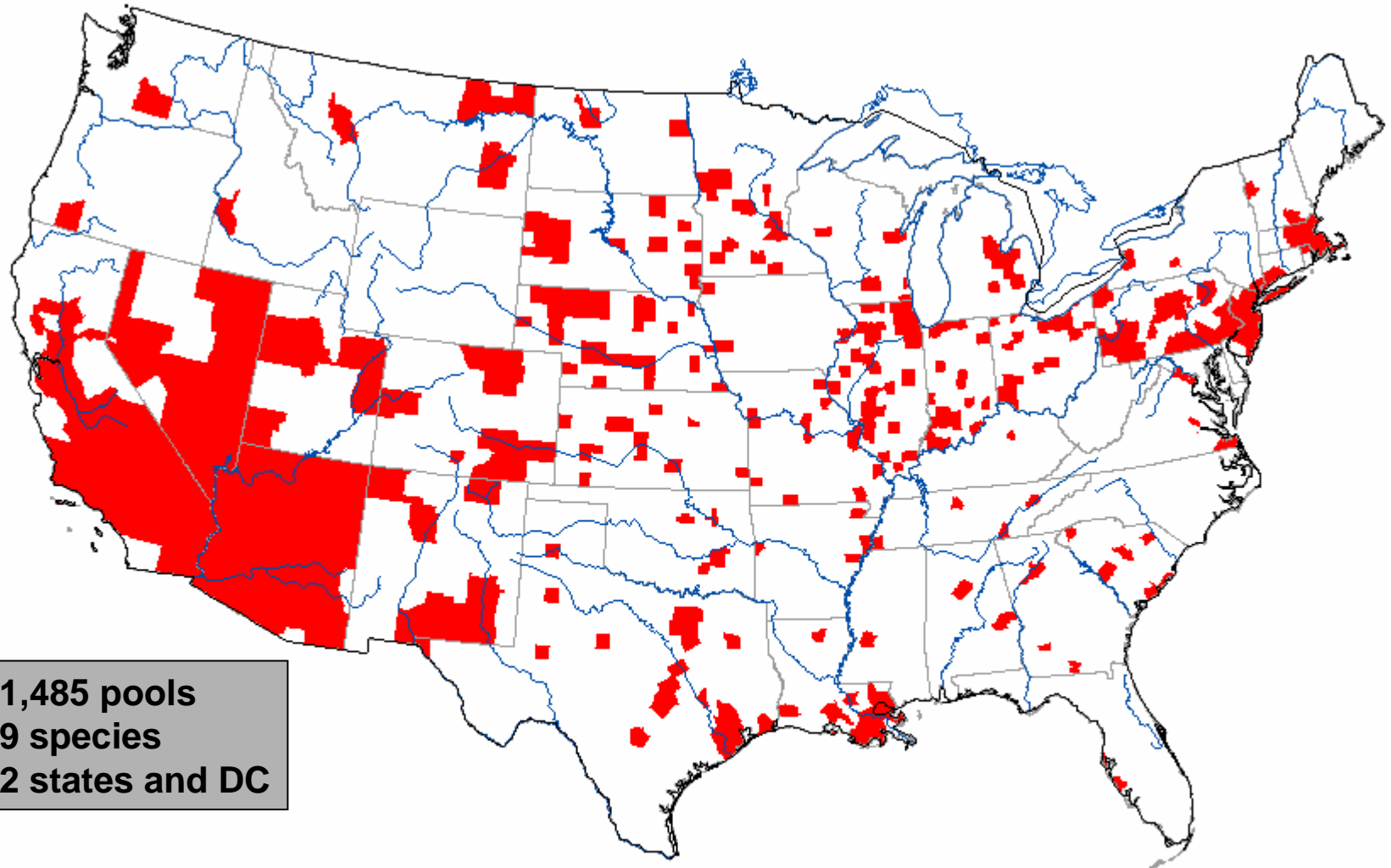
WNND County Level Incidence per Million, CT, NY, NJ, PA 2005*



