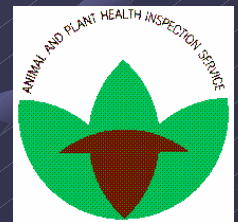


# **Equine West Nile Encephalitis: The 2002 U.S. Epizootic**

**Eileen N. Ostlund, DVM, PhD  
USDA / APHIS/ VS  
National Veterinary Services  
Laboratories**



# Acknowledgments

Data on equine cases of West Nile virus (WNV) infection were acquired through the efforts of private veterinary practitioners, clinicians, field investigators, laboratory diagnosticians, animal health and public health officials in all the States where suspect equine cases have been investigated to date.

# Topics

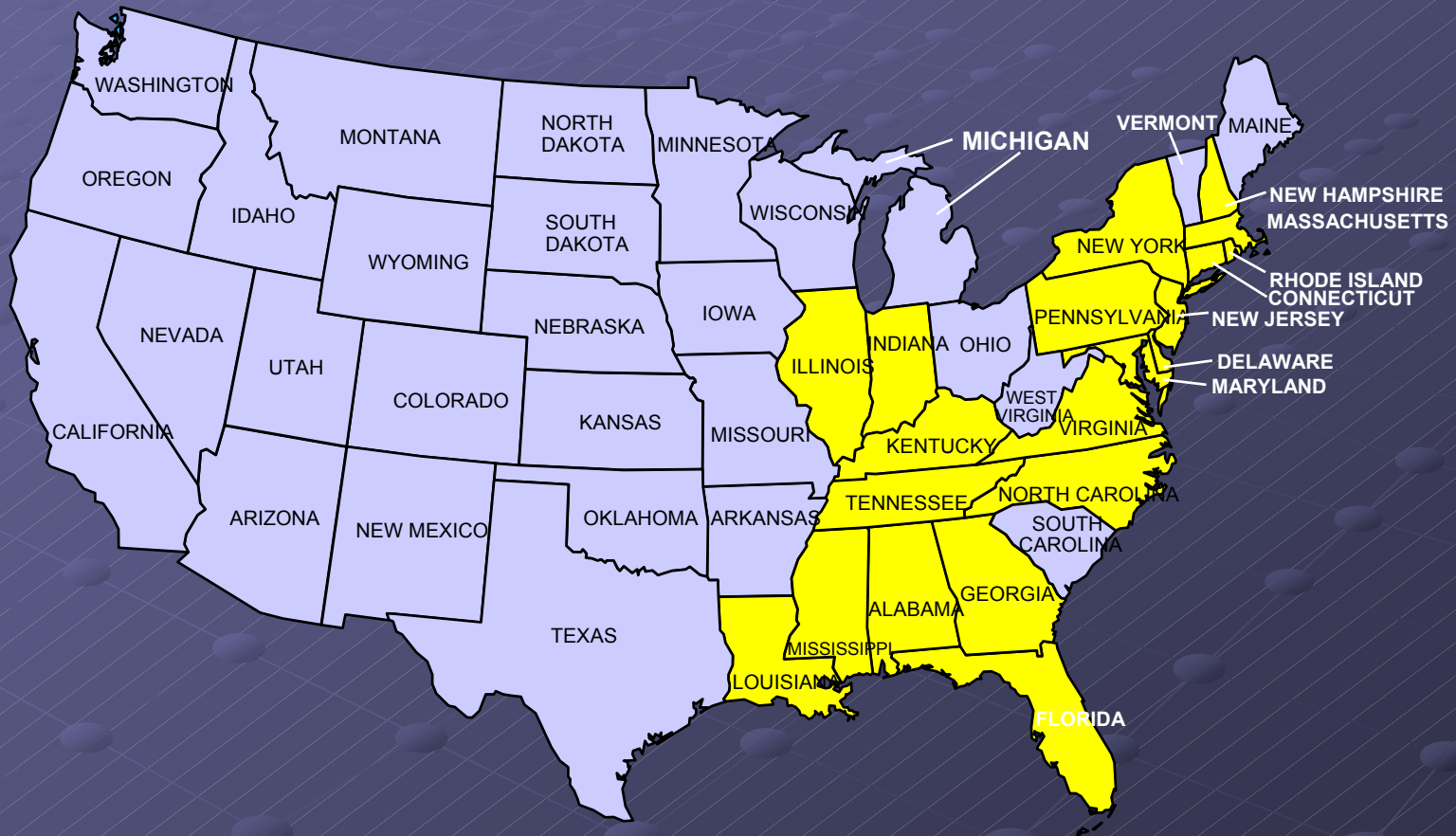
- **2002 equine epizootic**
- **WNV laboratory tests veterinary species**
- **Update equine vaccine issues**
- **Predictions for 2003**

# ***West Nile encephalitis 2002 equine epizootic***



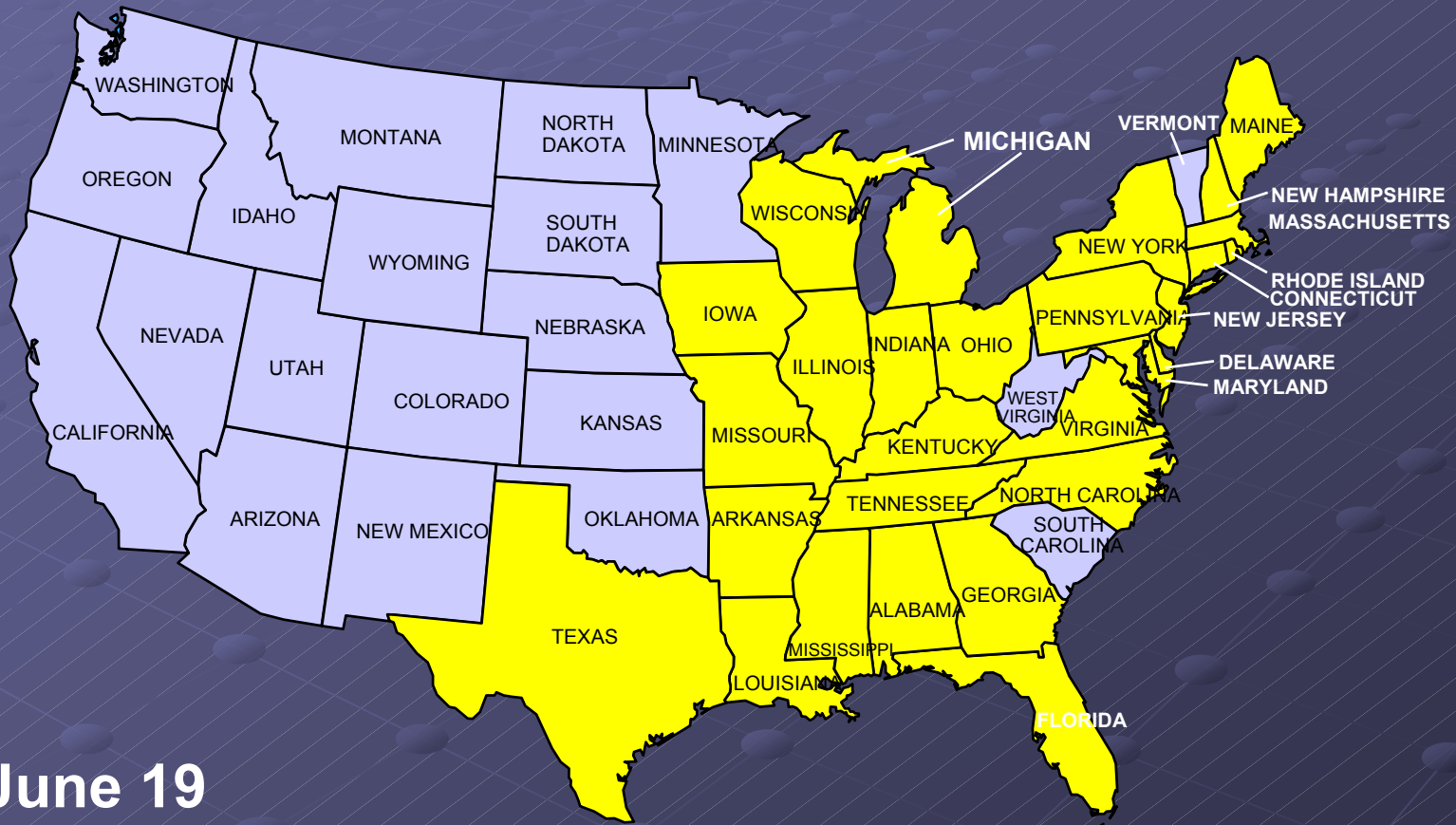


# West Nile Virus 2001 – equine





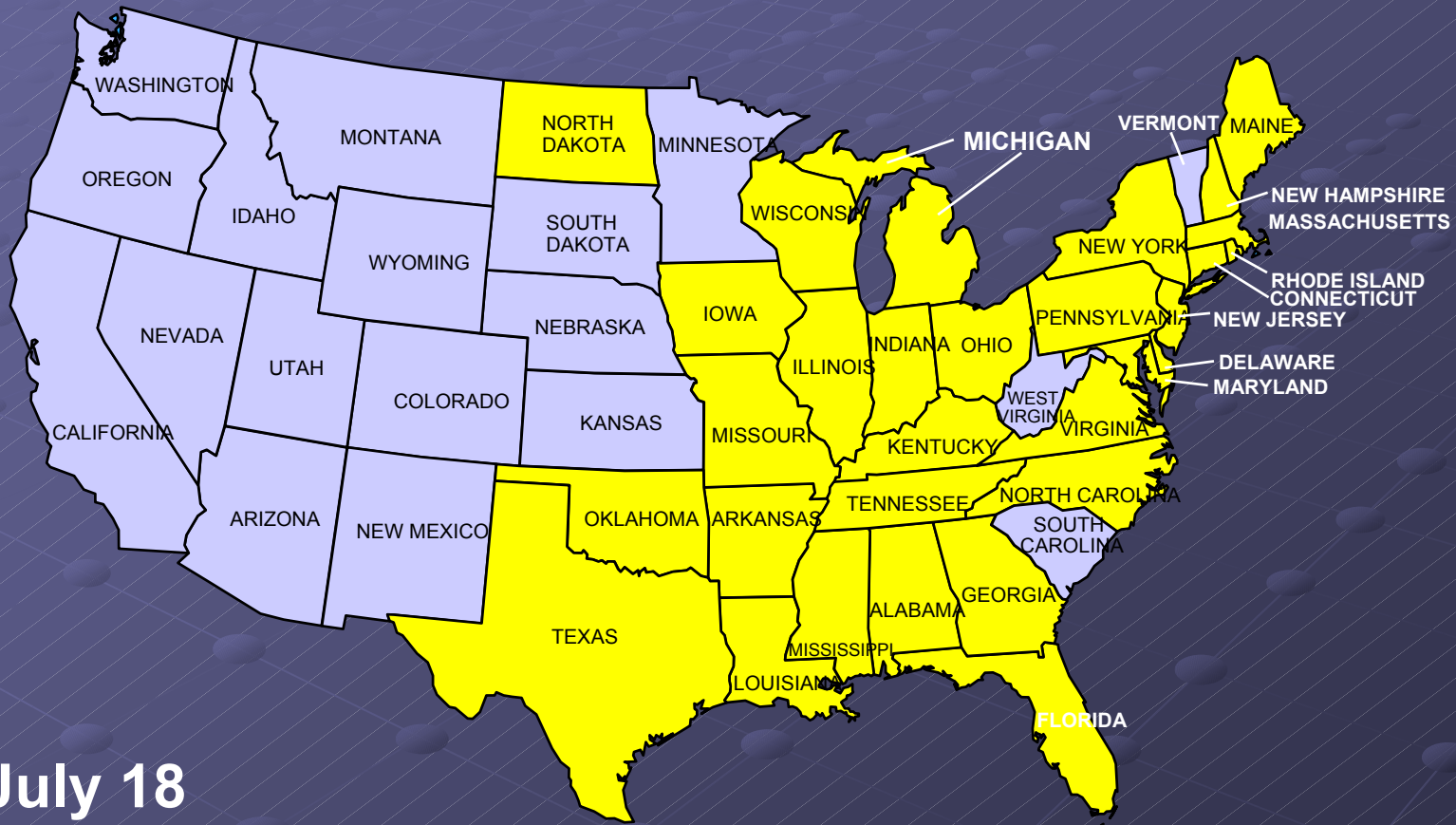
# West Nile Virus Emergency Management Warnings 2002