Incidence per million



U.S. Counties Reporting WNV-Positive Mosquitoes, 2005



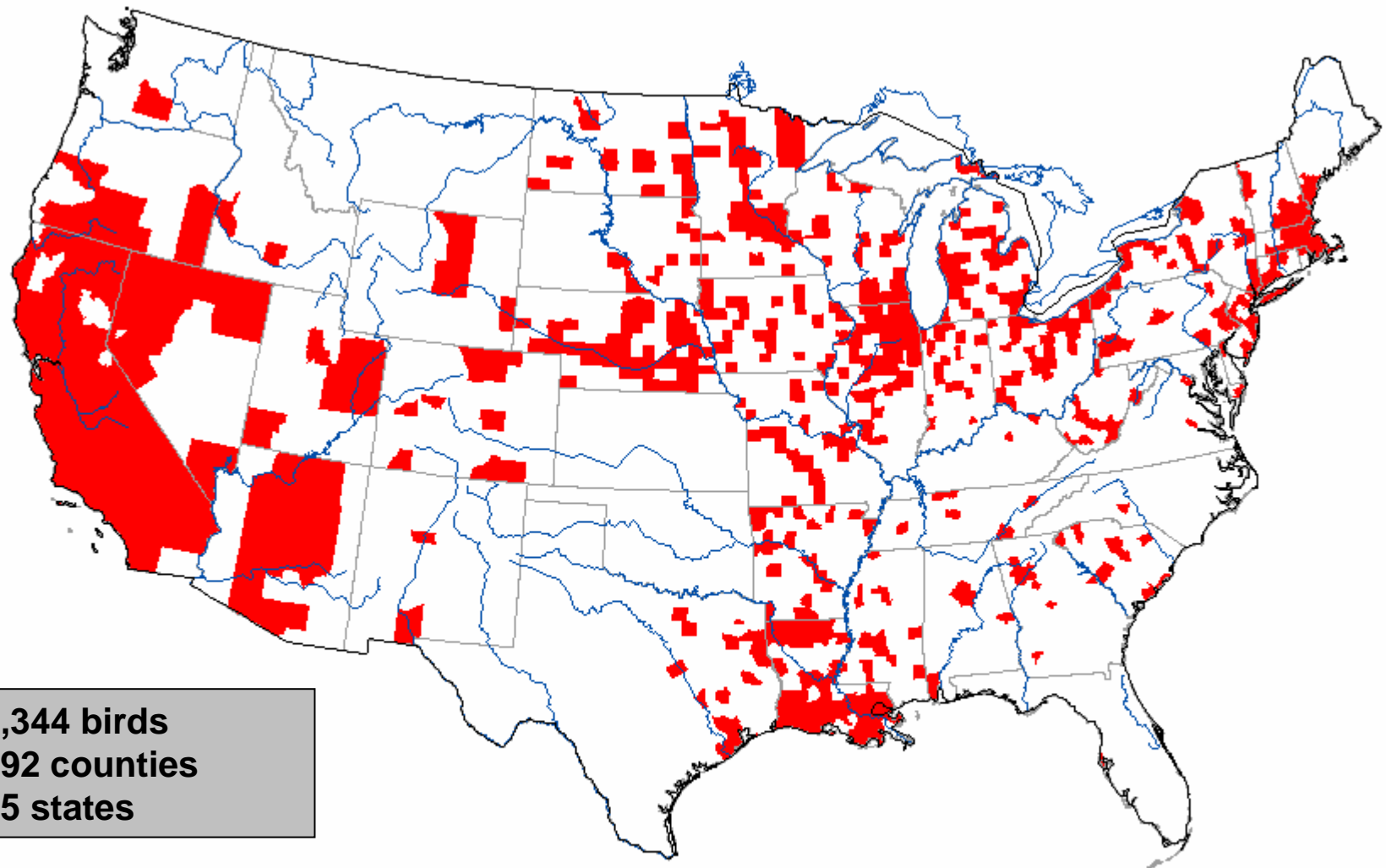
11,485 pools
39 species
42 states and DC