June 19



# West Nile Virus Emergency Management Warnings 2002



July 18



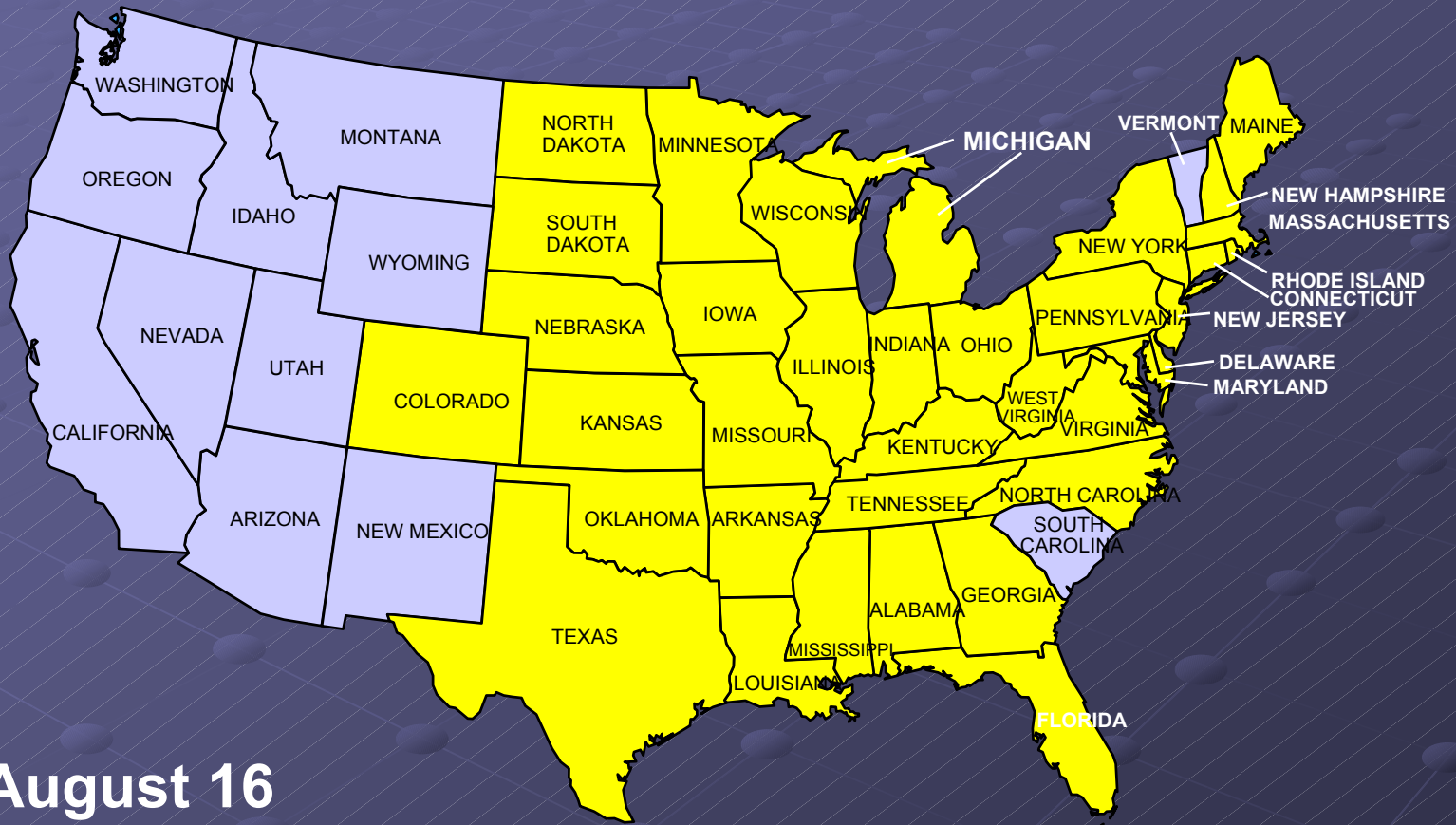




# West Nile Virus Emergency Management Warnings 2002



# West Nile Virus Emergency Management Warnings 2002



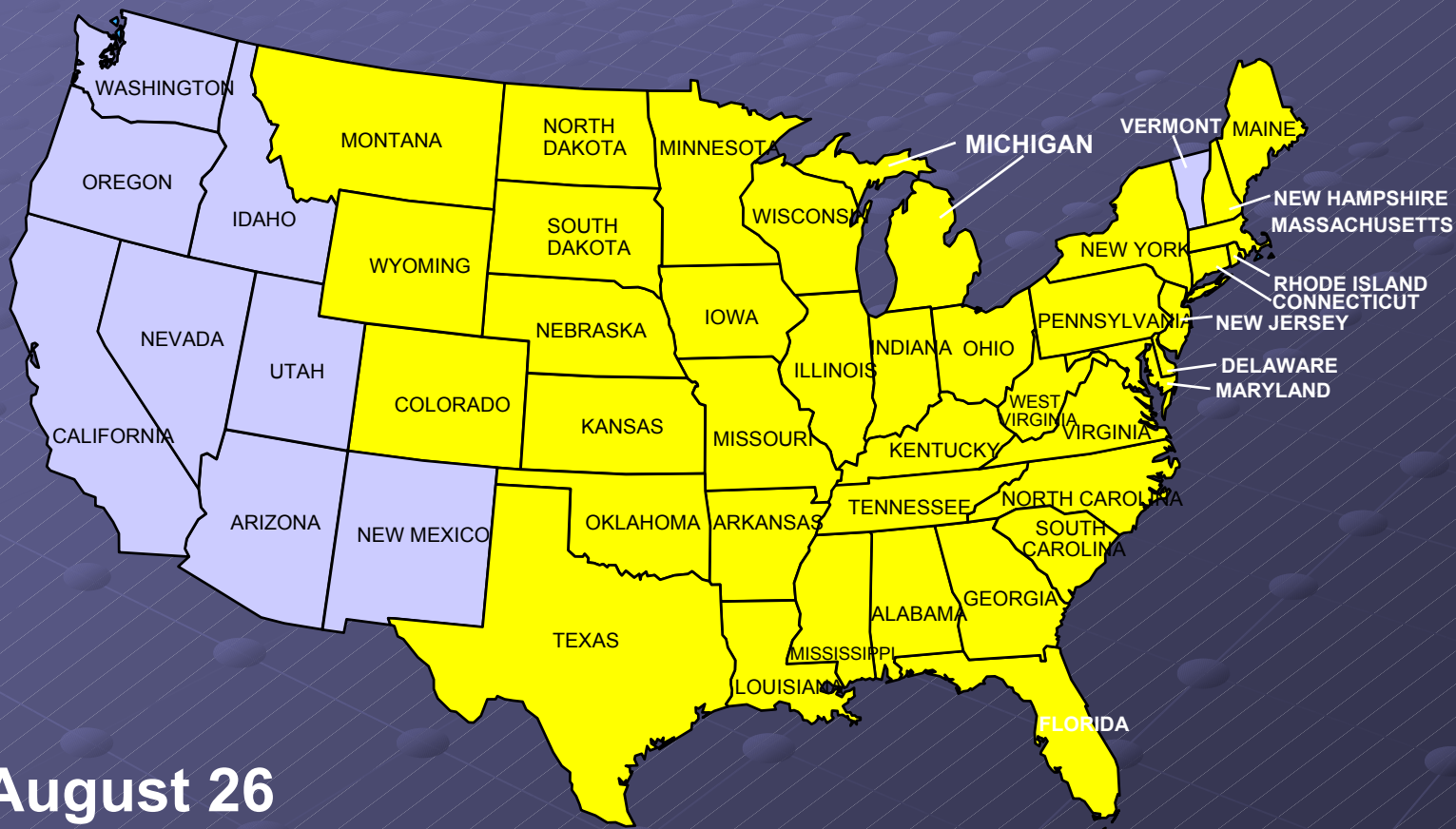
# West Nile Virus Emergency Management Warnings 2002