Through MMWR week 52 (ending 12/31/2005) - 411 counties
Reported through ArboNET as of 2/14/2006

CDC/NCID/DV/BD

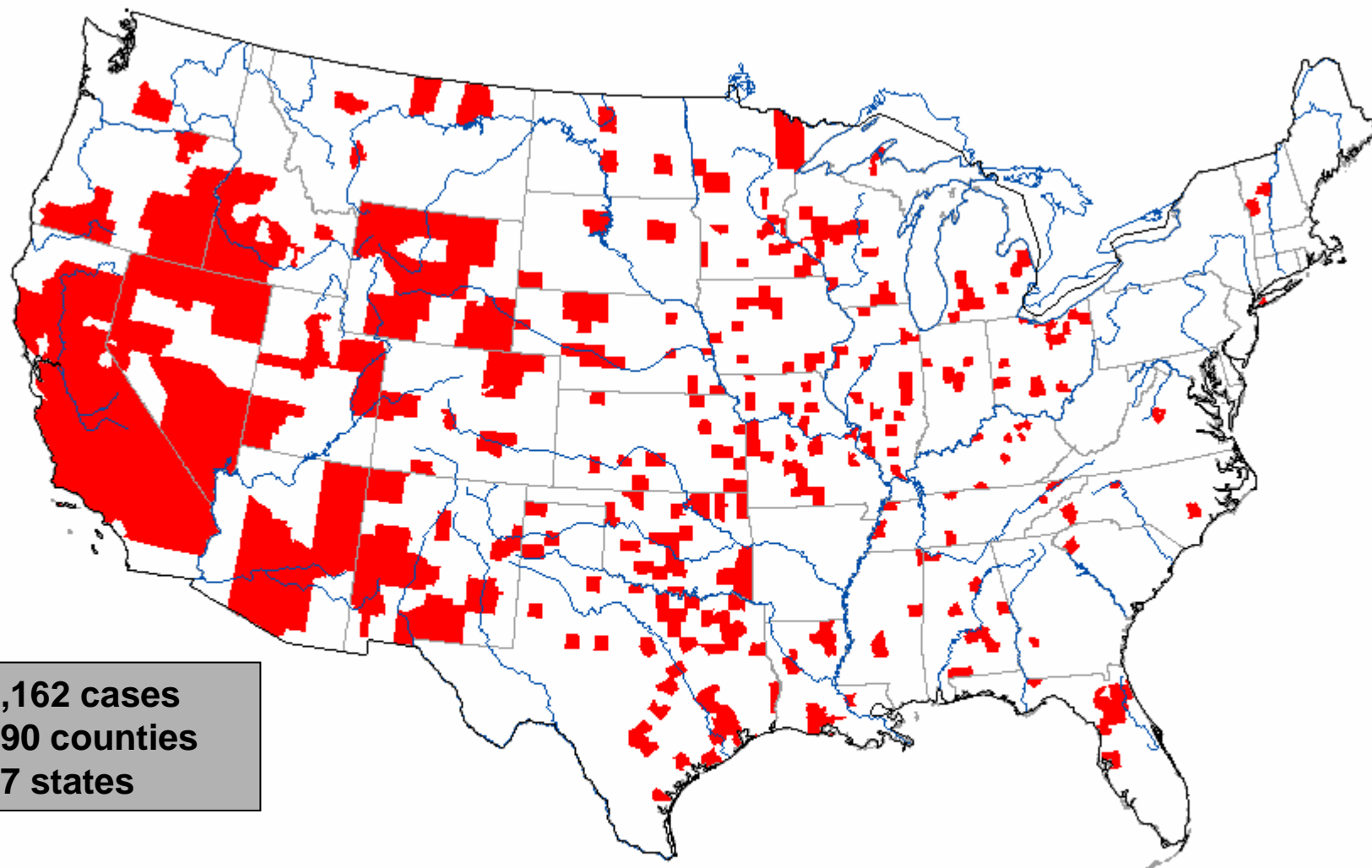
CDC

U.S. Counties Reporting WNV-Positive Dead Birds, 2005



Through MMWR week 52 (ending 12/31/2005) - 592 counties
Reported through ArboNET as of 2/14/2006