# West Nile Virus Emergency Management Warnings 2002

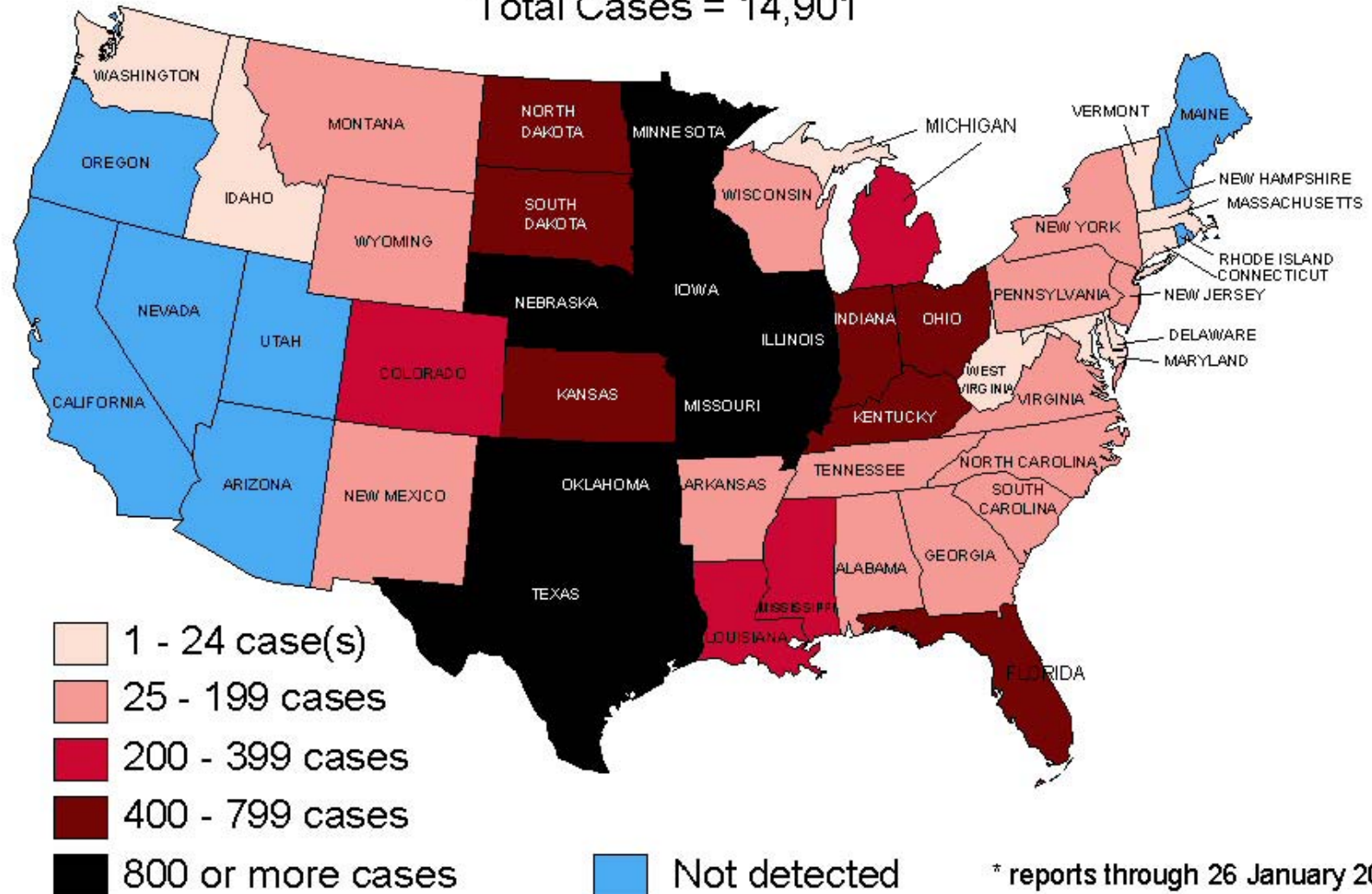


August 26

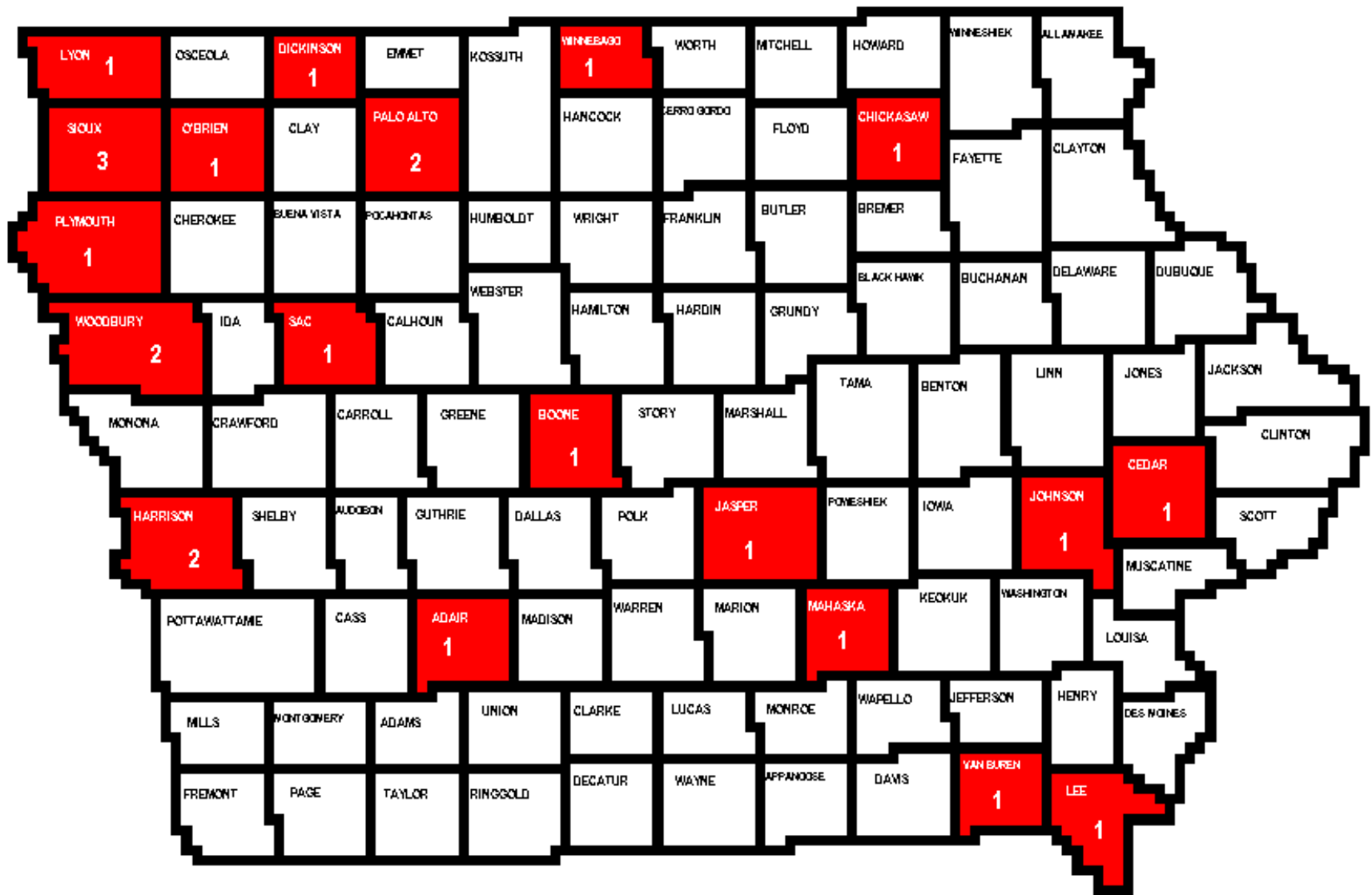
# West Nile Virus in 2002\*

## States with an Equine Case(s)

Total Cases = 14,901



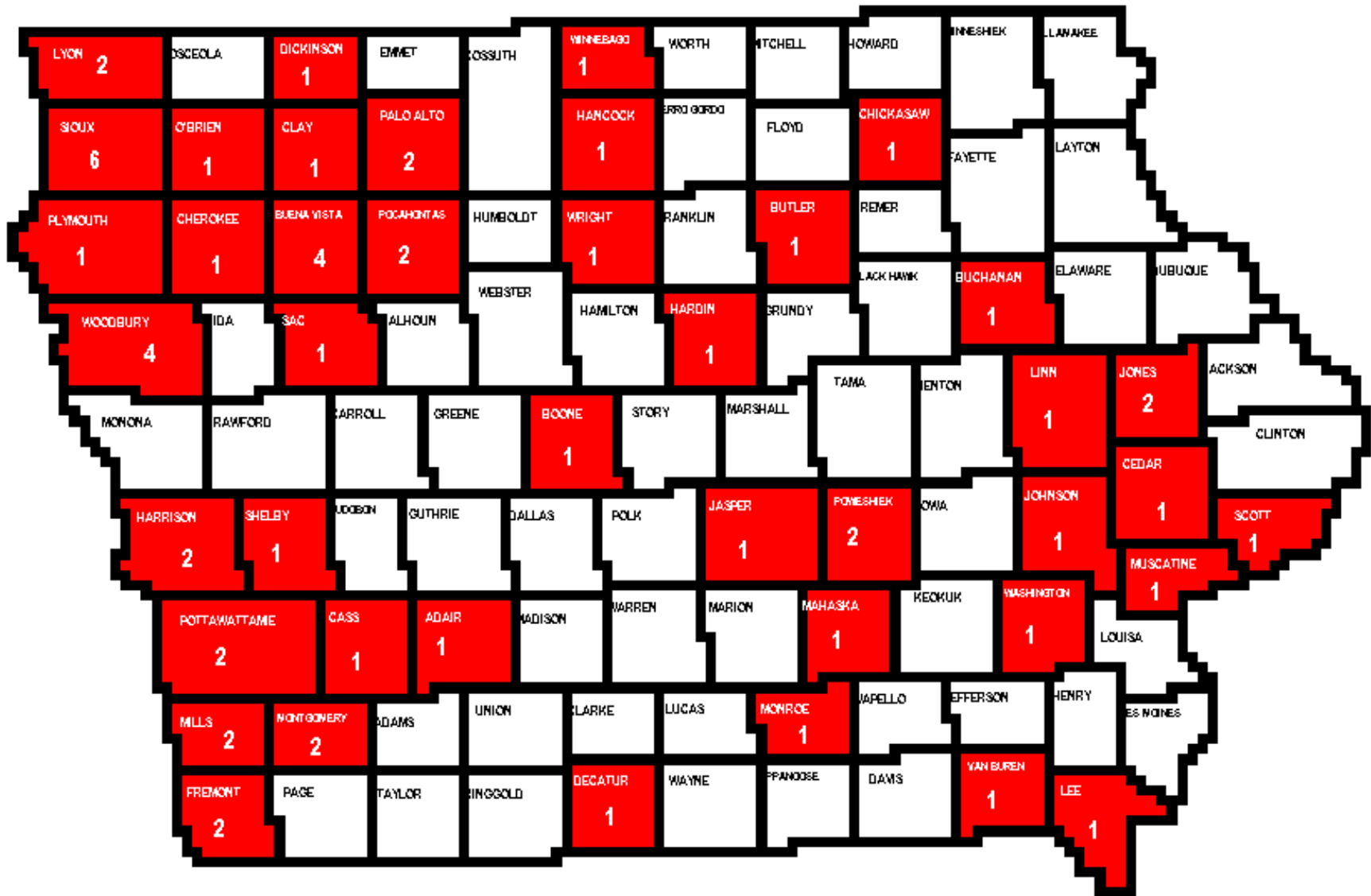
## West Nile Virus - Equine Surveillance



August 23

Positive Horse(s) for WNV

# West Nile Virus - Equine Surveillance



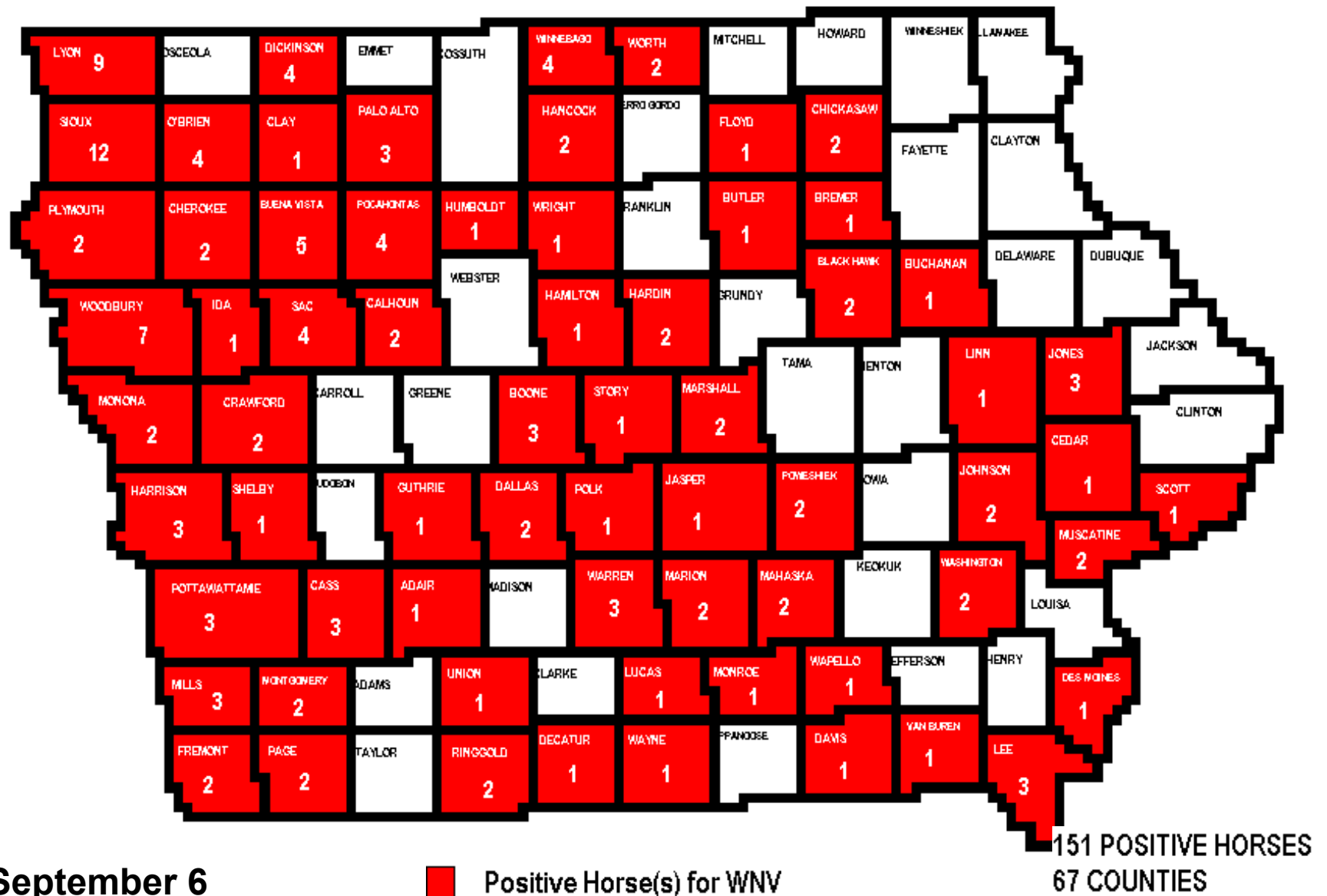
August 30

■ Positive Horse(s) for WNV

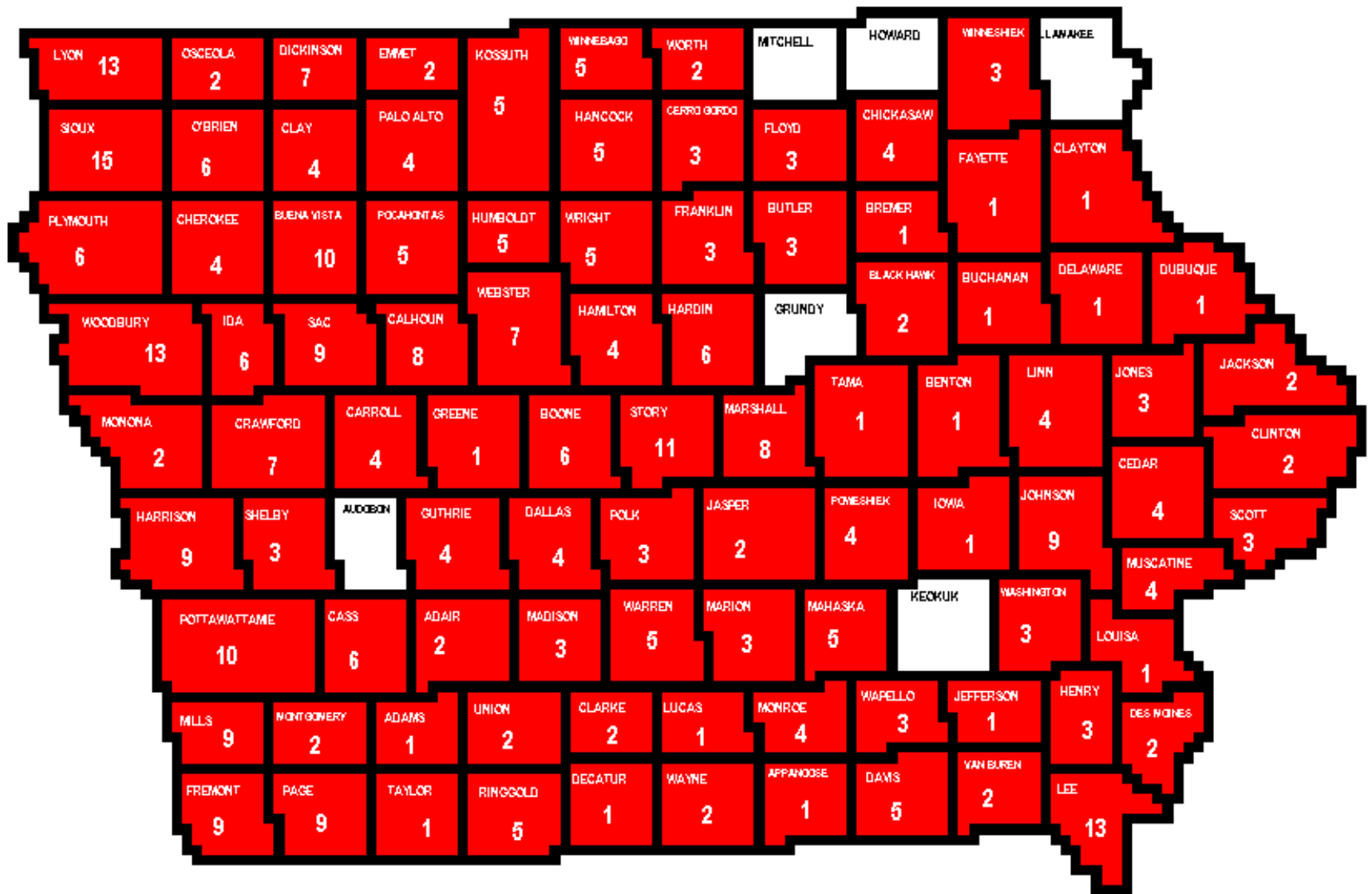
63 POSITIVE HORSES  
42 COUNTIES



# West Nile Virus - Equine Surveillance



# West Nile Virus - Equine Surveillance

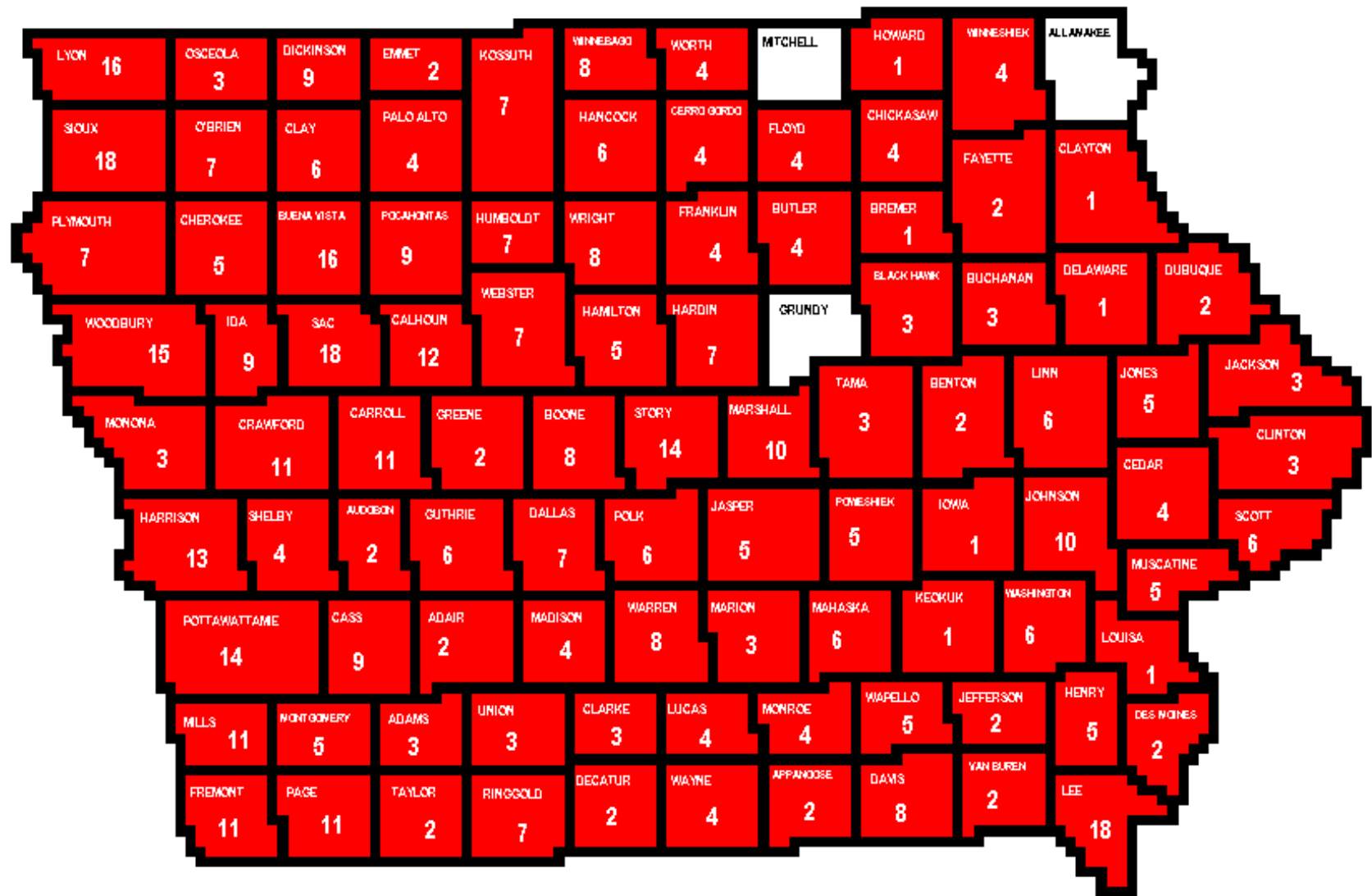


September 18

Positive Horse(s) for WNV

403 POSITIVE HORSES  
93 COUNTIES

# West Nile Virus - Equine Surveillance

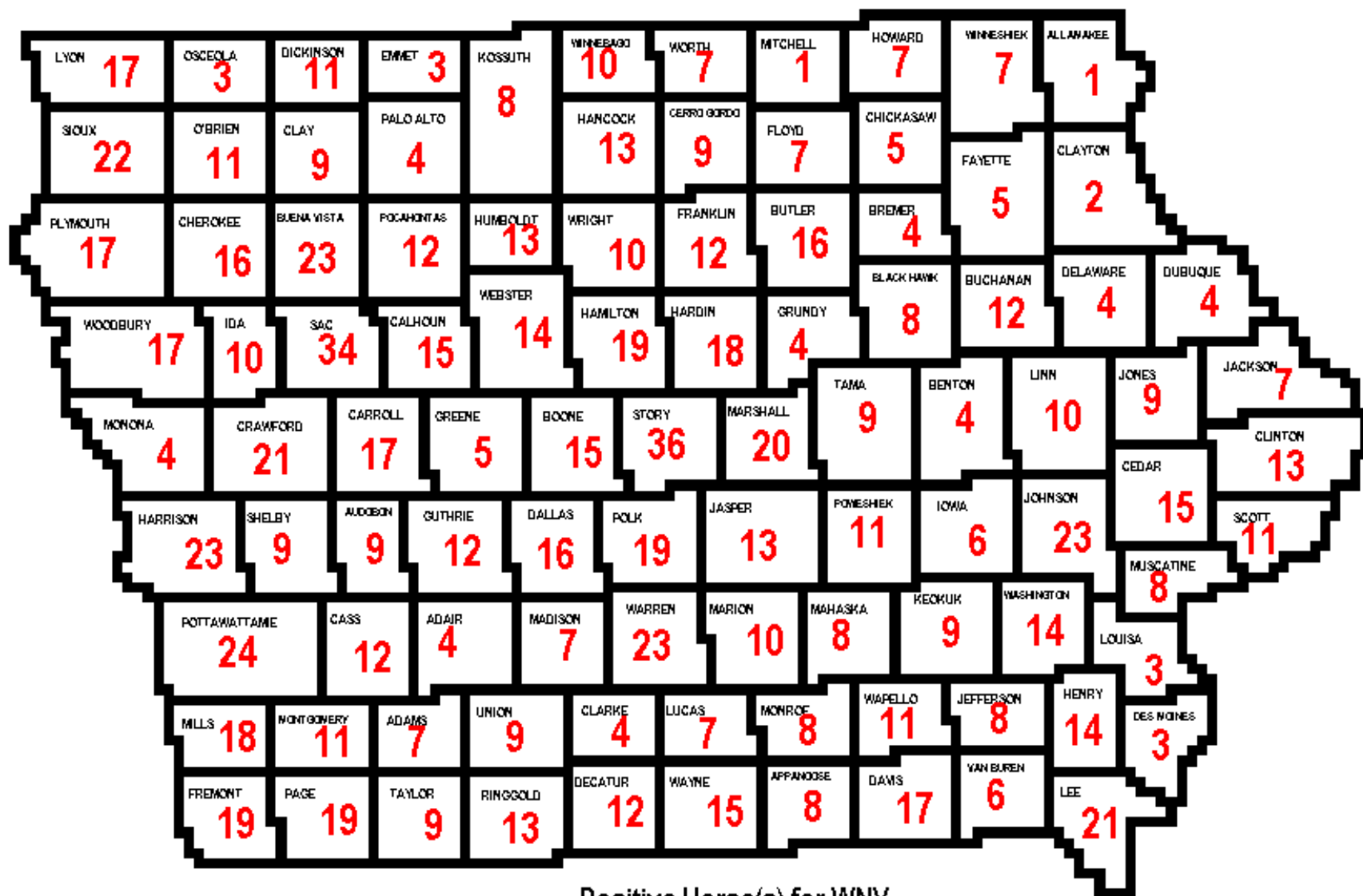


September 23

Positive Horse(s) for WNV

576 POSITIVE HORSES  
96 COUNTIES

# West Nile Virus - Equine Surveillance



November 6

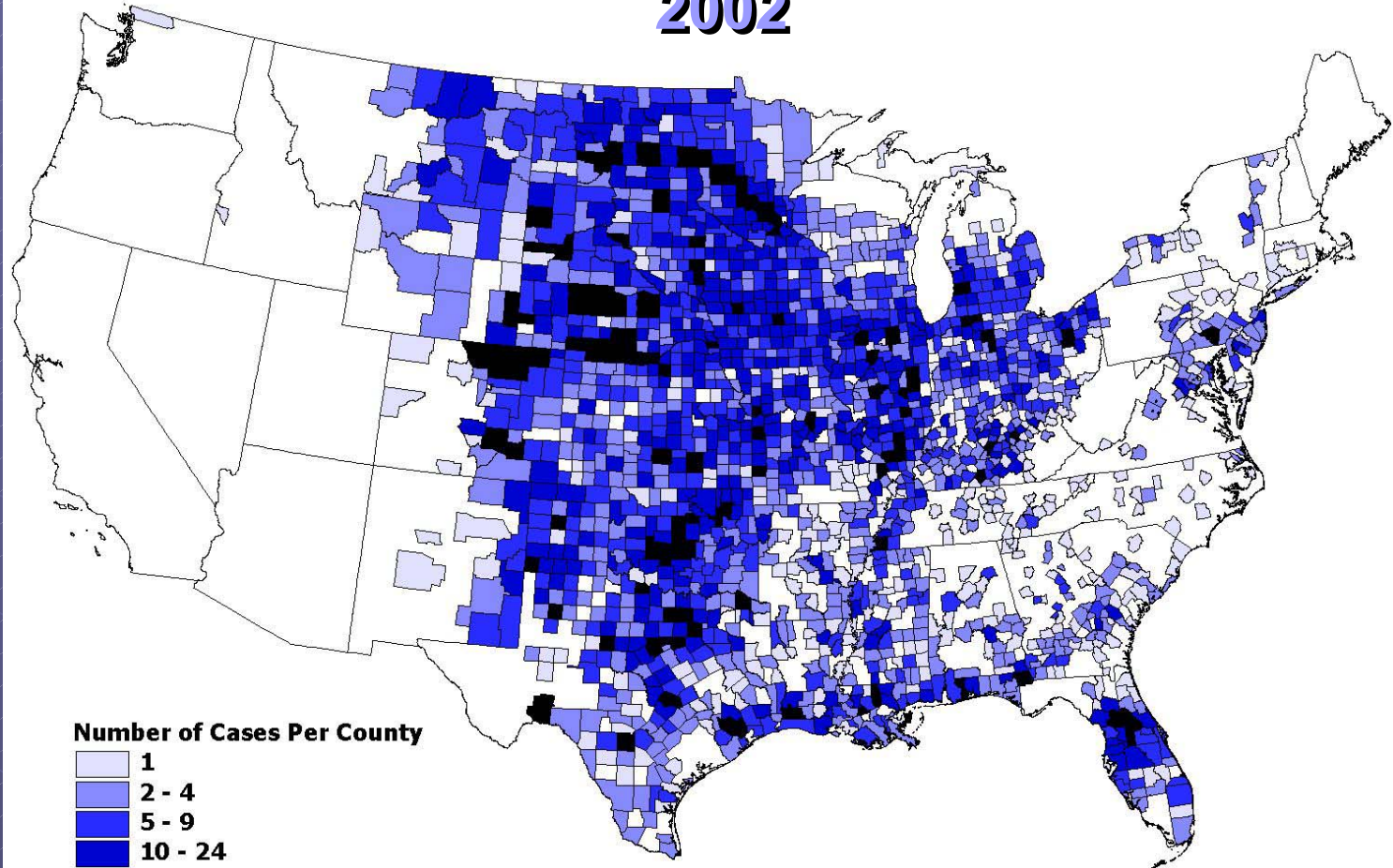
Positive Horse(s) for WNV

1142 POSITIVE HORSES

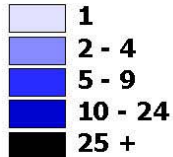
99 COUNTIES

# Equine WNV Cases by County

2002



**Number of Cases Per County**

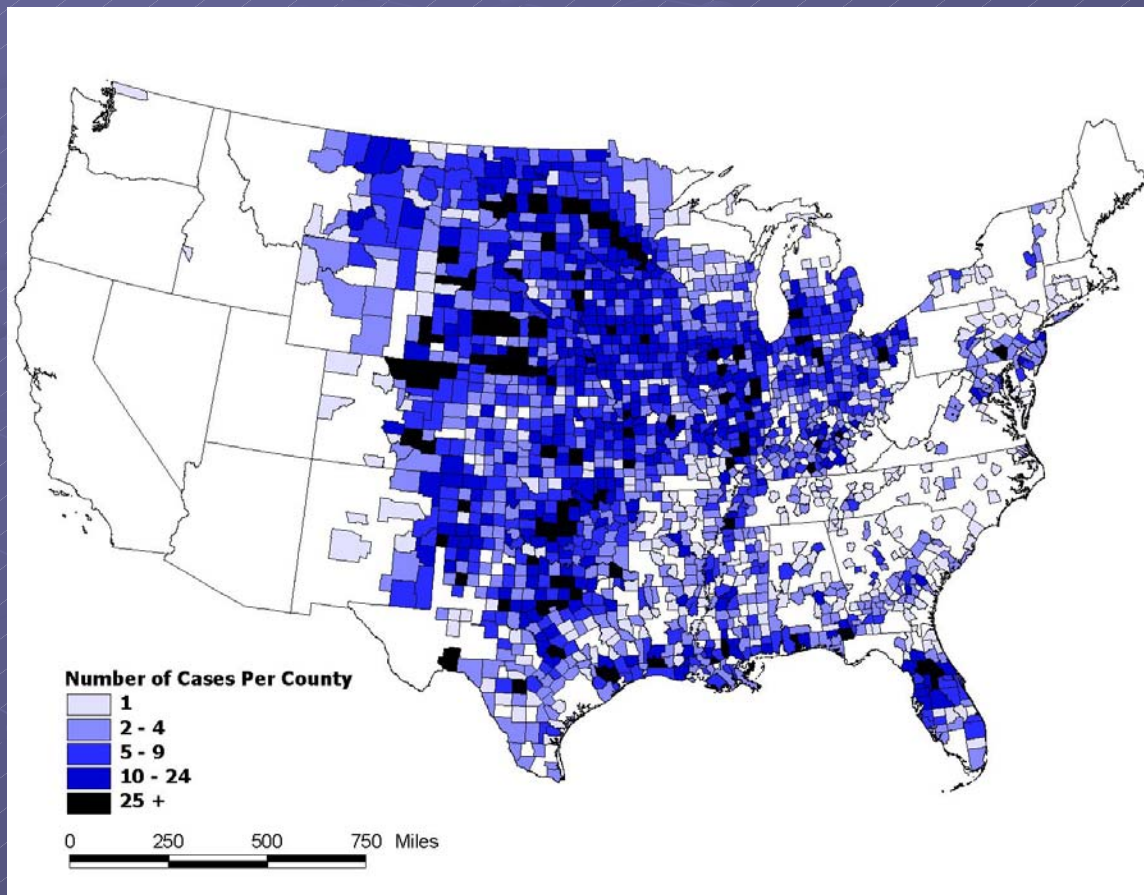


0 250 500 750 Miles