U.S. Counties Reporting Equine WNV Disease Cases, 2005



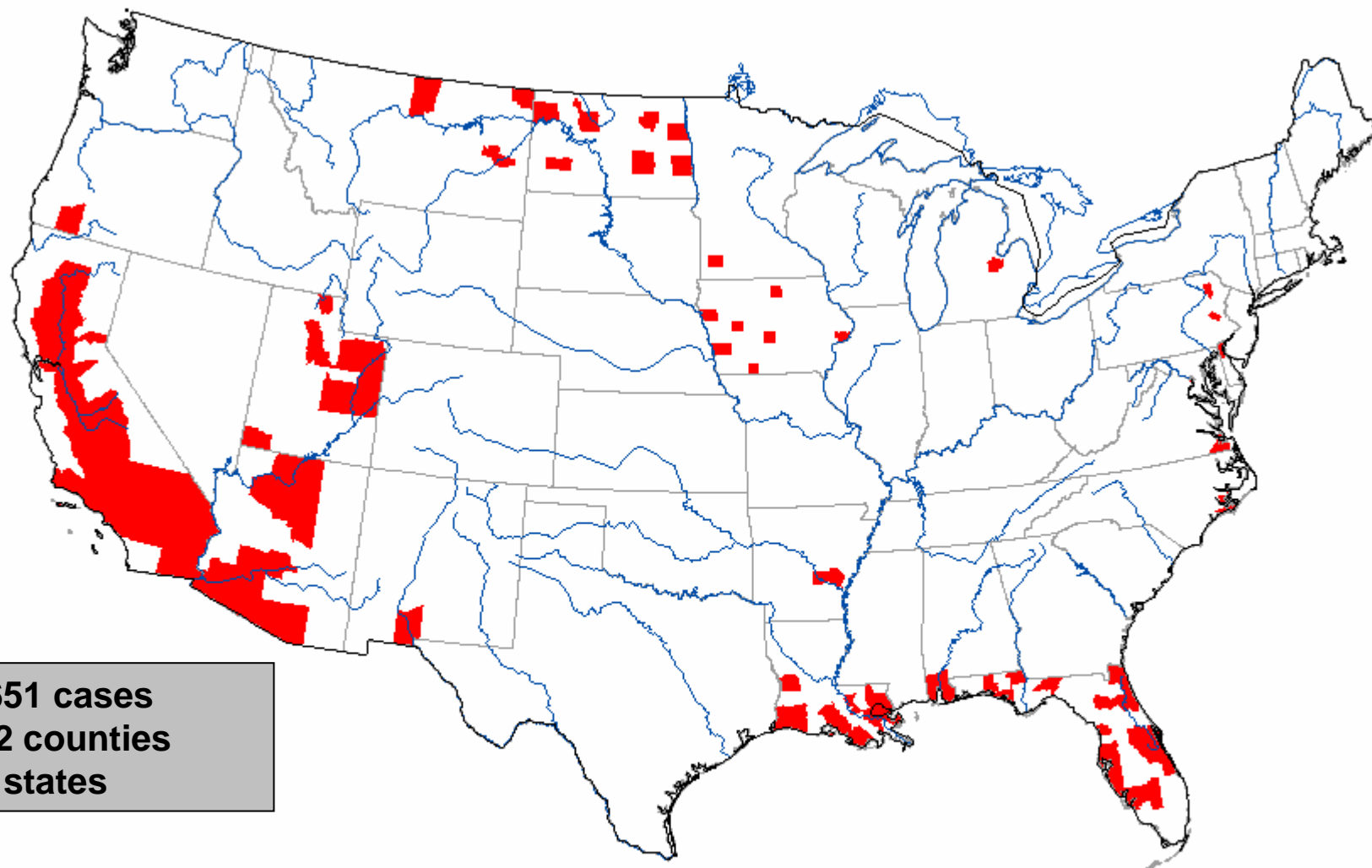
1,162 cases
390 counties
37 states

Through MMWR week 52 (ending 12/31/2005) - 390 counties
Reported through ArboNET as of 2/14/2006

CDC/NCID/DV/ID

CDC

U.S. Counties Reporting WNV-Positive Sentinels, 2005



1,651 cases
512 counties
18 states

Through MMWR week 52 (ending 12/31/2005) - 512 counties
Reported through ArboNET as of 2/14/2006

CDC/NCID/DV/ID

CDC

WNV-Positive Mosquito Species Reported, United States, 1999-2005*

<i>Culex</i>	<i>Aedes</i>	<i>Ochlerotatus</i>		<i>Anopheles</i>	Other
<i>coronator</i>	<i>aegypti</i>	<i>atlanticus</i>	<i>nigromaculis</i>	<i>atropos</i>	<i>Cs. incidens</i>
<i>erraticus</i>	<i>albopictus</i>	<i>atropalpus</i>	<i>provocans</i>	<i>barberi</i>	<i>Cs. impatiens</i>