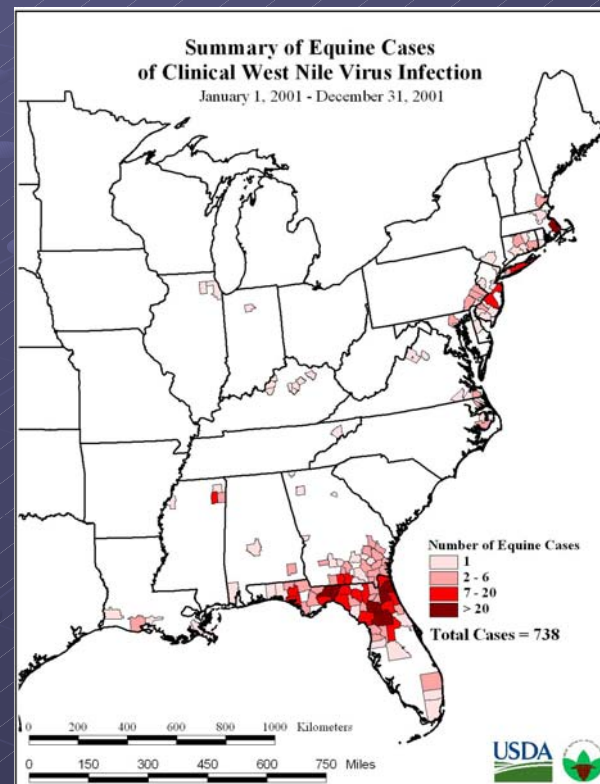
Total cases = 14,740



# Comparison of Equine WNV Cases by County



2002

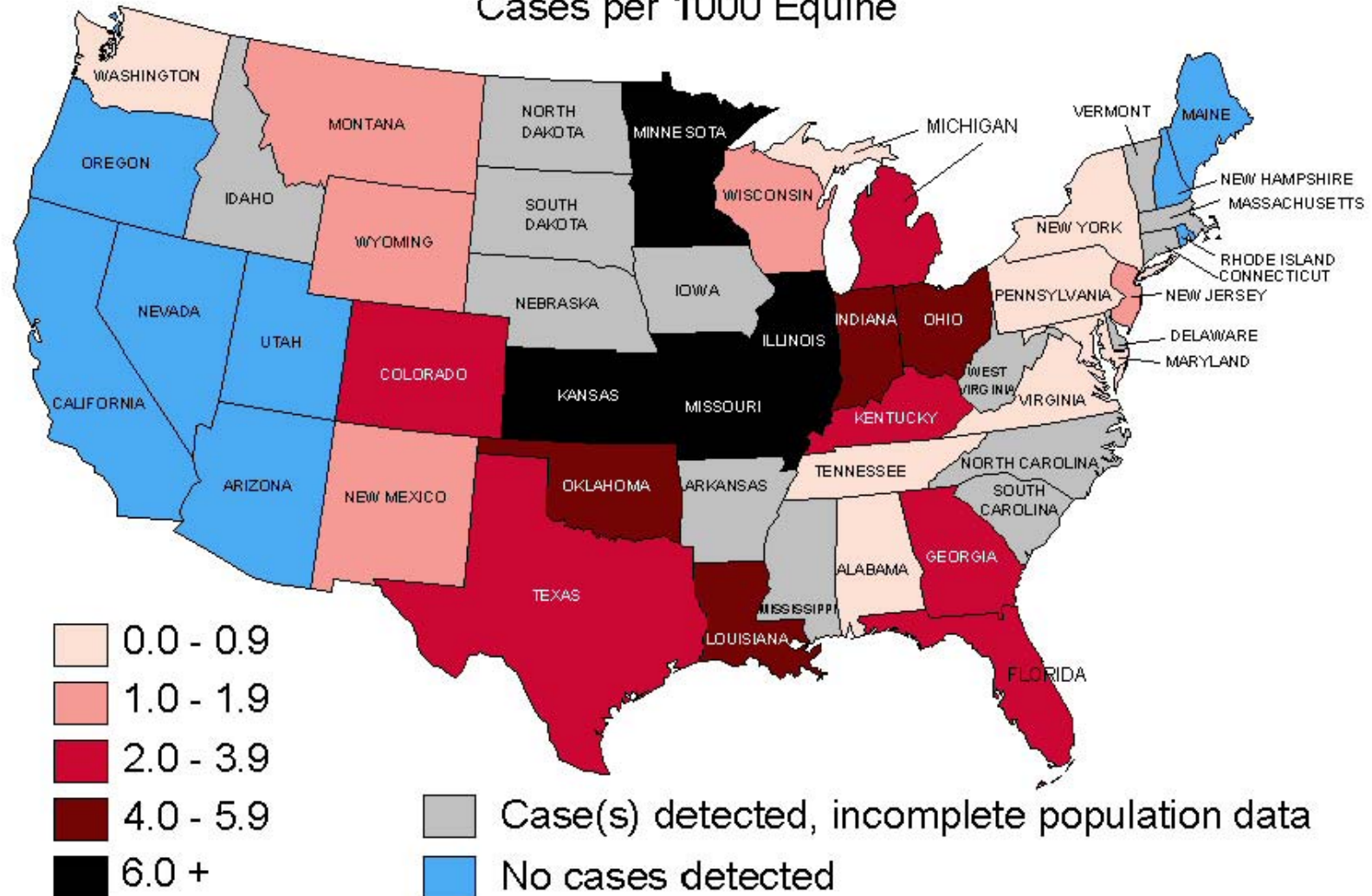


2001

# West Nile Virus in 2002

## States with an Equine Case(s)

Cases per 1000 Equine







# Clinical presentation of Equine WN encephalitis\*

- **Weakness (94%)**
- **Ataxia (72%)**
- **Abnormal Mentation (67%)**
- **Increased Body Temperature (65%)**
- **Fasciculation (61%)**
- **Anorexia (57%)**
- **Cranial Nerve Deficits (44%)**
- **Teeth Grinding (20%)**

\* data compiled by Maureen Long, DVM, PhD, U of FL

# Weakness or Ataxia: 100%

Asymmetrical	39%
Front limbs	15%
Hind limbs	26%
Both limbs	40%
Dysmetria	39%





# Flaccid Paralysis



Recumbent	30%
Mortality	65%



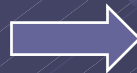
Can be intermittent

# Mentation/Behavior Change: 67%



Nonresponsiveness  
Somnolence  
Low numbers of seizures  
Persistent or intermittent

Not always recumbent



# WNV Equine Case Fatality Rate 2002

- Specific data available from only 10 states; estimate from 1 additional
- Overall CFR for 10 states was 28.2 percent
  - 324 deaths/euthanasias out of 1148 cases
  - CFR by state ranged from 0 to 53 percent
- Estimated CFR for 1 state was 33.3 percent
  - About 214 deaths/euthanasias out of 644 cases
- Combining all data gives estimate of 30.0 percent CFR for 11 states (538/1792)
  - Likely that actual CFR was higher, probably about 33 percent (based on previous years' experiences)

# *West Nile laboratory tests for veterinary species*

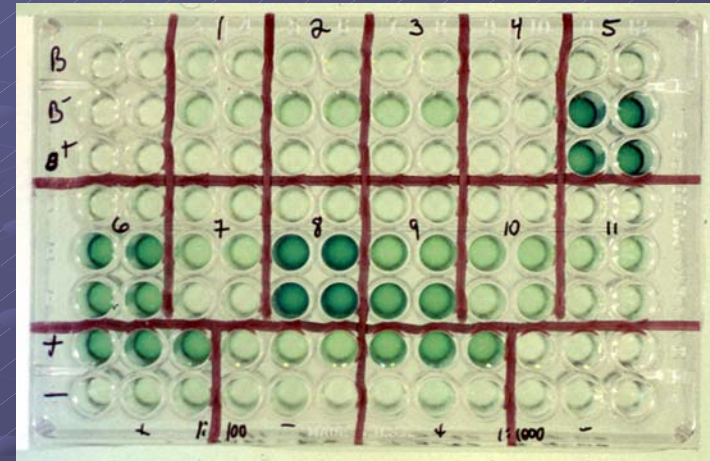




# WNV Diagnostic tests - NVSL

## ● Antibody detection

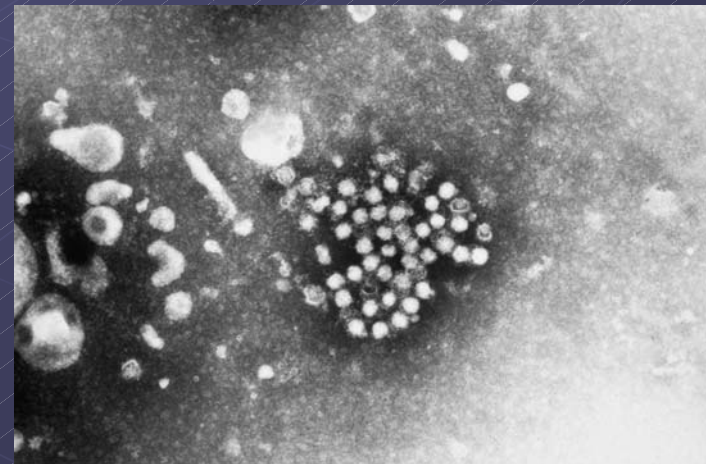
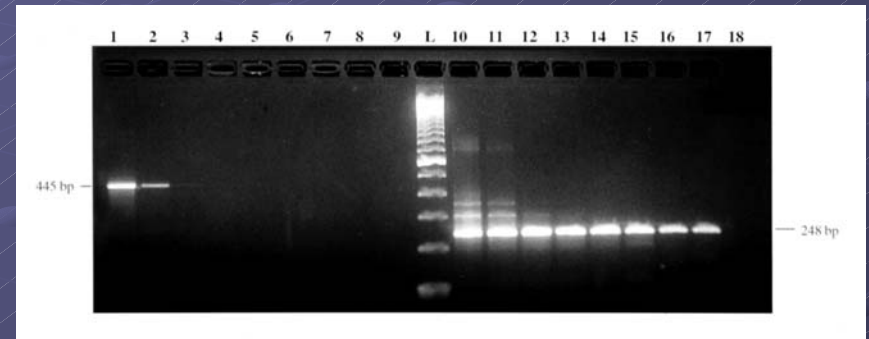
- MAC ELISA
- PRNT





# WNV Diagnostic tests - NVSL

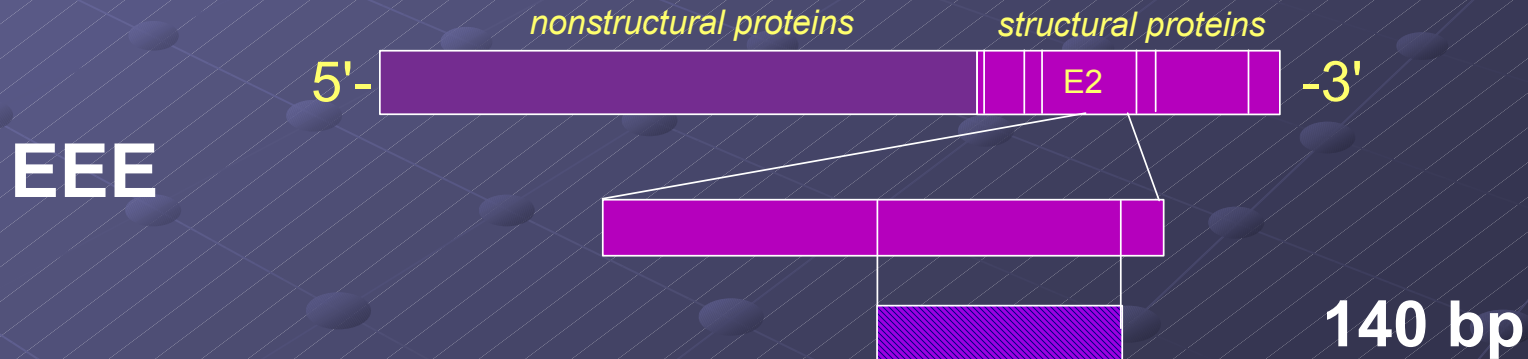
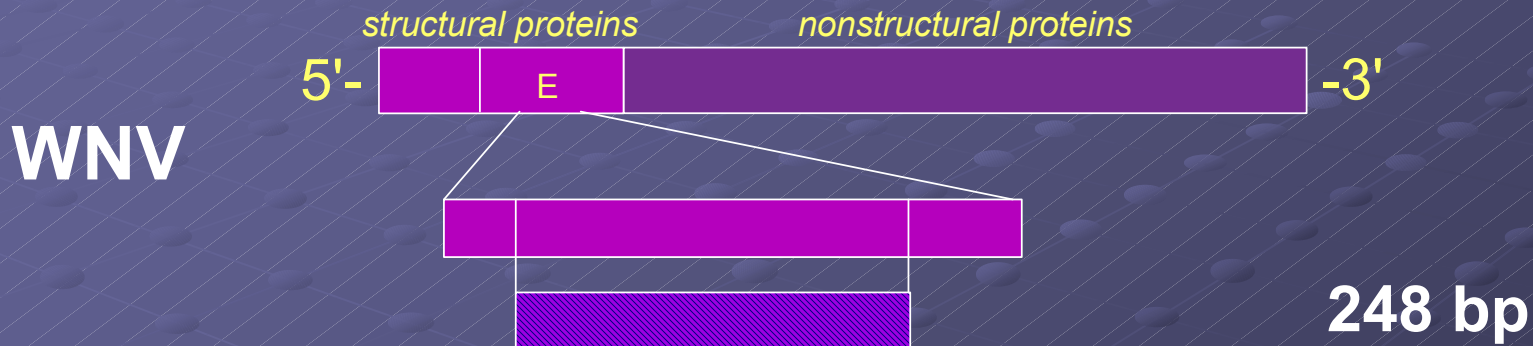
- Agent detection
  - RT-nested PCR
  - virus isolation