<i>erythrothorax</i>	<i>cinereus</i>	<i>canadensis</i>	<i>sollicitans</i>	<i>crucians</i>	<i>Cs. inornata</i>
<i>nigripalpus</i>	<i>vexans</i>	<i>cantor</i>	<i>squamiger</i>	<i>franciscanus</i>	<i>Cs. melanura</i>
<i>pipiens</i>		<i>dorsalis</i>	<i>sticticus</i>	<i>freeborni</i>	<i>Cs. morsitans</i>
<i>quinq.</i>		<i>dupreei</i>	<i>stimulans</i>	<i>hermsi</i>	<i>Cq. perturbans</i>
<i>restuans</i>		<i>fitchii</i>	<i>taeniorhyechus</i>	<i>puncitpennis</i>	<i>Deinocerites cancer</i>
<i>salinarius</i>		<i>fulvus pallens</i>	<i>triseriatus</i>	<i>quadramac.</i>	<i>Mansonia titillans</i>
<i>stigmatosoma</i>		<i>grossbecki</i>	<i>trivittatus</i>	<i>walkeri</i>	<i>Orthopodomyia signifera</i>
<i>tarsalis</i>		<i>infirmatus</i>			<i>Ps. ciliata</i>
<i>territans</i>		<i>japonicus</i>			<i>Ps. columbiae</i>
<i>thriambus</i>		<i>melanimon</i>			<i>Ps. ferox</i>
					<i>Ps. howardii</i>

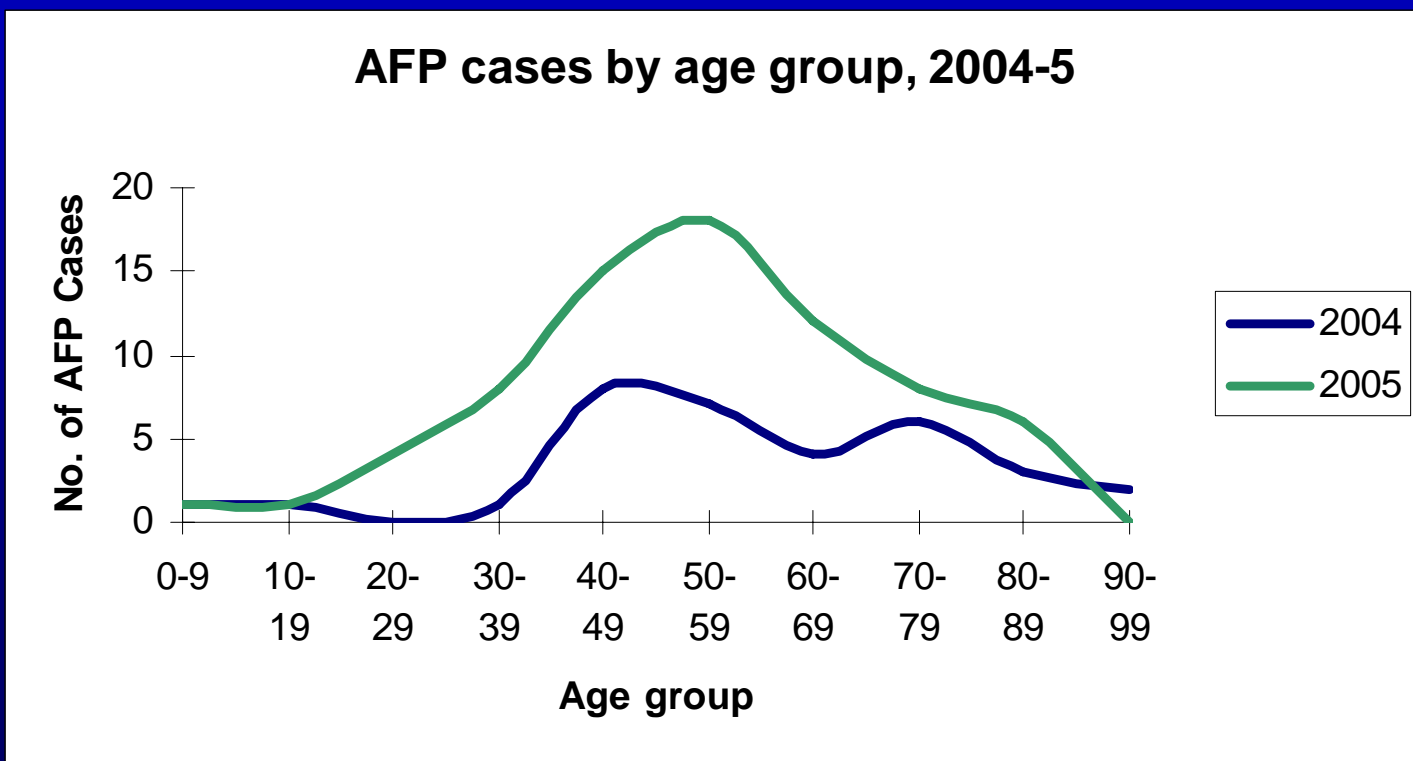
* Reported as of 2/14/2006– 60 species

WNV-Infected Non-Human Mammals Reported, United States, 1999-2005*

Species	# Infected 1999-2001	# Infected 2002	# Infected 2003	# Infected 2004	# Infected 2005
Equine	821	14,571	5,145	1,460	1,139
Squirrel	1	9	20	7	6
Canine	0	7	37	11	7
Cat	1	1	1	0	0
Sheep	0	1	0	0	0
Domestic rabbit	1	0	0	0	0
Eastern Chipmunk	1	0	0	0	0
Striped Skunk	1	0	0	0	0
Bat	2	0	0	1	0
Raccoon	0	0	0	39	0
Other	3	14	48	15	10