# TaqMan and RT-nested PCR testing of equine brain tissues

	TaqMan Positive	TaqMan Negative	Total
RT-nPCR positive	5	7	12
RT-nPCR negative	0	4	4
Total			16

# WNV / EEE RT-nested PCR Amplified Regions of Genomes

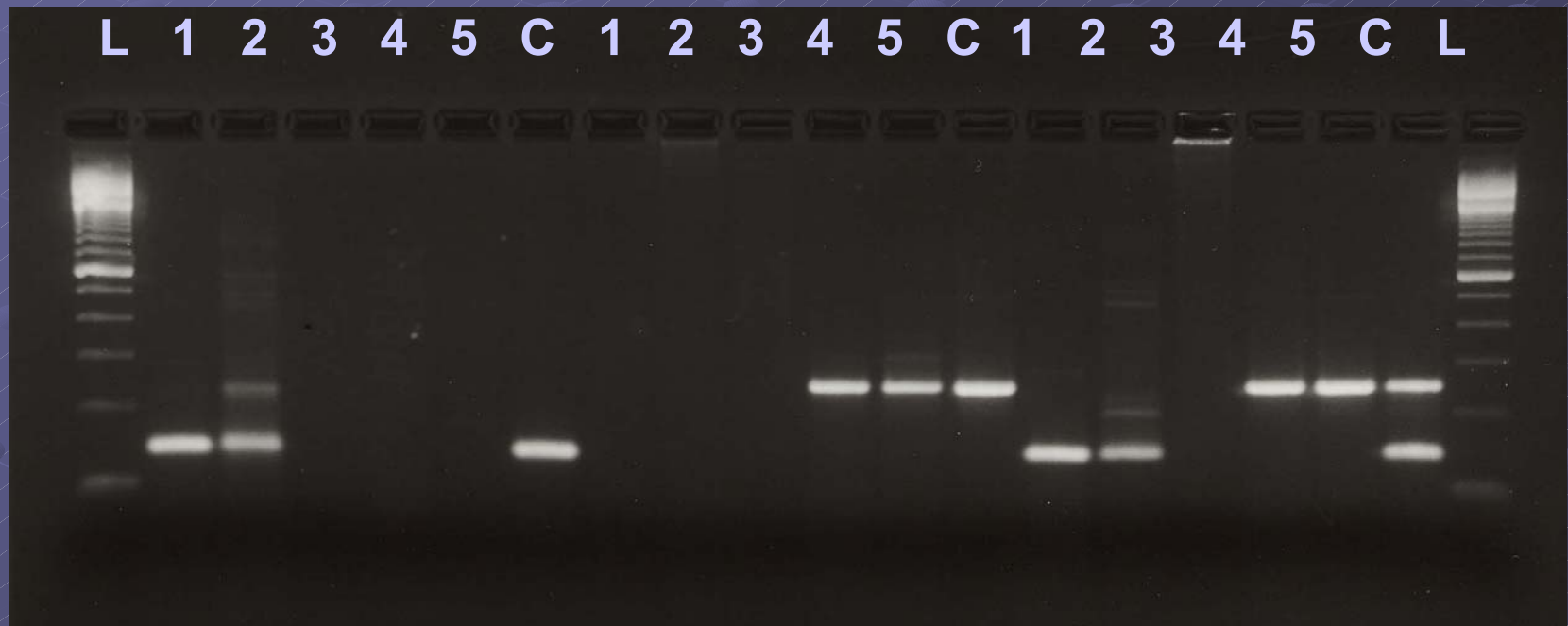


# Tissue Samples Tested by RT-PCR and mRT-PCR

EEE RT-PCR

WN RT-PCR

mRT-PCR

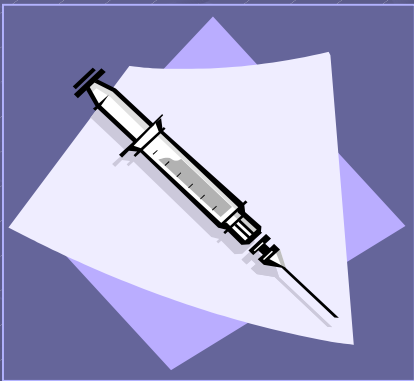


# ***West Nile virus equine vaccine(s)***





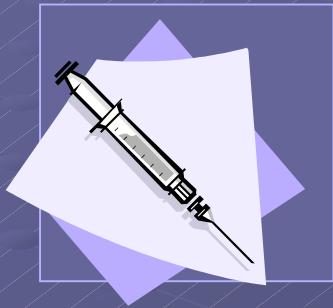
# WNV equine vaccine



- Killed virus product given conditional license by APHIS / VS / CVB on 1 August 2001, renewed 2002
- Full license February 2003
- Over 6 million doses distributed
- Administration: 2 doses IM 3-6 weeks apart; one annual booster

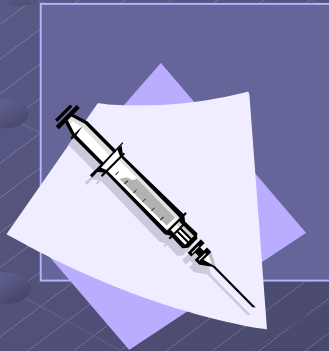


# WNV equine vaccine post-vaccination responses



## ● WNV specific IgM

- No IgM response @ 1:400 detected after 1<sup>st</sup> dose
- No IgM response @ 1: 400 detected after 2<sup>nd</sup> dose



## ● Neutralizing Antibody

- Low or undetectable neutralizing Ab titers after 1<sup>st</sup> dose
- Neutralizing Ab after 2<sup>nd</sup> dose detected in many vaccinates

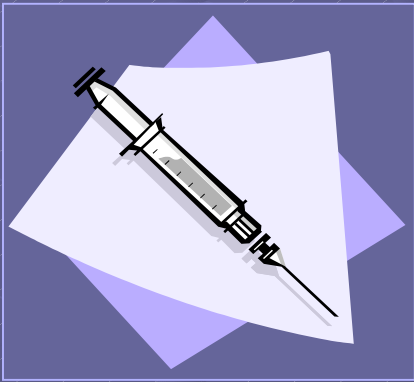
# WNV Cases in “Vaccinated” Horses 2002

- Given a reported vaccine efficacy of 94 percent in properly vaccinated horses:
  - *On average, ~100,000 horses in a State*
  - *If 20 percent are vaccinated (20,000) and if clinical attack rate is about 4 per 1000, then:*
    - *80 vaccinated horses should have become ill, but 94 percent (75) would be protected;*
    - *thus, 5 vaccinated horses would still become clinically ill (vaccine “failures”) in an “average” State in 2002.*
- The more vaccinated horses, or the higher the attack rate, the more potential vaccine failures.

# WNV Cases in “Vaccinated” Horses 2002

- Data available from only 8 states
- 71 cases of possible vaccine failure
  - *WNV illness onset 21 days or more after proper vaccination protocol*
  - *5 states with at least one possible failure:  
FL (44), KY (17), NJ (3), PA (4), VA (3)*
    - 1,201 total equine cases reported
  - *3 states reported no vaccinated equine cases:  
CT, ID, WA*
    - only 7 total equine cases reported

# WNV DNA equine vaccine



- *E. coli* plasmid containing the WNV prM and E genes
- Field trials planned
  - CA, KS, KY, MD, OH, OK
- Environmental assessment

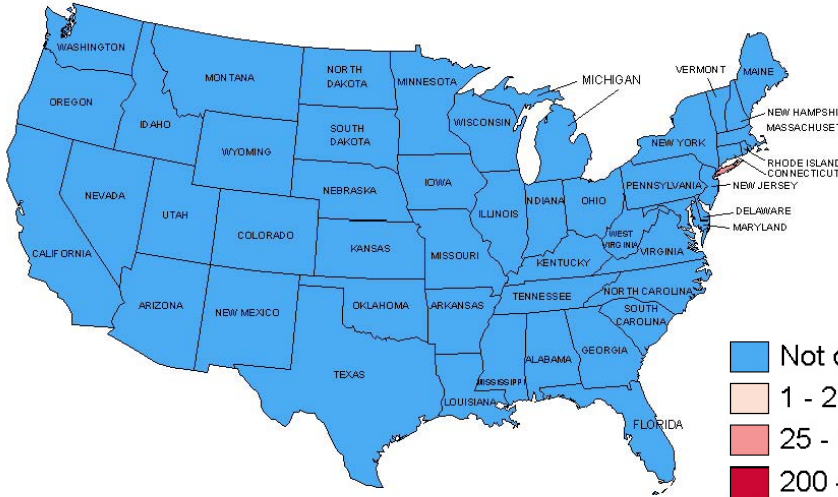


***West Nile virus  
predictions:  
veterinary impact  
in 2003***



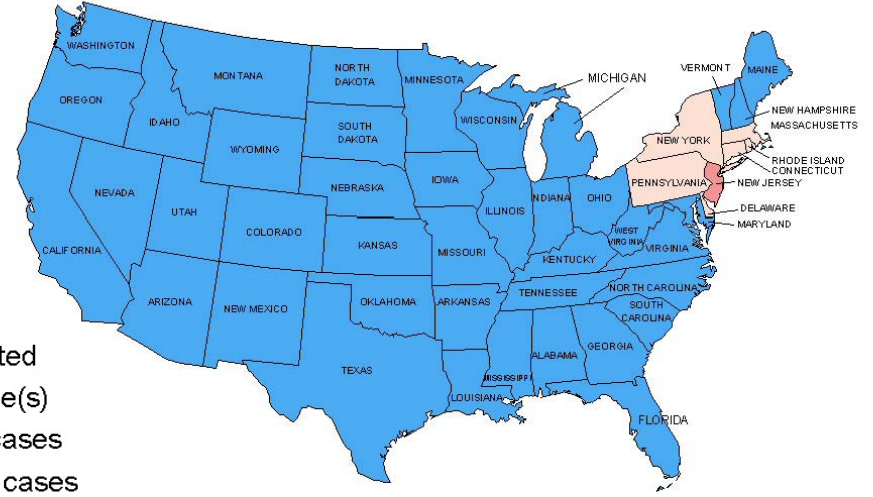
## West Nile Virus in Equine - 1999

Total Cases = 25



## West Nile Virus in Equine - 2000

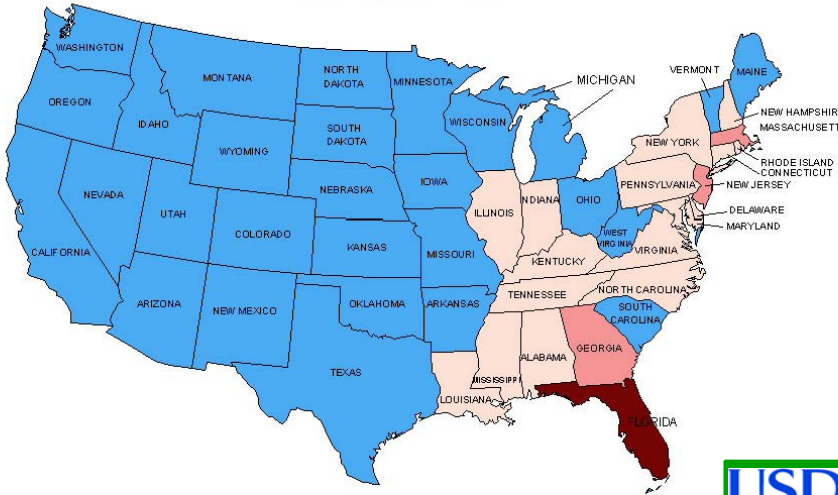
Total Cases = 60



- Not detected
- 1 - 24 case(s)
- 25 - 199 cases
- 200 - 399 cases
- 400 - 799 cases
- 800 or more cases