* Reported as of 2/14/2006

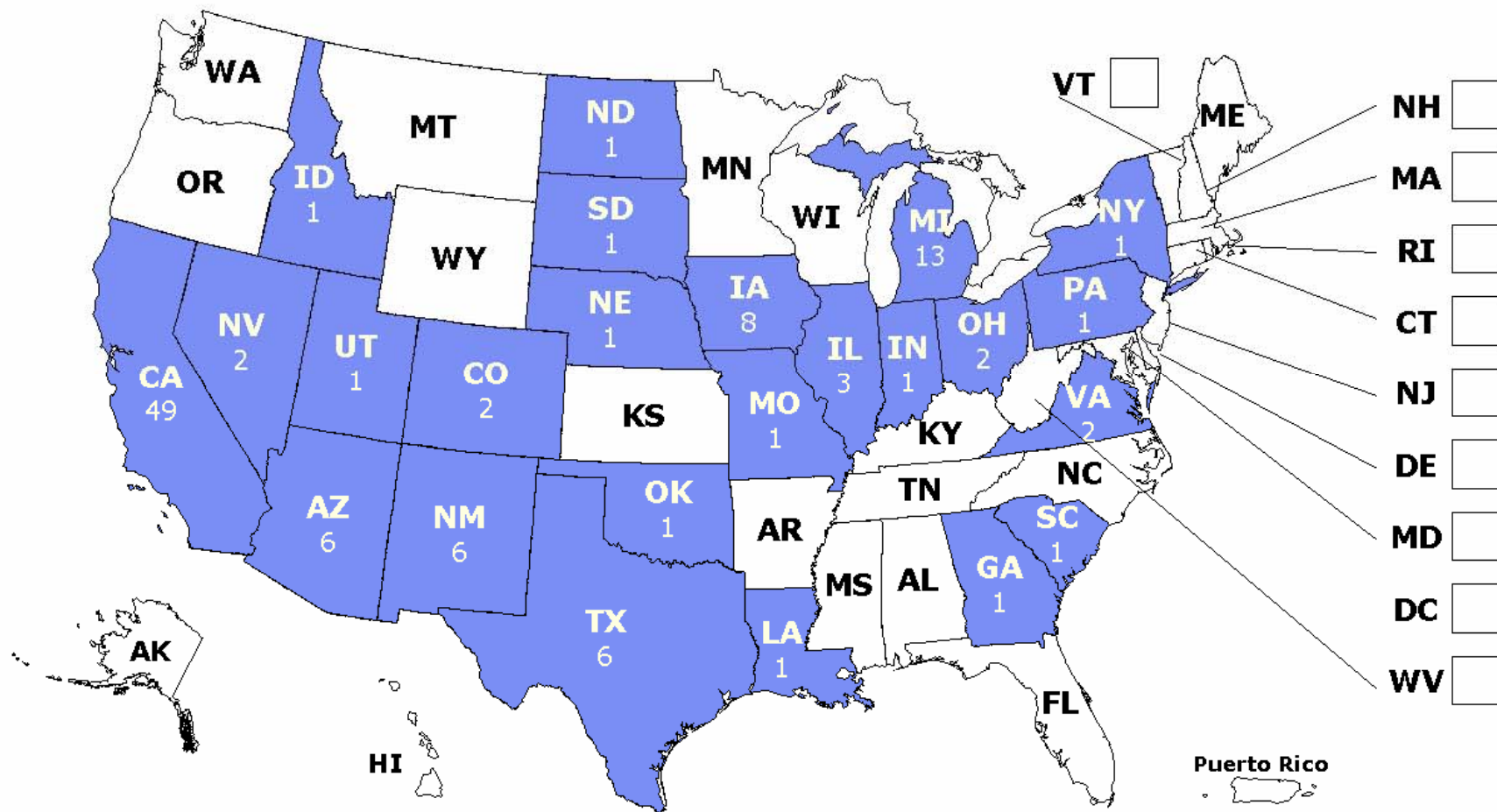
AFP Cases by Age Group, 2004-5



Location of AFP cases, 2004-5*



Acute Flaccid Paralysis Cases



*Reported as of 2/14/2006