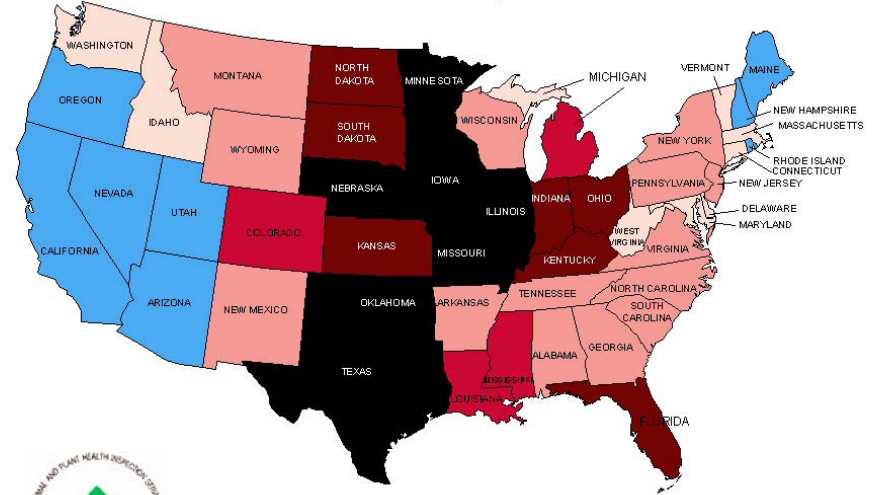
## West Nile Virus in Equine - 2001

Total Cases = 738



## West Nile Virus in Equine - 2002\*

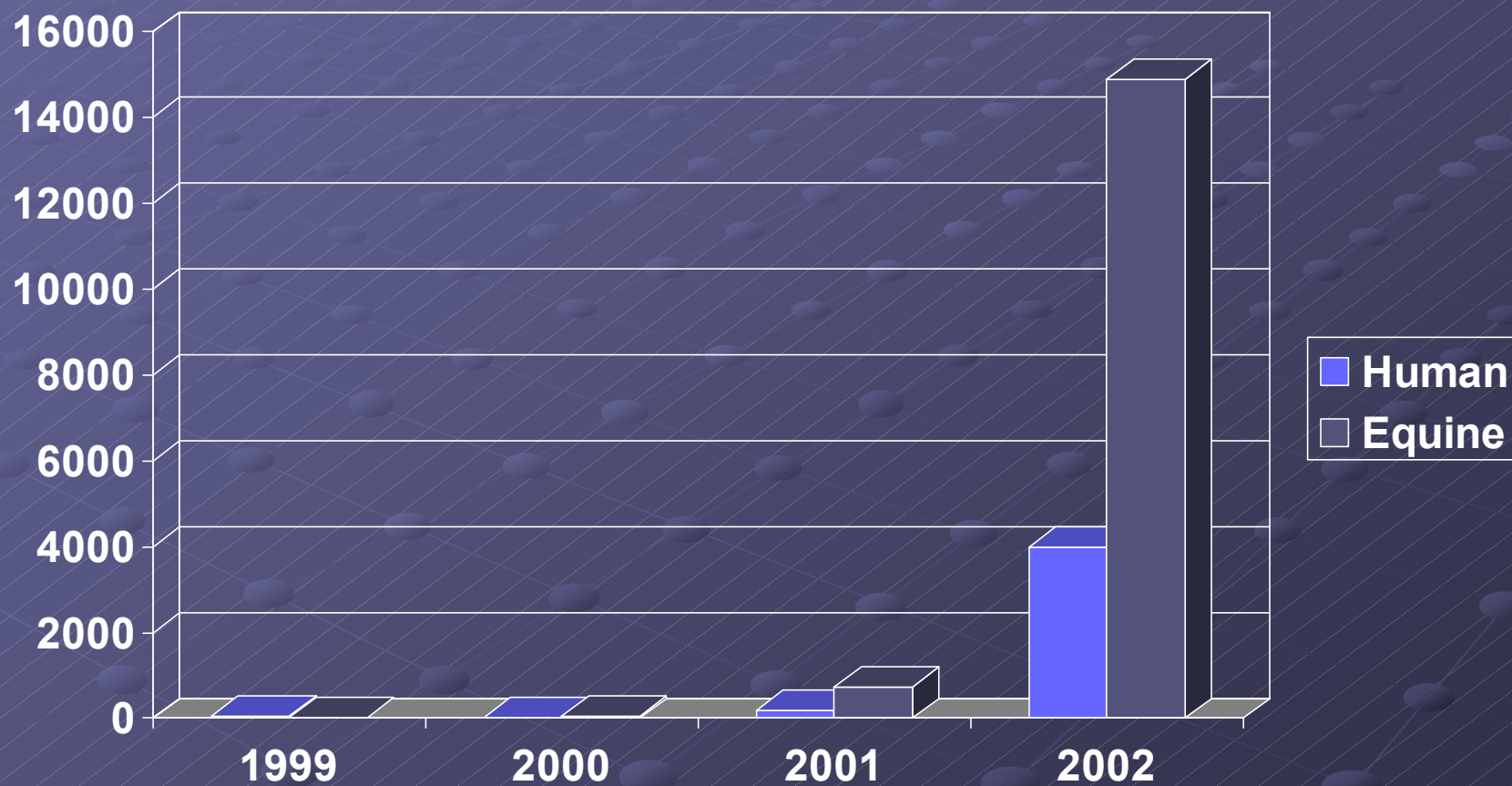
Total Cases = 14,901



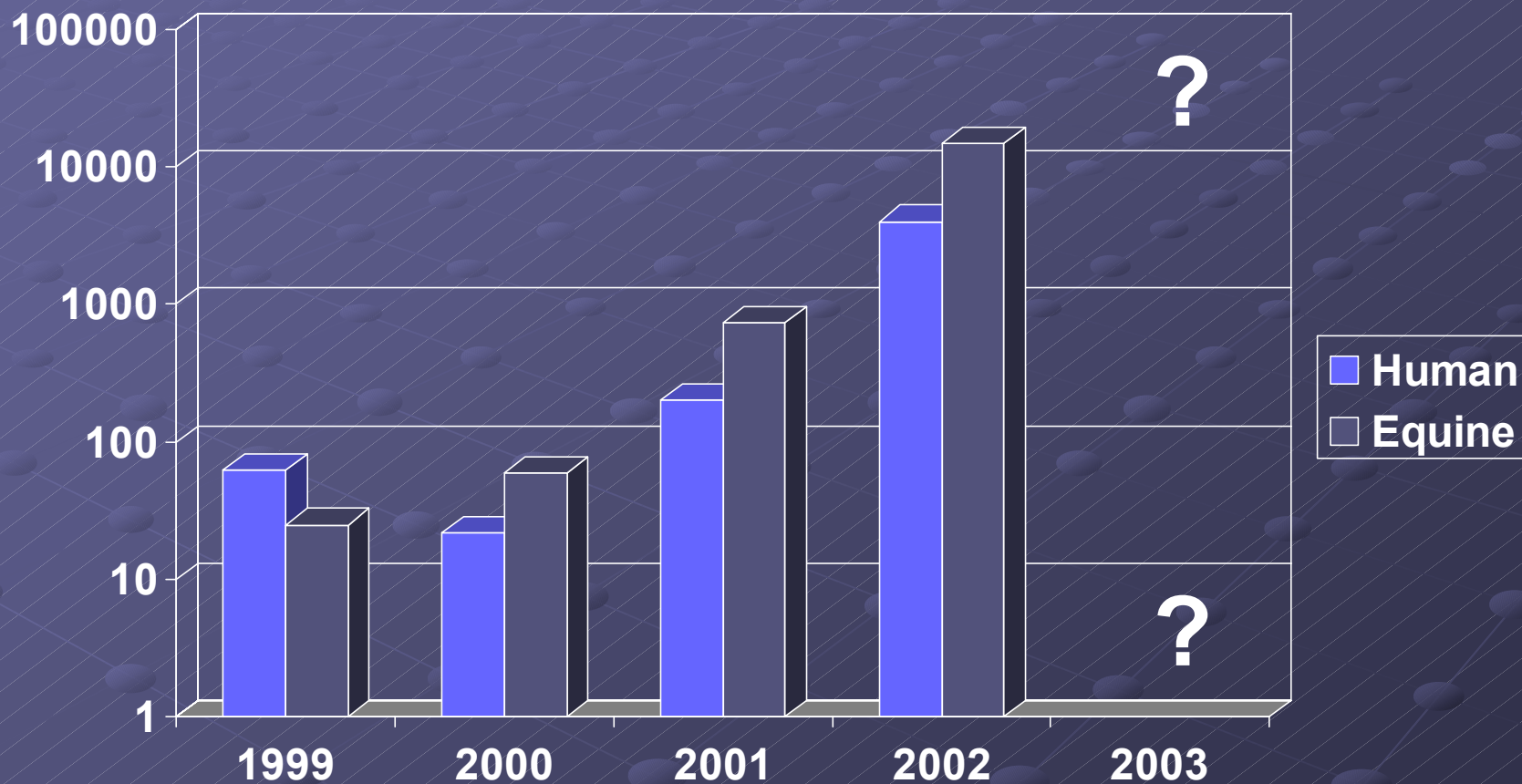
\* reports through 26 January 2003



# WNV Clinical infections per year



# WNV Clinical infections per year



# What should we expect in the future?

- Areas that have had WNV in horses, will have it again (although in different horses).
- Additional areas/states will have WNV cases in horses (i.e., the West Coast).
- Detecting equine cases of WNV will help define areas of WNV activity.
- Equine illness may be an early indicator in western areas with numerous and efficient bridge vectors (*Culex tarsalis?*).

# What should we expect in the future?

- **An increased number of horses will receive WNV vaccine.**
- **Expansion of facilities for WNV testing will influence number of horses (and other veterinary species) tested.**
- **Expansion of facilities for WNV testing will impact data collection.**
- **Additional species will be identified as susceptible to rare clinical illness from WNV infection.**

# Questions?

